GAYATRI VIDYA PARISHAD COLLEGE OF ENGINEERING FOR WOMEN

(Autonomous)

(Approved by AICTE, New Delhi and Permanently Affiliated to Andhra University, Visakhapatnam)

Madhurawada :: Visakhapatnam – 530 048

COURSE STRUCTURE

(Applicable for the Academic Year 2024-25 onwards)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

B.Tech. Computer Science and Engineering

SCHEME AND SYLLABI

(With effect from 2024-25 admitted batch)

I Year - I Semester								
Course Code	**Category**	**Course Title**	**Hours per Week**		**Internal Marks**	**External Marks**	**Total Marks**	**Credits**
			L	**P**				
24BM11RC01	BS	Calculus and Differential Equations	3	0	30	70	100	3
24BC11RC01	BS	Green Chemistry	3	0	30	70	100	3
24HE11RC01	HSS	English	3	0	30	70	100	3
24CT11RC01	ES	Fundamentals of Computers	3	0	30	70	100	3
24CT11RC02	ES	Problem Solving using C	3	0	30	70	100	3
24HE11RC02	HSS	Communication Skills Lab	0	3	50	50	100	1.5
24CT11RC03	ES	Computer Engineering Workshop	0	3	50	50	100	1.5
24CT11RC04	ES	Problem Solving using C Lab	0	3	50	50	100	1.5
							Total Credits	**19.5**

I Year - II Semester								
Course Code	**Category**	**Course Title**	**Hours per Week**		**Internal Marks**	**External Marks**	**Total Marks**	**Credits**
			L	**P**				
24BM11RC02	BS	Linear Algebra and Vector Calculus	3	0	30	70	100	3
24BP11RC01	BS	Engineering Physics	3	0	30	70	100	3
24EC11RC05	ES	Digital Logic Design	3	0	30	70	100	3
24EC11RC04	ES	Elements of Electronics Engineering	3	0	30	70	100	3
24CT11RC06	ES	Python Programming	3	0	30	70	100	3
24BP11RC02	BS	Engineering Physics Lab	0	3	50	50	100	1.5
24CT11RC07	ES	Python Programming Lab	0	3	50	50	100	1.5
24CT11RC08	ES	Web Technologies Fundamentals Lab	0	3	50	50	100	1.5
							Total Credits	**19.5**

CALCULUS AND DIFFERENTIAL EQUATIONS

I Year B. Tech. I Semester

[Common to EEE, ECE, CSE, IT, CSE (AI&ML)]

L	T	P	C
3	0	0	3

Course Code: 24BM11RC01

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Examine the functional dependency and utilize Taylor's theorem to expand the function of two variables. (L3)

CO2: Determine extrema of multivariable functions. (L5)

CO3: Utilize double and triple integrals to evaluate areas of plane curves and the volumes of solids. (L5)

CO4: Solve the first order differential equations and higher order differential equations with constant coefficients, apply the techniques to solve problems related to various engineering fields. (L3)

CO5: Find the Laplace Transforms of various functions and apply it to solve ordinary differential Equations with initial conditions. (L3)

UNIT-I: **8 Lectures**

Partial Differentiation: Functions of two or more variables: Introduction - Partial derivatives - Total derivative - Change of variables - Jacobians – Functional dependence - Taylor's theorem for function of two variables. [Sections: 5.1, 5.2, 5.5, 5.6, 5.7, 5.9 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Examine the functional dependencies using the Jacobian. (L3)
2. Make use of Taylor's theorem to write series expansion of function of two variables. (L3)

UNIT-II: **7 Lectures**

Applications of Partial Differentiation: Maxima and minima of function of two and three variables - Constrained maximum/minimum problems using Lagrange's method of multipliers. [Sections: 5.11, 5.12 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Determine the critical points, maxima and minima of functions several variables. (L5)

UNIT-III: **11 Lectures**

Integral Calculus: Introduction - Double integrals - Change of order of integration - Double integrals in polar Coordinates - Triple integrals - Change of variables.

Applications: Area enclosed by plane curves - Volumes of solids. [Sections: 7.1 – 7.7 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Evaluate double integrals and triple integrals in Cartesian and polar coordinates also over the given region. (L5)
2. Evaluate the double integrals by change of order of integration. (L5)
3. Evaluate double and triple integrals by change of variables. (L5)
4. Determine the areas and volumes using multiple integrals. (L5)

UNIT-IV: **11 Lectures**

Differential Equations and its Applications: Exact differential equations - Equations reducible to exact equations - Solutions of higher order linear ordinary differential equations with constant coefficients - Method of variation of parameters.

Applications: Orthogonal Trajectories - Newton's law of cooling - Law of Natural growth and decay. [Sections: 11.11, 11.12, 12.3, 12.6, 12.8, 13.1 – 13.8 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Solve the first-order differential equations and higher order Linear differential equations with constant coefficients. (L3)
2. Apply the techniques to solve problems related to various engineering fields. (L3)

UNIT-V: **11 Lectures**

Laplace Transforms: Introduction - Existence conditions - Transforms of elementary functions - Properties of Laplace transforms - Transforms of derivatives - Transforms of integrals - Multiplication by t - Division by t– Evaluation of integrals by Laplace transforms - Laplace transforms of Unit step function, Unit impulse function and Laplace transforms of periodic functions - Inverse Laplace transforms - Convolution theorem - Second shifting theorem.

Applications: Laplace Transforms to ordinary differential Equations. [Sections: 21.1 – 21.5, 21.7 – 21.15, 21.17, 21.18 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Find the Laplace transform of the function. (L1)
2. Find the Inverse Laplace transform of a function. (L1)
3. Make use of convolution theorem to find the Inverse Laplace transform of a function. (L3)
4. Apply Laplace transform to solve ordinary differential equations. (L3)

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 45th Edition, Khanna Publishers, 2024.

Reference Books:

1. R K Jain and SRK Iyengar, Advanced Engineering Mathematics, Narosa Publishers, 5th Edition, 2016.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th edition, John Wiley & Sons, 2011.
3. Peter V. O'Neil, Advanced Engineering Mathematics, 7th edition, Cengage Learning, 2011.
4. Greenberg, Advanced Engineering Mathematics, 2nd Edition, Pearson, 2017.

Web References:

1. https://nptel.ac.in/courses/111104125
2. https://nptel.ac.in/courses/111105160

GREEN CHEMISTRY

I Year B. Tech. I semester
[Common to CSE, EEE, IT]

L	T	P	C
3	0	0	3

Course Code: 24BC11RC01

Course Outcomes: At the end of the Course, the student shall be able to

CO1: To develop knowledge about water and its treatment for industrial and potable purpose. (L3)

CO2: Utilize the theory of construction and discharge reactions of various types of batteries are used in commercial society. (L3)

CO3: Explain the importance of working principle, fabrication of electrodes and other components, advantages, disadvantages and environmental aspects of fuel cells. (L4)

CO4: Classify the corrosion mechanism of metals and factors influenced by rate and extent of corrosion and categorize the reasons for corrosion control methods. (L4)

CO5: Apply green chemistry technology processes the knowledge for solving existing challenges faced in various engineering and societal areas. (L5)

UNIT-I **10 Lectures**

Water-Technology: Sources of Water – Impurities and their influence of living systems – WHO Limits – Hardness and its Determination – Boiler Troubles and their removal – Water Softening Methods – Lime-Soda, Zeolite and Ion Exchange - Municipal Water Treatment-Break Point Chlorination – Desalination of Sea Water –Reverse Osmosis Method Electro-dialysis. Chemical analysis of water. [TB1: Chapter1]

Learning Outcomes:

At the end of the unit the student will be able to

1. Explain the principles of reverse osmosis (L4)
2. Compare the quality of drinking water with BIS and WHO standards (L4)
3. Illustrate problems associated with Boiler Troubles (L2)
4. Demonstrate the estimation of hardness of water (L3)

UNIT-II **10 Lectures**

Batteries: Primary batteries: The Chemistry-Types: Zinc-carbon (Leclanche type), zinc alkaline (Duracell), zinc/air batteries; Lithium primary cells and lithium-ferrous sulphide cells.

Secondary batteries: Lead acid and VRLA (valve regulated (sealed) lead acid), nickel cadmium, nickel-

zinc, nickel- metal hydride batteries, lithium-ion batteries, ultrathin lithium polymer cells. Advanced Batteries for electric vehicles, requirements of the battery – sodium-beta and redox batteries. [TB1: Chapter6]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Deduct the working mechanism of various types of cells (L5)
2. Illustrate difference between primary and secondary cells (L2)
3. List the environmental applications of Various types of batteries (L4)
4. Utilize the manufacturing methods of advanced batteries for electric vehicles (L3)

UNIT-III **8 Lectures**

Fuel Cells: Description, working principle, anodic, cathodic and cell reactions, fabrication of electrodes and other components, applications, advantages, disadvantages and environmental aspects of the following types of fuel cells: Proton Exchange Membrane Fuel Cells, alkaline fuel cells, phosphoric acid, solid oxide, molten carbonate, direct methanol fuel cells- Membranes and Fuels, Electrochemical Sensors and Optical fibres. [TB1: Chapter 6]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Explain the fundamental theories of fuel cells (L2)
2. Classify types of fuel cells (L4)
3. Make use of the various components fabrication of fuel cells (L3)
4. Distinguish the advantages, disadvantages and environmental aspects of fuel cells(L4)

UNIT-IV **10 Lectures**

Corrosion: Origin and Theory – Types of Corrosion: Chemical and Electrochemical; Pitting, inter granular, Waterline, Stress – Galvanic Series – Factors Effecting Corrosion. Corrosion Controlling Methods, Protective Coatings, Electroplating and Electroless Plating, Paints, Varnishes, Lacquers, Enamels. [TB1: Chapter 7]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Explain the Mechanism of corrosion (L4)
2. List the various types of Corrosion (L4)
3. Describe the Factors Effecting Corrosion (L5)
4. Differentiate between Paints Lacquers Enamels (L4)

UNIT-V **10 Lectures**

Green-Chemistry and Technology: Introduction and significance of green chemistry, Goals of green chemistry, 12 principles of green chemistry, toxicity of chemicals, concept of zero pollution technologies; Aqueous phase method, Super critical fluid method, Phase transfer catalytic method, atom economy, functional toxicity vs non- functional toxicity, functional group approaches to green chemistry, Elimination of toxic functional group, optimization of frameworks for the design of greener synthetic pathways -Green synthesis of Adipic acid and Paracetamol- energy minimization-Microwave synthesis, ultra sound assisted method Bio catalyzed reaction and Only explanation with examples Processes involving solid catalysts – zeolites, ion exchange resins, applications of Green Chemistry, Green solvents, green fuels & propellants. [TB2: Chapter- 2,3,4&5]

Learning Outcomes:

At the end of the unit the student will be able to

1. Processes involving Green Chemistry and apply the knowledge for solving existing
2. Challenges faced in various engineering and societal areas (L-5)
3. Differentiate between functional toxicity vs non- functional toxicity (L-4)
4. Explain the green chemistry, 12 principles (L-2)

Textbooks:

1. Engineering Chemistry – PC Jain and M. Jain –15th Edition, Dhanpath Rai and Sons, New Delhi.
2. Anastas, P. T., Warner, J. C. Green Chemistry: Theory and Practice, Oxford UniversityPress Inc., New York, 1998.

Reference Books:

1. M. Aulice Scibioh and B. Viswanathan ‘Fuel Cells – principles and applications’, University Press India (2006).
2. A Textbook of Engineering Chemistry – S. S. Dara – S. Chand & Co. New Delhi
3. Handbook of Green Chemistry and Technology; by James Clarke and Duncan Macquarrie; Blakwell Publishing.

Web References:

1. https://archive.nptel.ac.in/course.html
2. https://nptel.ac.in/courses/engineering

ENGLISH

I Year B. Tech. I Semester

[Common to CSE, IT]

L	T	P	C
3	0	0	3

Course Code: 24HE11RC01

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Develop moral values and inner peace(L3), Demonstrate the use of LSRW skills, Vocabulary and basic grammar concepts. (L3)

CO2: Identify the impact of different social backgrounds (L3), recognize the poet's insights. (L4) Demonstrate the use of LSRW skills, Vocabulary and basic grammar concepts. (L3)

CO3: Analyse socio-cultural context(L4), Establish effective interpersonal and communication skills(L3), Demonstrate the use of LSRW skills, Vocabulary and basic grammar concepts(L3)

CO4: Focus on value of education(L4), Relate to the poet's nostalgia(L4), Demonstrate the use of LSRW skills, Vocabulary and basic grammar concepts (L3)

CO5: Determine the central idea of the text(L3), Identify one's resilience(L3), Demonstrate the use of LSRW skills, Vocabulary and basic grammar concepts (L3)

UNIT-I **10 Lectures**

Prose:	Swami Vivekananda: The Secret of Work
Poetry:	Grenville Kleiser: Stay Calm
Grammar & Vocabulary:	Synonyms & Antonyms
Listening:	Listening for Context and Specific Information
Speaking:	Introducing Oneself and Others
Writing:	Basics of writing

Learning Outcomes:

At the end of the unit, the student will be able to

1. Interpret the spiritual growth and capacity building of the individual in the 21st century. (L3)
2. Use appropriate synonyms and antonyms to communicate effectively. (L3)
3. Listen and understand for specific information in the audio(L2)
4. Establish connections between oneself and others(L3)
5. Apply appropriate punctuation marks for clarity and organization of written text (L3)

UNIT-II **10 Lectures**

Prose:	Katherine Mansfield: The Doll's House
Poetry: Rabindranath Tagore:	Where the Mind Is Without Fear
Grammar & Vocabulary:	Phrasal Verbs
Listening:	Listening for Main Idea and Supporting Ideas
Speaking:	Getting Someone's Attention and Interrupting
Writing:	Formal Letters

Learning Outcomes:

At the end of the unit, the student will be able to

1. Relate to the world through adult & child's points of view (L3)
2. Identify the sense of self dignity & rationality in the poem (L4)
3. Utilize appropriate phrasal verbs for effective communication(L3)
4. Listen & identify main and supporting ideas in the audio(L3)
5. Practice conversational etiquette(L3)
6. Write formal letters(L3)

UNIT-III **10 Lectures**

Prose:	O. Henry: The Last Leaf
Poetry:	Rudyard Kipling: If
Grammar & Vocabulary:	Idiomatic Expressions
Listening:	Listening for Global Comprehension
Speaking:	Asking for Information and Giving Information
Writing:	Note-Making

Learning Outcomes:

At the end of the unit, the student will be able to:

1. Analyze strategies to face challenges in life (L4)
2. Develop one's own personality (L3)
3. Use idiomatic expressions in oral & written communication (L3)
4. Listen & Interpret the audio for Global Comprehension (L3)
5. Ask & provide information (L3)
6. Practice note making study skills(L3)

UNIT-IV **10 Lectures**

Prose:	Francis Bacon: Of Studies
Poetry:	Toru Dutt: Our Casuarina Tree
Grammar & Vocabulary:	Remedial Grammar I
Listening:	Listening to Make Inferences
Speaking:	Expressing Opinions, and Agreeing and Disagreeing with Opinions
Writing:	Essay Writing

Learning Outcomes:

At the end of the unit, the student will be able to

1. Prioritize the habits of continuous learning(L4)
2. Recognize the significance of Indian philosophy (L4)
3. Identify and correct common errors in English grammar and usage(L3)
4. Draw inferences from the audio(L3)
5. Articulate one's own opinions(L3)
6. Develop different types of essays (DEAN)(L3)

UNIT-V **8 Lectures**

Prose:	Mark Twain: Whitewashing the Fence
Poetry:	William Ernest Henley: Invictus
Grammar & Vocabulary:	Remedial Grammar II
Listening:	Listening for Key Ideas
Speaking:	Telephone Etiquette
Writing:	E-mail Etiquette

Learning Outcomes:

At the end of the unit, the student will be able to

1. Discover the humour & moral lessons in the text (L3)
2. Show resilience in adverse situations. (L3)
3. Modify sentences with appropriate grammar, vocabulary and usage (L3)
4. Identify key ideas (L3)
5. Practice telephone Etiquette (L3)
6. Apply the knowledge of E-mail Etiquette (L3)

Text Books:

1. English for Engineers: Theory to practice. Board of Editors, Orient Black Swan Publishers, India.2024.

Reference Books:

1. English Grammar in Use by Raymond Murphy
2. Oxford English Grammar Course by Michael Swan
3. Word Power Made Easy by Norman Lewis
4. Cambridge Vocabulary for IELTS by Pauline Cullen
5. The Elements of Style by William Strunk Jr. and E.B. White
6. English Vocabulary in Use by Michael McCarthy and Felicity O'Dell
7. Practical English Usage by Michael Swan
8. The Only Grammar Book You'll Ever Need by Susan Thurman
9. Advanced English Grammar: A Linguistic Approach by Ilse Depraetere and Chad Langford

FUNDAMENTALS OF COMPUTERS

I Year B. Tech. I semester
[Common to CSE, CSE (AI&ML), IT]

L	T	P	C
3	0	0	3

Course Code: 24CT11RC01

Course Outcomes: At the end of the Course, the student shall be able to:

CO1: Identify different I/O devices and their usage. (L3)

CO2: Compare different computer memory with their efficiency. (L3)

CO3: Relate different computer software's and programming languages for solving problems. (L2)

CO4: Summarize the use of operating system, database system, and computer network in the field of computing in engineering. (L2)

CO5: Infer the methods and applications of artificial intelligence (AI), machine learning (ML) and data science. (L3)

UNIT-I **10 Lectures**

Introduction to Computers: Computers, Stored Program Concept, Classification of Computers, Evolution and Development of Computers, Application Areas of Computers, Features/Characteristics of Computers, Basic Organization of a Computer.

Input and Output Devices: Input Devices, Output Devices, Soft Copy Devices, Hard Copy Devices, Voice Response Systems, Biometric Devices [TextBook-1: Chapter 1 (S-1.1 – S-1.7)]

https://oer-studentresources.gesci.org/wp-content/courses/Computer/CS-F1-Introduction-to-computers/evolution_and_development_of_computers.html (Development of Computers) [TextBook-1: Chapter 2 (S-2.1 – S-2.6)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Outline characteristics and classification of computers (L2)
2. Demonstrate different configurations of software and hardware used in computer (L2)
3. Model the computer by organizing different computer peripherals such as I/O, CPU, etc. (L3)

UNIT-II **10 Lectures**

Computer Memory: Introduction, Memory Organization, Memory Hierarchy, Sequential and Random Access, Processor Registers, Cache Memory, Primary Memory, Secondary Storage Devices, Magnetic Tapes, Floppy Disks, Hard Disks, External Hard Disks, Optical Disks, USB Flash Drives, Memory Cards, Mass Storage Devices. [TextBook-1: Chapter 3 (S-3.1 – S-3.16)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Summarize computer memory hierarchy. (L2)
2. Classify different memory with respect to speed and cost. (L2)
3. Illustrate different external storage devices and its applications. (L2)

UNIT-III **10 Lectures**

Computer Software: Introduction to Computer Software, Classification of Computer Software, System Software, Application software, Graphics Software, Multimedia Software, Database Management Software, Firmware, Middleware, Procuring Computer Software.

Problem Solving using Computers: Introduction, Program Development Life Cycle, Program Design Tools, Programming Languages, Generations of Programming Languages, Categorization of High-level Languages, Some Popular High-level Languages, Apps. [TextBook-1: Chapter 6 (S-6.1 – S-6.7), TextBook-1: Chapter 7 (S-7.1 – S-7.7)]

https://www.builder.ai/glossary/app#:~:text=An%20app%20is%20a%20type,enhance%20productivity%20and%20streamline%20communication (Apps)

Learning Outcomes:

At the end of the unit, the student will be able to

1. Compare different computer software's (L2)
2. Summarize different programming languages for solving problems. (L2)
3. Contrast Structured Programming Language, Logic-oriented Programming Language, and Object-oriented Programming. (L2)

UNIT-IV **10 Lectures**

Fundamental Operating Systems: Introduction, History of Operating Systems, Functions of Operating Systems, Types of Operating Systems, Providing User Interface, Popular Operating Systems

Database Systems: File-Oriented Approach, Database-oriented Approach, Database Views, Three-schema Architecture, Database Models, Components of Database Management, Retrieving Data Through Queries.

Computer Networks: Introduction to Computer Networks, Types of Networks, Physical Components of a Network, Wired Media, Wireless Media, Networking Devices, Network Topologies, Wireless Networks. [TextBook-2: Chapter 11 (S-11.1 / P-238 – S-11.11 / P-258), TextBook-1: Chapter 9 (S-9.1 – S-9.7), Chapter 10 (S-10.1 – S-10.8)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Explain fundamentals of operating systems. (L2)
2. Illustrate database system applications and its design concepts. (L2)

3. Outline fundamentals of computer networks and its applications. (L2)

UNIT-V **8 Lectures**

Introduction to Artificial Intelligence & Machine Learning (AI&ML) and Data Science: Introduction to AI & ML, and Data Science, Use Cases in Business and Scope, Modelling Concepts, CRISP-DM Method.

1. https://community.aws/content/2drbbXokwrIXivItJ8ZeCk3gT5F/introduction-to-artificial-intelligence-and-machine-learning?lang=en (Artificial Intelligence)
2. https://www.javatpoint.com/machine-learning-models (Machine Learning)
3. https://www.techtarget.com/searchenterpriseai/feature/Top-12-machine-learning-use-cases-and-business-applications (Machine Learning)
4. https://www.heavy.ai/learn/data-science (Data Science)
5. https://www.sv-europe.com/crisp-dm-methodology/ (CRISP-DM Method)

Learning Outcomes:

At the end of the unit, the student will be able to

1. Outline the main methods and applications of artificial intelligence (AI) concepts. (L2)
2. Outline the main methods and applications of machine learning (ML) concepts. (L2)
3. Outline the main methods and applications of data science concepts. (L2)

Textbooks:

1. Reema Thareja, Fundamentals of Computers, Second Edition, Oxford University Press, 2019.
2. E Balagurusamy, Fundamentals of Computers, Tata McGraw Hill Education Private Limited, 2009

Reference Books:

1. Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems, 4th Edition, McGraw-Hill, 2002.
2. Andrew S. Tanenbaum, Modern Operating Systems, 2nd edition, PHI, 1995.

Web References:

1. https://oer-studentresources.gesci.org/wp-content/courses/Computer/CS-F1-Introduction-to-computers/evolution_and_development_of_computers.html (Development of Computers)
2. https://www.builder.ai/glossary/app#:~:text=An%20app%20is%20a%20type,enhance%20productivity%20and%20streamline%20communication (Apps)
3. https://www.geeksforgeeks.org/what-is-an-operating-system/ (Operating System)
4. https://www.javatpoint.com/computer-network-tutorial (Computer Network)
5. https://community.aws/content/2drbbXokwrIXivItJ8ZeCk3gT5F/introduction-to-artificial-intelligence-and-machine-learning?lang=en (Artificial Intelligence)
6. https://www.javatpoint.com/machine-learning-models (Machine Learning)

7. https://www.techtarget.com/searchenterpriseai/feature/Top-12-machine-learning-use-cases-and-business-applications (Machine Learning)
8. https://www.heavy.ai/learn/data-science (Data Science)
9. https://www.sv-europe.com/crisp-dm-methodology/ (CRISP-DM Method)

PROBLEM SOLVING USING C

I Year B. Tech. I semester

[Common to CSE, CSE (AI&ML), IT, ECE]

L	T	P	C
3	0	0	3

Course Code: 24CT11RC02

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Explain the basic constructs of C through the use of simple applications. (L2)

CO2: Demonstrate the utilization of arrays and strings in the development of C programs. (L2)

CO3: Utilize functions and pointers to construct various applications in C. (L3)

CO4: Apply concepts of structures and unions to build and implement C applications. (L3)

CO5: Develop applications using sequential and random-access file processing techniques. (L3)

UNIT-I **10 Lectures**

Introduction to C: Basic structure of C program, Constants, Variables and data types, Operators and Expressions, Arithmetic Precedence and associativity, Type Conversions. Managing Input and Output Operations Formatted Input, Formatted Output. [TextBook-1: Chapter 2 (S-2.1 – S-2.12)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Outline the Basic Structure and Components of C Programs. (L2)
2. Demonstrate Variables, Data Types, Operators, and Expressions. (L2)
3. Illustrate Input and Output Operations. (L2)

UNIT-II **11 Lectures**

Decision Making, Branching, Looping: Decision making with if statement, Simple if statement, The if…else statement, Nesting of if…else statement, the else.. if ladder, switch statement, the (? :) operator, the goto statement, The while statement, the do statement, the for statement, Jumps in Loops.

Arrays & Strings: One, Two-dimensional Arrays, multi-dimensional Arrays, Character Arrays. Declaration and Initialization of Strings, reading and writing of strings, string handling functions. [TextBook-1: Chapter 3 (S-3.1 – S-3.8), TextBook-2: Chapter 13,14,15,16 (PP:215-283)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Classify Decision Making and Branching (L2)
2. Interpretation of Looping Constructs (L2)
3. Summarize Arrays and Strings (L2)

UNIT-III **10 Lectures**

Function and Dynamic Memory Allocation: Functions: Designing structured programs, declaring a function, Signature of a function, Parameters and return type of a function, passing parameters to functions, call by value, passing arrays to functions, recursion.

Introduction to Pointers, Pointer Arithmetic, Pointers for Inter-Function Communication, passing pointers to functions, call by reference, Dynamic Memory Allocation. [TextBook-1: Chapter 4 (S-4.1 – S-4.11), Chapter 5 (S-5.1 – S-5.12)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Utilize Functions (Understand and Implement Functions, Utilize Various Function Types, Advanced Function Techniques) (L3)
2. Experiment with Pointers (Basic Pointer Operations, Pointers and Data Structures) (L3)
3. Explain Advanced Pointer Usage (Pointers in Functions, Pointers to Complex Data Types) (L2)

UNIT-IV **9 Lectures**

Structure and Unions: Defining a structure and union, declaring structure variables, accessing structure members, structure initialization, copying and comparing structure variables, arrays of structures, arrays within structures, structures within structures, definition and usage of union, structures and unions using functions, size of structures and bit-fields. The Type Definition (Type def), Enumerated Types. [TextBook-1: Chapter 6 (S-6.1 – S-6.9)]

Learning Outcomes:

1. At the end of the unit, the student will be able to
2. Define Structures and Build C programs using Structures. (L3)
3. Explain Complex Data Structures. (L2)
4. Explain Unions and Bit-Fields. (L2)

UNIT-V **8 Lectures**

File handling: Introduction to Files, Modes of File operations, Text and Binary Files, Defining and opening a file, closing a file, Input/ Output operations on files, Error handling during I/O operations, random access to files and Command Line Arguments, user defined header files. [TextBook-2: Chapter 19 (PP:325-348)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Outline File Operations. (L2)
2. Summarize Error Handling and Random Access. (L2)
3. Utilize Command Line Arguments. (L3)

Text Books:

1. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, 2015, Pearson Education India, ISBN: 978-93-3254-944-9.
2. Yashavant P. Kanetkar, "Let Us C", 16th Edition, 2019, BPB Publications, ISBN: 978-93-8728-449-4.

Reference Books:

1. N. B. Venkateswarlu, E. V. Prasad, "C and Data Structures", 1st Edition, S. Chand Publishing, 2010, ISBN: 978-93-525-3356-5.
2. Pradip Dey, Manas Ghosh, "Programming in C", 2nd Edition, 2018, Oxford University Press, ISBN: 978-01-9949-147-6.
3. Jacqueline A. Jones and Keith Harrow, "Problem Solving with C", Pearson Education. ISBN: 978-93-325-3800-9.
4. E. Balagurusamy, "Programming in ANSI C", 8th Edition, 2019, McGraw Hill Education, ISBN: 978-93-5316-513-0.

Web References:

1. https://nptel.ac.in/courses/106105171
2. https://ocw.mit.edu/courses/6-087-practical-programming-in-c-january-iap-2010/pages/lecture-notes/
3. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013843237039374336345 17_shared/overview
4. https://cse02-iiith.vlabs.ac.in/List%20of%20experiments.html

COMMUNICATION SKILLS LAB

I Year B. Tech. I semester

[Common to CSE, IT]

Course Code: 24HE11RC02

L	T	P	C
0	0	3	1.5

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Identify and pronounce the sounds of English; choose the accurate stress in connected speech for proper intonation. (L3)

CO2: Apply the main theme and ideas of the audio/video to take notes and summarize. (L3)

CO3: Develop speaking skills by taking part in Just A Minute (JAM) – Picture Prompts-Narratives-Role Play. (L3)

CO4: Practice discussions and debates. (L3)

CO5: Demonstrate Presentation Skills. (L3)

ACTIVITY-I

Introduction to Phonetics: The Sounds of English (Speech sound – vowels and consonants) - Stress and Intonation - Accent and Rhythm.

Learning Outcomes:

At the end of the unit, the student will be able to

1. Apply the knowledge of Phonetics for better pronunciation and articulation. (L3)
2. Choose appropriate stress, intonation and rhythm of English language for clear communication. (L3)

ACTIVITY-II

Listening Skills: Listening for gist and specific information - listening for Note taking, Summarizing and for opinions - Listening to the speeches of eminent personalities.

Learning Outcomes:

At the end of the unit, the student will be able to

1. Develop effective listening skills for better comprehension of academic lectures and English spoken by native speakers. (L3).
2. Apply effective strategies for good writing. (L3)
3. Demonstrate writing skills in note taking and summarizing. (L3)

ACTIVITY-III

Speaking Skills: Just A Minute (JAM) session –Picture Prompts- Narrating stories and anecdotes-Role Play

Learning Outcomes:

At the end of the unit, the student will be able to

1. Make use of dialogues for different roles. (L3)
2. Develop communication skills in formal and informal situations. (L3)
3. Practice speaking skills through participation in activities such as narrating stories and role plays(L3)

ACTIVITY-IV

Speaking skills: Group Discussions-Arguments-Debates

Learning Outcomes:

At the end of the unit, the student will be able to

1. Organize one's own ideas for various Group-Discussion formats. (L3)
2. Develop ideas and arguments to debate. (L3)

ACTIVITY-V

Presentation skills: Verbal and non-verbal communication - Body Language - Making a Presentation

Learning Outcomes:

At the end of the unit, the student will be able to

1. Design presentations with PowerPoint slides(L3)
2. Apply appropriate body language (postures, gestures, facial expressions and eye contact) in formal presentations. (L3)

LIST OF LAB ACTIVITIES:

1. Identification and pronunciation of Vowel sounds and Consonant sounds (CO1)
2. Identification of word stress, Intonation and Rhythm (CO1)
3. Listening for specific information & Note taking (CO2)
4. Listening to the speeches of eminent personalities and summarizing (CO2)
5. Just A Minute sessions (CO3)
6. Picture Prompts (CO3)
7. Narrating Stories& anecdotes (CO3)
8. Role-Plays (CO3)
9. Group Discussions (CO4)

10. Debates (CO4)
11. Presentation Skills-I (CO5)
12. Presentation Skills-II (CO5)

Reference Books:

1. Language and Life: A Skills Approach Board of Editors, Orient Black swan Publishers, India.2018.
2. A Textbook of English Phonetics for Indian Students, T.Balasubramanian, Macmillan India Ltd.
3. Ashraf Rizvi. Effective Technical Communication. Tata McGraw Hill Education Private Limited, New Delhi.
4. Speak Well. Orient Black swan Publishers, Hyderabad.
5. Allan Pease. Body Language. Manjul Publishing House, New Delhi.

Web References:

1. https://www.englishlanguageclub.co.uk
2. https://www.ted.ed.com/
3. https://learningenglish.voanews.com/
4. https://www.bbc.co.uk/learningenglish/
5. https://www.abc.net.au/education/learn-english
6. NDTV News

COMPUTER ENGINEERING WORKSHOP

I Year B. Tech. I semester
[Common to CSE, CSE (AI&ML), IT]

Course Code: 24CT11RC03

L	T	P	C
0	0	3	1.5

Course Outcomes: At the end of the Course, the student shall be able to:

CO1: Identify the peripherals of a computer. (L3)

CO2: Demonstrate the installation process of operating systems like MS Windows, LINUX. (L3)

CO3: Make use of MS-Office suite that comprises of various applications to create documents, organizes & analyses data and captivating presentations. (L3)

CO4: Categorize various UNIX/LINUX Commands to work on a modern operating system. (L3)

CO5: Experiment with GIT Commands and make use of LaTeX to prepare research articles. (L3)

Module-1: Hardware Concepts

1. Identify the peripherals of a computer, components in a CPU and its functions.
2. Draw the block diagram of the CPU along with the configuration of each peripheral.
3. Disassemble and assemble the PC back to working condition.

Module-2: Software Installations

1. Install operating systems like LINUX and MS windows on a personal computer.
2. The system should be configured as dual boot with both MS windows and LINUX.

Module-3: Office Suite

1. Creating Documents: Formatting Fonts/Texts, page layout, Applying Text effects, Character Spacing, Borders and Colours, Inserting Header and Footer, equation editor.
2. Spreadsheet Orientation: Accessing, overview of toolbars, saving spreadsheet files, Using help and resources. Creating a Scheduler, Gridlines, Format Cells, Summation, auto fill, Formatting Text, Renaming and Inserting worksheets, Hyper linking.
3. Excel Calculation: Calculating Average, Cell Referencing, Excel Formula, std. deviation, Charts, Count Function, Sorting, Conditional formatting, Excel Advanced-sumif, VLOOKUP, and Pivot Table.
4. Creating Power Point: Student should work on basic power point utilities and tools to create basic power point presentation. PPT Orientation, Slide Layouts, Inserting Text, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows, Hyperlinks, Inserting Images, Tables and charts.
5. Software as a service (SaaS): Usage of online office suite.

Module-4: Unix / Linux Commands

1. Study and practice on file system, handling files with commands, syntax, usage, application.
2. Practice on vi editor.
3. Study and practice on shells/shell programming with relevant programming constructs, syntax, usage, application.

Module-5: GIT Commands and LaTeX

1. Installation of GIT, Branch in Git Basic GIT Commands.
2. Installation of LaTeX and preparing research articles by creating overleaf account.
3. Introduction to Scratch Programming - Introduction, Stage, Sprite, Script, Block Palette.

Reference Books:

1. IT Essentials: PC Hardware and Software Companion Guide, Third Edition, David Anfinson, Ken Quamme.
2. UNIX concepts and applications by Sumitabha Das, TMH Publications.
3. Shell programming by Yashwanth Kanetkar.

Web References:

1. https://www.javatpoint.com/

PROBLEM SOLVING USING C LAB

I Year B. Tech. I semester

[Common to CSE, CSE (AI&ML), IT, ECE]

Course Code: 24CT11RC04

L	T	P	C
0	0	3	1.5

Course Outcomes: At the end of the Course, the student shall be able to:

CO1: Outline the use of basic constructs of C for simple applications. (L2)

CO2: Develop C programs for simple applications using Arrays and Strings. (L3)

CO3: Illustrate concepts such as functions, recursion, and pointers with suitable examples. (L2)

CO4: Build C programs involving Structures and Unions. (L3)

CO5: Develop applications using sequential and random-access file processing. (L3)

Module-1:

1. Write a C program to demonstrate Format Specifiers and Input/Output Statements.
2. Write a C program to demonstrate various Data Types.

Module-2:

1. Write a C program to demonstrate various Operators including Bitwise Operator.
2. Write a C program to demonstrate Arithmetic Expressions and Type Casting.

Module-3:

1. Write a C program to demonstrate decision making statements.
2. Write a C program to demonstrate iterative statements.
3. Write a C program to demonstrate break and continue Statement.

Module-4:

1. Write a C program to demonstrate arrays (one-dimensional and two-dimensional).
2. Write a C program to demonstrate string handling functions using built-in and user defined functions.

Module-5:

1. Write a C program to demonstrate user defined functions.
2. Write a C program to demonstrate nested functions.

Module-6:

1. Write a C program to demonstrate arithmetic expressions using pointers.
2. Write a C program to demonstrate Pointers to Arrays.
3. Write a C program to demonstrate manipulate strings using pointers.
4. Write a C program to demonstrate dynamic memory allocation.

Module-7:

1. Write a C program to demonstrate Call-by-value, Call-by-reference.
2. Write a C program to demonstrate recursive function.
3. Write a C program to demonstrate Functions with Storage Classes (Static).

Module-8:

1. Write a C program to demonstrate structures.
2. Write a C program to demonstrate structures within structures.
3. Write a C program to demonstrate pointer to a structure.
4. Write a C program to demonstrate unions.

Module-9:

1. Write a C program to demonstrate I/O operations on files.
2. Write a C program to demonstrate concatenating two files.
3. Write a C program to demonstrate copy content of one file to another file.

Case Study: Select any one application mentioned below.

Note: A report has to be submitted by every student at the end of the semester that includes design, coding, output, etc.

1. Develop a library management system to add, delete, and search for books efficiently.
2. Develop an ATM system to check balance, deposit money, and withdraw funds.
3. Develop a C program to calculate salary increments using a lookup table which stores the percentage of increment based on the current salary.
4. Develop a voting system where users can vote for candidates and view results.
5. Develop a basic calculator for arithmetic operations like addition, subtraction, multiplication, and division.
6. Develop a contact management system to store and manage details like name, phone number, and email.
7. Develop a banking system supporting multiple users for account management and transactions.
8. Develop a C program to calculate SGPA and CGPA based on students' marks across semesters.
9. Develop a registration page in C using file handling to securely store usernames and passwords.
10. Develop an encryption and decryption algorithm to securely transform and restore data by using the GNU C Library: crypt.

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, 2015, Pearson Education India, ISBN: 978-93-3254-944-9.
2. Yashavant P. Kanetkar, "Let Us C", 16th Edition, 2019, BPB Publications, ISBN: 978- 93- 8728-449-4.
3. E. Balaguruswamy, "Programming in ANSI C", 8th Edition, 2019, McGraw Hill Education, ISBN: 978-93-5316-513-0.
4. Pradip Dey, Manas Ghosh, "Programming in C", 2nd Edition, 2018, Oxford University Press, ISBN: 978-01-9949-147-6.
5. N.B. Venkateswarulu, "C programming", 1st Edition, S.Chand Publishing, 2017, ISBN: 978-93-525-3356-5.
6. Jacqueline A Jones and Keith Harrow, "Problem Solving with C", Pearson Education. ISBN: 978-93-325-3800-9.

Web References:

1. https://nptel.ac.in/courses/106105171
2. https://ocw.mit.edu/courses/6-087-practical-programming-in-c-january-iap-2010/pages/lecture-notes/
3. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013843237039374336345 17_shared/overview
4. https://cse02-iiith.vlabs.ac.in/List%20of%20experiments.html

LINEAR ALGEBRA AND VECTOR CALCULUS

I Year B. Tech. II Semester

[Common to EEE, ECE, CSE, IT, CSE (AI&ML)]

L	T	P	C
3	0	0	3

Course Code: 24BM11RC02

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Test for consistency and solve linear system of equations, also determine unknown currents in the electrical circuits. (L5)

CO2: Find the Eigen values and Eigen vectors of a matrix and apply Cayley- Hamilton theorem to find the inverse of a matrix. (L3)

CO3: Reduce quadratic form to canonical form and examine the nature of quadratic form. (L4)

CO4: Interpret the meaning and evaluate gradient of a scalar valued, curl and divergence of vector valued functions. (L5)

CO5: Apply line integrals, surface integrals, volume integrals and their relations using Green's theorem, Stoke's theorem, Gauss Divergence theorems in various engineering applications. (L3)

UNIT-I: **10 Lectures**

Matrix Algebra: Rank of a matrix- Echelon form, Normal Form - Solution of Linear System of Equations - Consistency of Linear System of Equations – Gauss elimination and Gauss Jordan methods, LU Factorization method.

Applications: Finding the current in electrical circuits. [Sections: 2.7, 2.10, 28.6 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Find the rank of a matrix. (L1)
2. Test for consistency and solve a system of linear equations. (L4)
3. Apply Gauss elimination and Gauss Jordan methods, LU factorization to solve linear systems. (L3)
4. Determine unknown currents in electrical circuits. (L5)

UNIT-II: **10 Lectures**

Eigen Values and Eigen Vectors: Eigen Values and Eigen Vectors of a real Matrix – Properties - Cayley- Hamilton theorem (without proof) - Inverse and Powers of a Matrix using Cayley-Hamilton's theorem – Pseudo inverse of a matrix, Singular value decomposition. [Sections: 2.13 - 2.15 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Find eigenvalues and corresponding eigenvectors of a matrix. (L1)
2. Apply Cayley-Hamilton theorem to find powers and the inverse of a matrix. (L3)
3. Calculate the Pseudo Inverse of a matrix. (L3)
4. Calculate the singular values of a matrix. (L3)

UNIT-III: **9 Lectures**

Quadratic Forms: Inner Product – Orthogonal Vectors – Orthogonal matrix – Diagonalization of a Matrix-Quadratic Forms - Reduction of Quadratic Form to Canonical Form (Orthogonal Transformation) - Nature of a Quadratic Form. [Sections: 2.16 - 2.18 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Make use of Eigen values and eigen vectors to diagonalize the matrix. (L3)
2. Reduce the Quadratic form to canonical form examine the nature of a quadratic form. (L4)

UNIT-IV: Vector Differentiation **9 Lectures**

Introduction - Scalar and Vector point functions, General rules for vector differentiation - Vector operator ∇ applied to scalar point functions- Gradient, ∇ applied to vector point functions- divergence and curl. Physical interpretation of gradient, divergence and curl(i.e., ∇f, $\nabla . \overline{F}$, $\nabla \times \overline{F}$), Irrotational and Solenoidal fields, Vector Identities. [Sections: 8.1, 8.4 - 8.9 of Text Book]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Find the gradient of a scalar point function, divergence and curl of a vector point function. (L1)
2. Determine the directional derivative of scalar point function. (L5)

UNIT-V: Vector Integration **10 Lectures**

Integration of vectors - Line integral – Circulation - work done - surface integral-flux - Green's theorem in the plane - Stoke's theorem - Volume integral - Gauss Divergence theorem (All theoremswithout proofs). [Sections: 8.10 - 8.16, 8.18 of Text Book]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Determine the work done in a moving particle along a path. (L5)
2. Interpret surface and volume integrals. (L2)

3. Apply vector integral theorems to multiple integral. (L3)

Textbooks:

1. B. S. Grewal, Higher Engineering Mathematics, 45th Edition, Khanna Publishers, 2024.

Reference Books:

1. David Poole, Linear Algebra- A modern introduction, 4th edition, 2015.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th edition, John Wiley & Sons, 2011.
3. Peter V. O'Neil, Advanced Engineering Mathematics, 7th edition, Cengage Learning, 2011.
4. Greenberg, Advanced Engineering Mathematics, 2nd Edition, Pearson, 2017.

Web References:

1. https://nptel.ac.in/courses/111107112

ENGINEERING PHYSICS

I Year B. Tech. II Semester

[Common to CSE, IT]

L	T	P	C
3	0	0	3

Course Code: 24BP11RC01

Course Outcomes: At the end of the Course, the student shall be able to:

CO1: Apply the principles of interference, diffraction, and polarization in wave optics, and utilize optical instruments for practical applications. (L3)

CO2: Familiarize the basic concepts of Thermodynamics relevant to engineering applications. (L2)

CO3: Outline the knowledge of basic principles of Electromagnetism and EM Waves. (L2)

CO4: Describe the basic principles of lasers, optical fibres and their use in technological applications. (L2)

CO5: Understand the basic principles of Quantum mechanics, Quantum computing. (L2)

UNIT-I **10 Lectures**

Interference: Principle of superposition, Young's Experiment (qualitative treatment), Coherence, Interference in thin films (reflected light), Newton's Rings, Michelson's Interferometer and its applications (thickness of thin sheet, determination of wavelength).

Diffraction: Introduction, Differences between Interference and Diffraction, Differences between Fresnel and Fraunhoffer diffraction, Fraunhoffer diffraction at a single slit (Qualitative and Quantitative treatment)

Polarization: Introduction - types of Polarization. Polarization by reflection, Brewster's law, refraction and double refraction in uniaxial crystals, Nicol Prism, Quarter wave plate and Half wave plate, Applications of Polarization.

Text Book 1: 5.16,5.17,5.18, 5.20, 6.1, 6.2, 6.8.(1-3), 6.11, 6.13, 6.14.1, 6.14.3, 7.1, 7.2, 7.3, 7.4, 7.5, 8.1, 8.2,8.5, 8.6,8.11,8.12, 8.16,8.20.

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand the principles of interference patterns and apply Michelson's Interferometer to measure physical quantities such as thickness and wavelength. (L2)
2. Distinguish between interference and diffraction and perform qualitative and quantitative analysis of Fraunhoffer diffraction at a single slit. (L2)
3. Apply polarization concepts through various optical devices to explore and solve problems related to polarized light. (L3)

UNIT-II **7 Lectures**

Thermodynamics: Heat and Work, First law of thermodynamics and its applications, Reversible and Irreversible process, Carnot cycle and Efficiency, Second law of thermodynamics, Carnot's Theorem, Entropy, Second law in terms of Entropy, Entropy and disorder, Third law of thermodynamics (statement only). [TextBook-1: 16.3,16.5.1,16.6,16.8,16.11,16.12,16.14,16.16,16.17, 16.17.1, 16.18]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Apply the first and second laws of thermodynamics to analyse energy transformations and process efficiencies. (L3)
2. Understand the Carnot cycle and its efficiency and calculate entropy changes to explain thermodynamic processes. (L2)
3. Differentiate between reversible and irreversible processes and relate entropy to disorder. (L2)
4. State the third law of thermodynamics and understand its implications for materials at absolute zero. (L2)

UNIT-III **11 Lectures**

Electromagnetism: Concept of electric flux, Gauss' law, applications of Gauss' law (wire, sheet, sphere), Magnetic Field, Gauss' law in magnetostatics, Faraday's law of induction, Lenz's law, Induced magnetic fields, Displacement current, Maxwell's equations (no derivation, qualitative treatment), Electromagnetic wave equations, Introduction to EM waves, The Biot-Savart's law, magnetic field near a long wire, magnetic field for a circular Current loop, Ampere's law. [TextBook-1: 2.12,2.14,2.18, 3.5, 3.8, 3.9,3.12, 3.13,3.14, 3.10, 3.12, 3.3,3.4]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Apply Gauss's law and Faraday's law of induction to solve problems involving electric and magnetic fields. (L3)
2. Use Maxwell's equations to understand electromagnetic wave phenomena. (L2)
3. Analyse magnetic fields using Biot-Savart's law, Ampere's law, and apply e magnetostatic field distributions. (L3)

UNIT-IV **10 Lectures**

Lasers: Characteristics of laser beam, Spontaneous and stimulated emission of radiation, population inversion, Ruby laser, He-Ne laser, Semiconductor laser (homojunction), Applications of lasers.

Optical fibres: principle of propagation of light in optical fibres, Acceptance Angle and cone of a fibre, Numerical aperture, Modes of propagation, Classification of fibres based on refractive index profile and modes, Losses in optical fibres- scattering and bending losses, Fibre optics in communication- Block diagram, Applications of optical fibres. [TextBook-1: 24.12, 24.2, 24.5,24.6, 24.7, 24.11.1, 24.11.3, 24.11.5.1, 24.13, 10.2, 10.3, 10.4, 10.5, 10.6, 10.10, 10.11, 10.19,10.20 (only for list of applications]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand the principles of laser operation, including spontaneous and stimulated emission, and analyse various types of lasers such as Ruby, He-Ne, and Semiconductor lasers. (L2)
2. Describe the fundamentals of optical fibre technology, including light propagation, acceptance angle, numerical aperture, and classification of fibres. (L2)
3. Apply these concepts to fibre optics communication systems and explore their practical applications. (L2)

UNIT-V **10 Lectures**

Quantum Physics: de Broglie concept of matter waves, Heisenberg's uncertainty principle, Schrödinger time independent wave equation, Physical significance of wave function, particle in a one-dimensional box.

Quantum Computing Quantum bits, Introduction to Pauli spin matrices, Bloch sphere, Entanglement, Qubit Vs classical bit, Single Qubit gates, Quantum Teleportation – Basic Idea. [Textbook-1 20.5, 20.11, 20.17, 20.18, 20.22; Textbook -3 Sec 1.8, 1.9, 1.10.1]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand the concepts quantum mechanics such as the de Broglie wavelength and Heisenberg's uncertainty principle and use the Schrödinger equation (L2).
2. Describe the fundamentals of quantum computing (L2)

Textbooks:

1. M. N. Avadhanulu, P. G. Kshirsagar, and T. V. S. Arun Murthy, A textbook of Engineering Physics, 11th edition, S. Chand and Company Ltd., 2019.
2. H. K. Malik and A. K. Singh, Engineering Physics, 2nd Edition, McGraw Hill Education Pvt Ltd. ,2018.
3. P.K. Palanisamy, Engineering Physics, SCITECH Publications, 2011.

Reference Books:

1. Modern Engineering Physics by A.S. Vasudeva S. Chand and Company Ltd., 2010
2. University Physics by Young and Freedman Pearson Education, 2010.
3. Michael A. Nielsen, Isaac L. Chuang, Quantum Computation and Quantum Information Cambridge University Press, 10 th Ed., 2010

Web References:

1. https://nptel.ac.in/courses/115105537 (Wave optics)
2. https://nptel.ac.in/courses/115106122 (Electromagnetism)
3. https://nptel.ac.in/courses/112102255 (Thermodynamics)
4. https://nptel.ac.in/courses/115107095 (Fiber Optics)
5. https://nptel.ac.in/courses/104104085 (Lasers)
6. https://nptel.ac.in/courses/104104082 (Quantum Computing)
7. https://www.intechopen.com/online-first/73811 (Quantum Computing)
8. https://lewisla.gitbook.io/learning-quantum/quantum-circuits/single-qubit-gates(Quantum Computing)
9. https://profmcruz.wordpress.com/wp-content/uploads/2017/08/quantum-computation-and-quantum-information-nielsen-chuang.pdf (Quantum Computing)

DIGITAL LOGIC DESIGN

I Year B. Tech. II semester

[Common to ECE, CSE, CSE(AI&ML), IT]

Course Code: 24EC11RC05

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Represent different number systems & binary codes and perform conversions & binary arithmetic. (L2)

CO2: Apply different simplification methods for minimizing Boolean functions. (L3)

CO3: Model various combinational circuits using gates and PLD's. (L3)

CO4: Outline the concept of latches and flip-flops. Construct sequential logic circuits like counters and registers using flip-flops. (L3)

CO5: Categorize Mealy & Moore models and Design Synchronous Sequential machines. (L3)

UNIT-I **9 Lectures**

Number systems: Number systems, Base conversion methods, Representation of signed numbers and Binary Arithmetic.

Codes: Binary, Non binary, Decimal, Alphanumeric, XS-3, Gray. Error detecting and error correcting codes.

Logic Gates: AND, OR, NOT, NAND, NOR, XOR, EX-NOR. [Textbook1: Chapter1, Chapter 2: section 2.1 to 2.8]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand the advantages of using different number systems. (L2)
2. Describe the usefulness of different binary codes. (L2)
3. Summarize the error detection and correction concepts. (L2).

UNIT-II **10 Lectures**

Minimization of Boolean Functions: Fundamental postulates of Boolean algebra, Basic theorems, Simplification of Boolean equations, Min terms, Max terms, Standard form of Boolean functions. Simplification of functions using Karnaugh map method (2,3,4,5 variables) Don't care conditions, AOI implementation, NAND and NOR Realizations. [Textbook1: Chapter 2: Sections 2.11 to 2.19,2.21,2.22,2.23, Chapter 3: sections 3.2 to 3.6,3.7]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Apply basic laws and theorems to simplify Boolean expressions and construct logic circuits. (L3)
2. Understand concepts of sum-of-products and product-of-sums representations. (L2)
3. Apply K- Map for minimizing logic functions and build logic circuits. (L3)

UNIT-III **12 Lectures**

Combinational Logic-Circuit Design-I: Logic design of combinational circuits: Adders and Subtractors: Binary, BCD, Excess-3 and Look–ahead-carry adder, Code converters, Multiplexers, De multiplexers, Encoders, Decoders and priority encoders, Realization of Boolean functions using multiplexers and Decoders.

Combinational Logic-Circuit Design-II: Design of 4-bit comparator, Parity checker/Generator. Basics of PLDs: Basic structure of PROM, PAL, PLA, Realization of Boolean functions with PLDs and their merits and demerits. [Textbook1: Chapter 4: section 4.1 to 4.27, Chapter 5 Sections 5.1 to 5.11]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Apply Boolean algebra for describing combinational digital circuits (L3)
2. Describe standard combinational circuits such as adders, subtractors, comparators etc. (L2)
3. Develop the digital circuits using PLDs (L3)

UNIT-IV **10 Lectures**

Sequential Circuits: Classification of sequential circuits, SR-latch, Gated latches, Flip flops: RS, JK, D, T and Master slave flip flops, Excitation tables, flip flop conversion from one type to another. Design of counters: Ripple counters, Synchronous counters, asynchronous counters, up-down counters, Johnson counter, ring counter. Design of registers: Buffer registers, Shift registers, Bi directional shift registers, Universal shift register. [Textbook1: Chapter 6]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand the principle of Flip-Flops and Latches. (L2)
2. Summarize the concepts of Shift Registers and Counters. (L2)
3. Construct different sequential logic circuits using Flipflops. (L3)

UNIT-V **7 Lectures**

Analysis and Design of Synchronous Sequential Machines: Moore and Mealy machine models, State Equations, State Table, State diagram, State reduction & assignment, Synthesis of synchronous sequential circuits- sequence detector and generator. [Textbook1: Chapter 7 Sections 7.1 to 7.5]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand Moore and Mealy machine models (L2)
2. Discuss the concepts of State assignment & Reduction (L2)
3. Analyse the design and synthesis of synchronous sequential circuits (L3)

Textbooks:

1. Anand Kumar, Switching Theory and Logic Design. PHI, 2014.
2. M. Morris Mano and Michael D. Ciletti, Digital Design, 4th Edition, Pearson Education, 2013.

Reference Books:

1. Foundation of Switching theory and Logic Design, A k Singh, New age International Publishers,2008
2. Modern Digital Electronics, R P Jain, 4th Edition, Tata McGraw Hill Education Pvt. Ltd, New Delhi,2010
3. Fundamentals of Logic Design, Charles. R. Roth, Thomson Publications,5th edition,2004.

Web References:

1. https://nptel.ac.in/courses/108105132 (Digital Electronic Circuits)
2. https://onlinecourses.nptel.ac.in/noc24_ee147/preview (Digital Circuits)
3. https://nptel.ac.in/courses/117105080 (Digital Systems Design)
4. https://onlinecourses.swayam2.ac.in/nou24_ec07/preview (Digital electronic and System design)

ELEMENTS OF ELECTRONICS ENGINEERING

I Year B. Tech. II Semester

[Common to CSE, IT]

Course Code: 24EC11RC04

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Outline the concepts of semiconductor devices. (L2)

CO2: Understand the characteristics of different semiconductor diodes and their applications. (L2)

CO3: Apply various biasing techniques for design of BJT circuits. (L3)

CO4: Apply hybrid models to understand the operation of BJT amplifier. (L3)

CO5: Understand the characteristics of FET. (L2)

UNIT-I 8 Lectures

Introduction to Electronics and Semiconductors: Energy band theory, Conduction in Insulators, Semiconductors and metals, Classification of semiconductors, Properties of intrinsic and extrinsic semiconductor, Carrier concentration in an intrinsic semiconductor, Drift, and diffusion currents. [Textbook 1: Chapter -1 Section 1.6, 1.7, 1.8; Chapter -2 Section 2.2, 2.3, 2.9; Chapter -19 Section 19.5]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Explain the energy band theory of solids (insulators, semiconductors, and metals) based on their band structures (L2)
2. Describe the transport phenomena in semiconductors (L2)

UNIT-II 11 Lectures

Semi-Conductor Diode: Theory of PN junction, Open circuited PN junction, V-I characteristics of a PN diode, Diode current equation, basics on junction capacitance, Break down in PN diode, Applications of PN diodes. Zener diode, Zener regulator, Tunnel diode, Schottky diode.

Rectifying circuits: Half wave and full wave rectifiers, Bridge rectifiers, Efficiency, Ripple and regulation of each rectifier, Capacitor filters. [Textbook 2: Chapter 4 Section 4.1 – 4.5, 4.8; Chapter 5 Section 5.3, 5.4, 5.7; Chapter 8 Section 8.2 – 8.4, 8.6]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Explain the formation of PN junction and represent the band structure, interpret the Volt-ampere characteristics (L2)

2. Describe the operation of rectifiers, and evaluate their performance metrics like ripple factor and regulation characteristics (L2)
3. Explain the working principles of special diodes such as Zener diode, tunnel diodes and Schottky barrier diodes. (L2)

UNIT-III **11 Lectures**

Bi-Polar Junction Transistor: Introduction, construction, Operation of PNP and NPN Transistors, transistor configurations, Input and Output Characteristics of CE configuration, Comparison of CE, CB, and CC Configurations.

Transistor Biasing and thermal stabilization: Junction Biasing for Saturation, Cutoff and Active Region, Biasing circuits analysis, fixed bias, collector to base bias, emitter bias, voltage divider bias, thermal runaway. [Textbook 2: Chapter 6 Section 6.1 - 6.3, 6.6-6.9, 6.11, Chapter 10 Section 10.4 - 10.8]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Describe the characteristics of transistor in CE, CB, and CC configurations. (L2)
2. Understand the principals of transistor biasing and compensation methods (L2)
3. Identify the characteristics of different transistor biasing techniques (L3)

UNIT-IV **8 Lectures**

Transistor Amplifiers: CE, CB, CC amplifier configurations –Multistage amplifier – A Two Stage RC coupled amplifier – frequency response curve and bandwidth. [Textbook 2: Chapter -11 Section 11.9, 11.11, 11.12, 11.16, 11.17, 11.20]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Represent transistor with its equivalent h parameter model (L2)
2. Apply hybrid models to obtain the performance of transistor amplifiers (L3)

UNIT-V **10 Lectures**

Field Effect Transistors: Construction of JFET and its drain, transfer characteristics, pinch off Voltage, Drain Saturation Current, parameters of JFET, Construction of MOSFET – Enhancement and Depletion Modes, drain and transfer characteristics. [Textbook 2: Chapter -7 Section 7.1 – 7.5, 7.11, 7.12]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Comprehend the characteristics of BJT and FET(L2)
2. Explain the construction of JFET and MoSFETs (L2)
3. Describe the characteristics of JFET and MoSFET (L2)

Textbooks:

1. Jacob Millman, Christos C. Halkias, Integrated Electronics: Analog and Digital Circuits and Systems, McGRAW-HILL. 1972
2. Sanjeev Gupta, Electronic Devices and Circuits, 2nd Edition, Dhanpat Rai Publications,2005.

Reference Books:

1. Thomas L.Floyd, Electronic Devices, 9th Edition , Prentice Hall, 2012.
2. B. V. Rao and K. Raja Rajeswari, Electronic Devices and Circuits 2nd Edition, Pearson Education.,2010.
3. David A. Bell, Electronic Devices and Circuits, 5th Edition, Oxford University Press, 2008
4. Robert Boylestad, Louis Nashelsky, Electronic Devices and Circuit Theory, 7th Edition, Prentice Hall,1998

Web References:

1. https://onlinecourses.nptel.ac.in/noc21_ee80/preview
2. https://be-iitkgp.vlabs.ac.in/

PYTHON PROGRAMMING

I Year B. Tech. II Semester

[Common to CSE, IT, CSE (AI&ML)]

Course Code: 24CT11RC06

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, the student shall be able to:

CO1: Understand the historical development, necessity, applications, and basic concepts of python programming. (L2)

CO2: Identify and implement appropriate control structures to solve a particular programming problem. (L3)

CO3: Examine various data structures and apply to solve real world problems. (L3)

CO4: Build simple functions and packages used in python for solving real world problems. (L3)

CO5: Outline Object Oriented concepts in python and illustrate Exception handling. (L2)

UNIT-I **8 Lectures**

Introduction: History of Python, Need of Python Programming, Applications of Python, Variables, Assignment, Comments, Keywords, Data types, Input-Output, Indentation. [TextBook-1: Chapter 3 (S-3.1 – S-3.12)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand the Evolution of Python [L2]
2. Recall the Need and Applications of Python [L1]
3. Outline python's Input and Output Functions[L2]

UNIT-II **10 Lectures**

Operators and Expressions: Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations, Control Flow- if, if-elif-else, for, while, break, continue, pass [TextBook-1: Chapter 3 (S-3.12), Chapter 4 (S-4.1 – S-4.7)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Illustrate python operators: arithmetic, comparison, assignment, logical, bitwise, membership, identity [L2]
2. Make use of control flow statements: if, if-elif-else, for, while, break, continue, pass. [L3]

UNIT-III **10 Lectures**

Data Structures: Strings, Lists, Tuples, Sets, Dictionaries. Data Structures manipulations - create, Index, Negative indexing, Slicing, update, add elements, delete or remove elements, operations, Comprehension, Membership Test, Iteration. [TextBook-1: Chapter 6 (S-6.1 – S-6.9), Chapter 8 (S-8.1 – S-8.6)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understanding basic operations on lists, including indexing and slicing [L2]
2. Utilize methods of lists, tuples, sets, and dictionaries to solve problems [L3]
3. Compare and apply appropriate use cases for lists, tuples, sets, and dictionaries. [L2]

UNIT-IV **10 Lectures**

Functions - Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Lambda Functions, Function Returning Values, Built-in functions, Scope of the Variables in a Function - Global and Local Variables.

Modules: Creating modules, import statement, from…import statement, namespaces. Python packages: Introduction to PIP, Installing Packages via PIP [TextBook-1: Chapter 5 (S-5.1 – S-5.8,5.12)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understanding and implementing various types of function arguments and scopes in Python. [L2]
2. Utilize Python modules to understanding the import mechanisms [L3]

UNIT-V **10 Lectures**

Object Oriented Programming (OOP) in Python: Classes and Objects, Class Method and self-Argument, The __init() Method (The Class Constructor), Class Variables and Object Variables, Public and Private Data Members, Inheritance, Overriding Methods.

Error and Exceptions: Introduction to Errors and Exceptions, Handling Exception, try except block, finally block, Raising Exceptions.

File Handling: Type of files, Opening and Closing files, Reading and Writing files.

TextBook-1: Chapter 9 (S-9.1 – S-9.8), Chapter 10 (S-10.1 – S-10.3)

TextBook-1: Chapter 7 (S-7.1 – S-7.5), Chapter 12 (S-12.1 – S-12.10)

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand and implement classes, methods, and the 'self' variable in Python [L2]
2. Demonstrate concepts of inheritance, method overriding, and data hiding in OOP [L2]

3. List the differences between errors and exceptions, and handle exceptions using try-except blocks [L1]
4. Illustrate file operations including reading, writing, and manipulating file pointers in Python. [L2]

Textbooks:

1. Reema Thareja, “Python Programming: Using Problems Solving Approach”, Oxford University Press, 2017
2. Fundamentals of Python First Programs, Kenneth. A. Lambert, Cengage.

Reference Books:

1. Fundamentals of Data Structures using Python, P Lalitha Surya Kumari, P. S. Avadhani, Lambert Academic Publishing
2. Introduction to Python Programming, Gowrishankar.S, Veena A, CRC Press.
3. Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

Web References:

1. https://www.tutorialspoint.com/python3/python_tutorial.pdf
2. https://www.python.org/doc/

ENGINEERING PHYSICS LAB

I Year B. Tech. II semester

[Common to CSE, IT]

Course Code: 24BP11RC02

L	T	P	C
0	0	3	1.5

Course Outcomes: At the end of the course the student will be able to

CO1: Interpret the physical parameters based on optical phenomena. (L2)

CO2: Verify the behaviour of double refraction in birefringent material like quartz. (L2)

CO3: Demonstrate the concepts of diffraction through experiments. (L3)

CO4: Calibrate instruments like low range voltmeters and ammeters. (L3)

CO5: Design temperature sensors based on diodes and thermistors. (L3)

List of Experiments: (Any TEN of the following experiments shall be conducted)

1. Determination of Radius of Curvature of a given Convex Lens By forming Newton's Rings.
2. Determination of Thickness Given Paper Strip or hairline by Wedge Method.
3. Determination of Wavelength of Spectral Lines in the Mercury Spectrum by Normal Incidence method
4. Determination of Cauchy's Constants of a Given Material of the Prism using Spectrometer in minimum deviation position
5. Determination of Refractive Index of Ordinary ray and Extra-ordinary ray in quartz prism
6. Laser- Diffraction – determination of wavelength of laser source using diffraction grating
7. Determination of wavelength of laser source using Fraunhofer single slit diffraction
8. Melde's Apparatus – Frequency of electrically maintained Tuning Fork.
9. Study of Intensity Variation of the Magnetic Field along the axis of circular Current Carrying conductor using Stewart and Gee apparatus
10. Calibration of Low Range Voltmeter using Potentiometer Bridge
11. Calibration of Low Range Ammeter using Potentiometer Bridge
12. Determination of dielectric constant of material using charging discharging method with a parallel plate capacitor
13. Determination of energy band gap of semiconductor using PN junction diode in reverse bias
14. Determination of thermo electric coefficients for thermistor
15. Determination of Planck's constant using LED.

Textbooks:

1. Practical physics by CL Arora, S.chand publishing company, 1995.
2. Advanced Practical Physics For Students by B.l.worsnop And H.t.flint, 1923

Web References:

1. http://lo-au.vlabs.ac.in/laser-optics/Newtons_Rings_Wavelength_of_light/
2. http://ov-au.vlabs.ac.in/optics/Spectrometer_Refractive_Index/
3. http://ov-au.vlabs.ac.in/optics/Diffraction_Grating/
4. http://htv-au.vlabs.ac.in/heat-thermodynamics/Characteristics_of_Thermistor/
5. https://bop-iitk.vlabs.ac.in/exp/energy-band-gap/simulation.html

PYTHON PROGRAMMING LAB

I Year B. Tech. II semester

[Common to CSE, CSE (AI&ML), IT]

Course Code: 24CT11RC07

L	T	P	C
0	0	3	1.5

Course Outcomes: At the end of the Course, the student shall be able to:

CO1: Understand core programming basics and various Operators of Python. (L2)

CO2: Implement programs using conditional statements and loops and strings. (L3)

CO3: Develop functions and strings to perform simple tasks. (L3)

CO4: Make use of various data structures like lists, tuples, sets and dictionaries. (L3)

CO5: Implement Python programs with files, Classes and objects. (L3)

Module-1: Basics of Python

1. Write a program to display the statements.
2. Demonstrate about fundamental Data types in Python Programming. (i.e., int, float, complex, bool and string types)
3. Write a Python program to demonstrate various type conversion functions.
4. Write a program to demonstrate the inbuilt Math function

Module-2: Operators in Python

1. Demonstrate the following Operators in Python with suitable examples.

   i) Arithmetic Operators ii) Relational Operators

   iii) Assignment Operators iv) Logical Operators

   v) Bit wise Operators vi) Ternary Operator

   vii) Membership Operators viii) Identity Operators

Module-3: Conditional Branching Statements

1. Write a program to check whether the given number is even or odd
2. Write a program to read marks of a student and display the corresponding grade
3. Write a program to find the largest element among the given numbers (multi-way if-elif-else statements.)

Module-4: Looping/Iterative Statements

1. Implement the following programs using while loop and for loop

   i. Display all prime numbers up to n. ii. Print the nth multiplication table.

   iii. Print different patterns using loops:

2. Demonstrate the following control transfer statements in Python with suitable examples.
   i. break ii. continue iii. Pass

Module-5: Functions

1. Write a function to find the multiplication of two numbers and demonstrate the usage of parameters and arguments of a function.
2. Write a program to define a function using default arguments.
3. Demonstrate lambda functions in Python with suitable example programs.

Module-6: Strings

1. Write a program to manage and analyse customer feedback using string operations include:

   i. Create feedback with name, email, comment ii. Collecting feedback.
   iii. Normalizing feedback (e.g., removing extra spaces, converting to lowercase).
   iv. Extracting key in formation (e.g., names, email addresses, and comments).
   v. Searching for keywords. vi. Replacing certain words.
   vii. Formatting feedback for display. viii. Summarizing feedback.

Module-7: Lists:

1. Write a program to create a list and perform the following operations:
   i. + ii. * iii. slicing iv. del
2. Inventory Management: You have a list of items in your warehouse along with their quantities. Write a program to find out which items are low in stock (quantity less than 10). (use only comprehensions)
3. Employee Performance: You have a list of employee names and their corresponding performance scores. Write a program to sort the list based on the performance scores in descending order.
4. Sales Analysis: you have a list of sales figures for the past week. Write a program to find the total sales, the highest sale, the lowest sale, and the average sale.
5. Write a program to calculate the length of each element in a list using map function in python.

Module-8: Tuples

1. Write a program to return the top n's most frequently occurring chars and their respective counts. e.g. string=aaaaaabbbbcccc, n=2 should return [(a 6) (b 4)].
2. Write a program to create n iterables of varied sizes and group the values using zip function in python.
3. Student Information: Write a program to create a list of tuples where each tuple contains the student ID, name, and grade and find the student with the highest grade.

4. Course Enrolment: Write a program to create list of tuples where each tuple contains the course ID and the number of students enrolled and find the total number of students enrolled across all courses
5. Faculty Information: Write a program to create a list of tuples where each tuple contains the faculty ID, name, and department and find all faculty members in a given department.
6. Library Book Tracking: You have a list of tuples where each tuple contains the book ID, title, and number of copies available. Write a program to find all books with fewer than 5 copies available.

Module-9: Sets & Dictionaries

1. Write a program to create two sets and perform the following operations:

i. Union ii. Intersection iii. Difference iv. Asymmetric Difference

2. Write a program to generate a dictionary that contains numbers (between 1 and n) in the form of (x,x*x).
3. Write a program to implement a shopping cart where you can add items with their prices and quantities, and then calculate the total cost.
4. Banking System: Write a program to create dictionary with customer name and balance and retrieve the balance for a given customer, deposit a specified amount into a customer's account, Withdraw a specified amount from a customer's account if sufficient balance is available, Transfer a specified amount from one customer's account to another's and Remove a customer from the bank's system.

Module-10: Classes and objects

1. Create a class to represent menu items in a restaurant with attributes like name, price, and category. Implement methods to display menu details and calculate the total cost of a selected list of items.
2. Write a program to read 3 subject marks and display pass or failed using class and object.

Module-11: Files

1. Write a program to copy the contents of a file to another file.
2. Write a program to compute the number of characters, words and lines in a file.

Case Study:

Select any one application mentioned below

Note: A report has to be submitted by every student at the end of the semester that includes design, coding, output, etc.

1. Design a Python program to manage inventory, process orders, and handle customer information for an online store.
2. Create a library system to track books, manage member accounts, and handle book loans and returns.
3. Implement a personal finance management tool to track income, expenses, and generate monthly reports.
4. Create a system to manage student grades, calculate GPAs, and generate academic reports.

5. Develop a Python-based movie recommendation system using collaborative filtering.
6. Build a to-do list application that allows users to add, update, delete, and prioritize tasks..
7. Build a patient management system to handle appointments, medical records, and billing.
8. Design a digital menu for a restaurant with options for ordering, bill generation, and inventory management.
9. Implement a fitness tracking application to log workouts, track progress, and suggest exercise plans.
10. Build a secure online voting platform with user authentication and vote tallying.
11. Create a program to manage recipes, including ingredients, instructions, and nutritional information.
12. Build a travel planning application to manage itineraries, bookings, and budget tracking.
13. Develop an e-learning application with course creation, student enrolment, and progress tracking.
14. Build a car rental management system to handle bookings, returns, and vehicle maintenance.
15. Build a budget planning application to track expenses, income, and financial goals.
16. Develop a cryptocurrency tracking application to monitor prices, market trends, and portfolio performance.

Reference Books:

1. Python Programming: Using Problem Solving Approach by Reema Theraja , Oxford publications
2. Ashok N Kamthane, Amit Ashok Kamthane, Programming and Problem Solving with Python, 1st Edition, McGraw Hill Education (India), 2018.

Web References:

1. https://www.python.org/doc/
2. https://www.w3schools.com/python/python_reference.asp
3. https://thepythonguru.com/
4. https://www.programiz.com/python-programming

WEB TECHNOLOGIES LAB

I Year B. Tech. II semester

[Common to CSE, CSE (AI&ML), IT]

Course Code: 24CT11RC08

L	T	P	C
0	0	3	1.5

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Develop professional web pages for an application using HTML elements like lists, navigations, tables, various form elements, and embedded media, including images, audio, and video. (L3)

CO2: Build inline, internal, and external CSS to enhance the visual presentation of web pages, including layout, fonts, colors, and backgrounds. (L3)

CO3: Utilize JavaScript to develop interactive HTML web pages and validate form data. (L3)

CO4: Apply JavaScript functions and events to enhance user interaction and provide a dynamic user experience. (L3)

CO5: Experiment with XML files to store and display structured data and write a DTD to perform well-formed and validated XML documents. (L3)

Module-1:

Design a web page using Basic HTML Elements – Structure of HTML, Headings, Paragraph, Division and Span, List, Link, Image, Table, Form, Input, Iframe, and Media Elements.

Module-2:

Design the following static web pages required for an online book store website.

1. **HOME PAGE:**
   i. The static home page must contain three frames.

   Top frame: Logo and the college name and links to the Home page, Login page, Registration page, Catalogue page, and Cart page (the description of these pages will be given below).

   Left frame: At least four links for navigation, which will display the catalogue of respective links.For e.g.: When you click the link "CSE" the catalogue for CSE Books should be displayed in the Right frame.

   Right frame: The pages to the links in the left frame must be loaded here. Initially, this page contains a description of the website.

   ii. Add media content in a frame using audio, video, and iframe elements to the Home page of an online bookstore website. The page should include:

   iii. Audio Element: An audio player to play background music or a podcast.

   iv. Video Element: A video player to display a promotional video about the bookstore.

v. Iframe Element: An iframe to embed a Google Maps location of the bookstore.

2. **LOGIN PAGE**
3. **CATALOGUE PAGE:** The catalogue page should contain the details of all the books available on the website in a table: The details should contain the following:

   i) Snapshot of Cover Page. ii)Author Name. iii)Publisher.

   iv) Price. v)Add to cart button.
4. **REGISTRATION PAGE:** Create a "registration form "with the following fields

   i) **Username:** Text input field ii) **Password:** Password input field

   iii) **Email:** Email input field iv) **Phone number:** Text input field

   v) **Birthday:** Date picker vi) **Favorite Color:** Color picker

   vii) **Gender:** Select an element with options (Male, Female, Other).

Module-3:

Develop and demonstrate the usage of inline, internal, and external style sheets using CSS.

Module-4:

Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next to the list. Add CSS to customize the properties of the font of the capital (colour, bold, and font size).

Module-5:

Develop and demonstrate JavaScript with POP-UP boxes and functions for the following problems:

1. Input: Click on the Display Date button using onclick( ) function

   Output: Display the date in the textbox.
2. Input: A number n obtained using prompt

   Output: Factorial of n number using alert.
3. Input: A number n obtained using prompt

   Output: A multiplication table of numbers from 1 to 10 of n using alert.
4. Input: A number n obtained using prompt and add another number using confirm

   Output: Sum of the entire n numbers using alert.

Module-6:

Write JavaScript to validate the following fields of the Registration page.

1. First Name (Name should contain alphabets and the length should not be less than 6 characters).
2. Password (Password should not be less than 6 characters in length).
3. E-mail ID (should not contain any invalid and must follow the standard pattern name@domain.com)
4. Mobile Number (The phone number should contain 10 digits only).

5. Last Name and Address (should not be Empty).

Module-7:

Write an HTML page including any required JavaScript that takes a number from the text field in the range of 0 to 999 and shows it in words. It should not accept four and above digits, alphabets, and special characters.

Module-8:

Create an 'Employee' class extending from a base class 'Person'. The task should include:

1. Create a class 'Person' with attributes 'name' and 'age' and add a constructor to initialize these values.
2. Create a class 'Employee' that extends 'Person' and includes an additional attribute 'role,' with a constructor to initialize 'name,' 'age,' and 'role.'

Module-9:

Create an array of objects representing book details in an online bookstore. Each object should include the book title, author, genre, and price. Render the details of the books on the page using this array, demonstrating array creation, accessing array elements, and applying array methods.

Module-10:

Write an XML file which will display the Book information which includes the following:

a) Title of the Book b) Author Name c) ISBN Name
d) Publisher Name e) Edition f) Price

Write a Document Type Definition (DTD) to validate the above XML file.

Case Study:

Select any one practical application mentioned below.

Note: A report has to be submitted by every student at the end of the semester, including design, coding, output, etc.

1. Portfolio Website: Create a personal portfolio website showcasing projects, skills, and experience using HTML, CSS, and JavaScript for interactive features.
2. Responsive Blog: Design a responsive blog template with multiple pages, utilizing HTML for structure, CSS for styling, and JavaScript for dynamic content.
3. E-commerce Site: Develop a basic e-commerce website with product listings, shopping cart functionality, and user authentication using HTML, CSS, and JavaScript.
4. Quiz Game: Create an interactive quiz game with multiple-choice questions, scoring, and feedback using HTML, CSS, and JavaScript for functionality.

5. To-Do List: Develop a to-do list application allowing users to add, edit, and delete tasks, with data persistence using JavaScript local storage.
6. Interactive Resume: Design a dynamic resume with sections for education, experience, and skills, including interactive elements powered by JavaScript.
7. Photo Gallery: Create an interactive photo gallery with image lightbox effects, using CSS for styling and JavaScript for functionality.
8. Recipe Finder: Build a recipe search application that fetches and displays recipes from an API, using JavaScript for dynamic content updates.
9. Expense Tracker: Develop an expense tracker app to log and categorize expenses, with data visualization using charts and graphs created with JavaScript.
10. Event Countdown: Create a countdown timer for upcoming events with HTML structure, CSS styling, and JavaScript for the timer logic.
11. Contact Form: Create a contact form with validation and submission handling using JavaScript, styled with CSS to match the site's theme.
12. Memory Game: Develop a memory matching game with cards that flip and match, using CSS for design and JavaScript for game logic.
13. Interactive Story: Design an interactive storytelling website where users make choices that affect the narrative, using JavaScript for decision logic.
14. Fitness Tracker: Build a fitness tracker to log workouts and track progress, with dynamic charts and data visualization using JavaScript.
15. Task Manager: Create a task manager application with features for adding, editing, and prioritizing tasks, using JavaScript for interactivity.
16. Interactive Timelines: Design interactive timelines to visualize historical events or project milestones, using HTML, CSS, and JavaScript.
17. Product Landing Page: Develop a product landing page with animations and interactive elements, using CSS for styling and JavaScript for effects.
18. Calculator: Build a fully functional calculator with basic arithmetic operations, using JavaScript for logic and CSS for design.
19. Job Board: Develop a job board where users can post and search for jobs, with dynamic content updates using JavaScript.
20. Interactive Form: Create a multi-step interactive form with validation and progress indicators, using JavaScript for form handling and CSS for styling.

References:

1. Internet and Web Technologies by Raj Kamal, Tata McGraw-Hill.
2. Programming the World Wide Web by Robert W. Sebesta, Pearson Education.

3. An Introduction to Web Design and Programming by Paul S Wang, Sanda S Katila, 1st Edition, Cengage Learning.

Web Links:

1. https://onlinecourses.swayam2.ac.in/nou24_cs18/preview
2. https://infyspringboard.onwingspan.com/en/app/toc/lex_17739732834840810000_shared /overview (HTML5)
3. https://infyspringboard.onwingspan.com/en/app/toc/lex_18109698366332810000_shared /overview (JavaScript)

GAYATRI VIDYA PARISHAD COLLEGE OF ENGINEERING FOR WOMEN
(Autonomous)

(Approved by AICTE, New Delhi and Permanently Affiliated to Andhra University, Visakhapatnam)

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COURSE STRUCTURE

(Applicable for the Academic Year 2024-25 onwards)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING [ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING]

B.TECH. COMPUTER SCIENCE AND ENGINEERING - AIML

SCHEME AND SYLLABI

(With effect from 2024-25 admitted batch)

I Year - I Semester

Course Code	Category	Course Title	Hours per Week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
24BM11RC01	BS	Calculus and Differential Equations	3	0	30	70	100	3
24BP11RC01	BS	Engineering Physics	3	0	30	70	100	3
24EC11RC04	ES	Elements of Electronics Engineering	3	0	30	70	100	3
24CT11RC01	ES	Fundamentals of Computers	3	0	30	70	100	3
24CT11RC02	ES	Problem Solving using C	3	0	30	70	100	3
24BP11RC02	BS	Engineering Physics Lab	0	3	50	50	100	1.5
24CT11RC03	ES	Computer Engineering Workshop	0	3	50	50	100	1.5
24CT11RC04	ES	Problem Solving using C Lab	0	3	50	50	100	1.5
							Total Credits	**19.5**

I Year - II Semester

Course Code	Category	Course Title	Hours per Week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
24BM11RC02	BS	Linear Algebra and Vector Calculus	3	0	30	70	100	3
24BC11RC01	BS	Green Chemistry	3	0	30	70	100	3
24HE11RC01	HSS	English	3	0	30	70	100	3
24EC11RC05	ES	Digital Logic Design	3	0	30	70	100	3
24CT11RC06	ES	Python Programming	3	0	30	70	100	3
24HE11RC02	HSS	Communication Skills Lab	0	3	50	50	100	1.5
24CT11RC07	ES	Python Programming Lab	0	3	50	50	100	1.5
24CT11RC08	ES	Web Technologies Fundamentals Lab	0	3	50	50	100	1.5
							Total Credits	**19.5**

CALCULUS AND DIFFERENTIAL EQUATIONS

I Year B. Tech. I Semester

[Common to EEE, ECE, CSE, IT, CSE (AI&ML)]

L	T	P	C
3	0	0	3

Course Code: 24BM11RC01

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Examine the functional dependency and utilize Taylor's theorem to expand the function of two variables. (L3)

CO2: Determine extrema of multivariable functions. (L5)

CO3: Utilize double and triple integrals to evaluate areas of plane curves and the volumes of solids. (L5)

CO4: Solve the first order differential equations and higher order differential equations with constant coefficients, apply the techniques to solve problems related to various engineering fields. (L3)

CO5: Find the Laplace Transforms of various functions and apply it to solve ordinary differential Equations with initial conditions. (L3)

UNIT-I: **8 Lectures**

Partial Differentiation: Functions of two or more variables: Introduction - Partial derivatives - Total derivative - Change of variables - Jacobians – Functional dependence - Taylor's theorem for function of two variables. [Sections: 5.1, 5.2, 5.5, 5.6, 5.7, 5.9 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Examine the functional dependencies using the Jacobian. (L3)
2. Make use of Taylor's theorem to write series expansion of function of two variables. (L3)

UNIT-II: **7 Lectures**

Applications of Partial Differentiation: Maxima and minima of function of two and three variables - Constrained maximum/minimum problems using Lagrange's method of multipliers. [Sections: 5.11, 5.12 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Determine the critical points, maxima and minima of functions several variables. (L5)

UNIT-III: **11 Lectures**

Integral Calculus: Introduction - Double integrals - Change of order of integration - Double integrals in polar Coordinates - Triple integrals - Change of variables.

Applications: Area enclosed by plane curves - Volumes of solids. [Sections: 7.1 – 7.7 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Evaluate double integrals and triple integrals in Cartesian and polar coordinates also over the given region. (L5)
2. Evaluate the double integrals by change of order of integration. (L5)
3. Evaluate double and triple integrals by change of variables. (L5)
4. Determine the areas and volumes using multiple integrals. (L5)

UNIT-IV: **11 Lectures**

Differential Equations and its Applications: Exact differential equations - Equations reducible to exact equations - Solutions of higher order linear ordinary differential equations with constant coefficients - Method of variation of parameters.

Applications: Orthogonal Trajectories - Newton's law of cooling - Law of Natural growth and decay. [Sections: 11.11, 11.12, 12.3, 12.6, 12.8, 13.1 – 13.8 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Solve the first-order differential equations and higher order Linear differential equations with constant coefficients. (L3)
2. Apply the techniques to solve problems related to various engineering fields. (L3)

UNIT-V: **11 Lectures**

Laplace Transforms: Introduction - Existence conditions - Transforms of elementary functions - Properties of Laplace transforms - Transforms of derivatives - Transforms of integrals - Multiplication by t - Division by t– Evaluation of integrals by Laplace transforms - Laplace transforms of Unit step function, Unit impulse function and Laplace transforms of periodic functions - Inverse Laplace transforms - Convolution theorem - Second shifting theorem.

Applications: Laplace Transforms to ordinary differential Equations. [Sections: 21.1 – 21.5, 21.7 – 21.15, 21.17, 21.18 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Find the Laplace transform of the function. (L1)
2. Find the Inverse Laplace transform of a function. (L1)
3. Make use of convolution theorem to find the Inverse Laplace transform of a function. (L3)
4. Apply Laplace transform to solve ordinary differential equations. (L3)

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 45th Edition, Khanna Publishers, 2024.

Reference Books:

1. R K Jain and SRK Iyengar, Advanced Engineering Mathematics, Narosa Publishers, 5th Edition, 2016.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th edition, John Wiley & Sons, 2011.
3. Peter V. O'Neil, Advanced Engineering Mathematics, 7th edition, Cengage Learning, 2011.
4. Greenberg, Advanced Engineering Mathematics, 2nd Edition, Pearson, 2017.

Web References:

1. https://nptel.ac.in/courses/111104125
2. https://nptel.ac.in/courses/111105160

ENGINEERING PHYSICS

I Year B. Tech. I Semester

[Common to ECE, EEE, CSE (AI&ML)]

Course Code: 24BP11RC01

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, the student shall be able to:

CO1: Apply the principles of interference, diffraction, and polarization in wave optics, and utilize optical instruments for practical applications. (L3)

CO2: Familiarize the basic concepts of Thermodynamics relevant to engineering applications. (L2)

CO3: Outline the knowledge of basic principles of Electromagnetism and EM Waves. (L2)

CO4: Describe the basic principles of lasers, optical fibres and their use in technological applications. (L2)

CO5: Understand the basic principles of Quantum mechanics, Quantum computing. (L2)

UNIT-I **10 Lectures**

Interference: Principle of superposition, Young's Experiment (qualitative treatment), Coherence, Interference in thin films (reflected light), Newton's Rings, Michelson's Interferometer and its applications (thickness of thin sheet, determination of wavelength).

Diffraction: Introduction, Differences between Interference and Diffraction, Differences between Fresnel and Fraunhoffer diffraction, Fraunhoffer diffraction at a single slit (Qualitative and Quantitative treatment)

Polarization: Introduction - types of Polarization. Polarization by reflection, Brewster's law, refraction and double refraction in uniaxial crystals, Nicol Prism, Quarter wave plate and Half wave plate, Applications of Polarization.

Text Book 1: 5.16,5.17,5.18, 5.20, 6.1, 6.2, 6.8.(1-3), 6.11, 6.13, 6.14.1, 6.14.3, 7.1, 7.2, 7.3, 7.4, 7.5, 8.1, 8.2,8.5, 8.6,8.11,8.12, 8.16,8.20.

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand the principles of interference patterns and apply Michelson's Interferometer to measure physical quantities such as thickness and wavelength. (L2)
2. Distinguish between interference and diffraction and perform qualitative and quantitative analysis of Fraunhoffer diffraction at a single slit. (L2)
3. Apply polarization concepts through various optical devices to explore and solve problems related to polarized light. (L3)

UNIT-II **7 Lectures**

Thermodynamics: Heat and Work, First law of thermodynamics and its applications, Reversible and Irreversible process, Carnot cycle and Efficiency, Second law of thermodynamics, Carnot's Theorem, Entropy, Second law in terms of Entropy, Entropy and disorder, Third law of thermodynamics (statement only). [TextBook-1: 16.3,16.5.1,16.6,16.8,16.11,16.12,16.14,16.16,16.17, 16.17.1, 16.18]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Apply the first and second laws of thermodynamics to analyse energy transformations and process efficiencies. (L3)
2. Understand the Carnot cycle and its efficiency and calculate entropy changes to explain thermodynamic processes. (L2)
3. Differentiate between reversible and irreversible processes and relate entropy to disorder. (L2)
4. State the third law of thermodynamics and understand its implications for materials at absolute zero. (L2)

UNIT-III **11 Lectures**

Electromagnetism: Concept of electric flux, Gauss' law, applications of Gauss' law (wire, sheet, sphere), Magnetic Field, Gauss' law in magnetostatics, Faraday's law of induction, Lenz's law, Induced magnetic fields, Displacement current, Maxwell's equations (no derivation, qualitative treatment), Electromagnetic wave equations, Introduction to EM waves, The Biot-Savart's law, magnetic field near a long wire, magnetic field for a circular Current loop, Ampere's law. [TextBook-1: 2.12,2.14,2.18, 3.5, 3.8, 3.9,3.12, 3.13,3.14, 3.10, 3.12, 3.3,3.4]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Apply Gauss's law and Faraday's law of induction to solve problems involving electric and magnetic fields. (L3)
2. Use Maxwell's equations to understand electromagnetic wave phenomena. (L2)
3. Analyse magnetic fields using Biot-Savart's law, Ampere's law, and apply e magnetostatic field distributions. (L3)

UNIT-IV **10 Lectures**

Lasers: Characteristics of laser beam, Spontaneous and stimulated emission of radiation, population inversion, Ruby laser, He-Ne laser, Semiconductor laser (homojunction), Applications of lasers.

Optical fibres: principle of propagation of light in optical fibres, Acceptance Angle and cone of a fibre, Numerical aperture, Modes of propagation, Classification of fibres based on refractive index profile and modes, Losses in optical fibres- scattering and bending losses, Fibre optics in communication- Block diagram, Applications of optical fibres. [TextBook-1: 24.12, 24.2, 24.5,24.6, 24.7, 24.11.1, 24.11.3, 24.11.5.1, 24.13, 10.2, 10.3, 10.4, 10.5, 10.6, 10.10, 10.11, 10.19,10.20 (only for list of applications]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand the principles of laser operation, including spontaneous and stimulated emission, and analyse various types of lasers such as Ruby, He-Ne, and Semiconductor lasers. (L2)
2. Describe the fundamentals of optical fibre technology, including light propagation, acceptance angle, numerical aperture, and classification of fibres. (L2)
3. Apply these concepts to fibre optics communication systems and explore their practical applications. (L2)

UNIT-V **10 Lectures**

Quantum Physics: de Broglie concept of matter waves, Heisenberg's uncertainty principle, Schrödinger time independent wave equation, Physical significance of wave function, particle in a one-dimensional box.

Quantum Computing Quantum bits, Introduction to Pauli spin matrices, Bloch sphere, Entanglement, Qubit Vs classical bit, Single Qubit gates, Quantum Teleportation – Basic Idea. [Textbook-1 20.5, 20.11, 20.17, 20.18, 20.22; Textbook -3 Sec 1.8, 1.9, 1.10.1]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand the concepts quantum mechanics such as the de Broglie wavelength and Heisenberg's uncertainty principle and use the Schrödinger equation (L2).
2. Describe the fundamentals of quantum computing (L2)

Textbooks:

1. M. N. Avadhanulu, P. G. Kshirsagar, and T. V. S. Arun Murthy, A textbook of Engineering Physics, 11th edition, S. Chand and Company Ltd., 2019.
2. H. K. Malik and A. K. Singh, Engineering Physics, 2nd Edition, McGraw Hill Education Pvt Ltd. ,2018.
3. P.K. Palanisamy, Engineering Physics, SCITECH Publications, 2011.

Reference Books:

1. Modern Engineering Physics by A.S. Vasudeva S. Chand and Company Ltd., 2010
2. University Physics by Young and Freedman Pearson Education, 2010.
3. Michael A. Nielsen, Isaac L. Chuang, Quantum Computation and Quantum Information Cambridge University Press, 10 th Ed., 2010

Web References:

1. https://nptel.ac.in/courses/115105537 (Wave optics)
2. https://nptel.ac.in/courses/115106122 (Electromagnetism)
3. https://nptel.ac.in/courses/112102255 (Thermodynamics)
4. https://nptel.ac.in/courses/115107095 (Fiber Optics)
5. https://nptel.ac.in/courses/104104085 (Lasers)
6. https://nptel.ac.in/courses/104104082 (Quantum Computing)
7. https://www.intechopen.com/online-first/73811 (Quantum Computing)
8. https://lewisla.gitbook.io/learning-quantum/quantum-circuits/single-qubit-gates.(Quantum Computing)
9. https://profmcruz.wordpress.com/wp-content/uploads/2017/08/quantum-computation-and-quantum-information-nielsen-chuang.pdf (Quantum Computing)

ELEMENTS OF ELECTRONICS ENGINEERING

I Year B. Tech. I Semester

[CSE(AI&ML)]

Course Code: 24EC11RC04

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Outline the concepts of semiconductor devices. (L2)

CO2: Understand the characteristics of different semiconductor diodes and their applications. (L2)

CO3: Apply various biasing techniques for design of BJT circuits. (L3)

CO4: Apply hybrid models to understand the operation of BJT amplifier. (L3)

CO5: Understand the characteristics of FET. (L2)

UNIT-I 8 Lectures

Introduction to Electronics and Semiconductors: Energy band theory, Conduction in Insulators, Semiconductors and metals, Classification of semiconductors, Properties of intrinsic and extrinsic semiconductor, Carrier concentration in an intrinsic semiconductor, Drift, and diffusion currents. [Textbook 1: Chapter -1 Section 1.6, 1.7, 1.8; Chapter -2 Section 2.2, 2.3, 2.9; Chapter -19 Section 19.5]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Explain the energy band theory of solids (insulators, semiconductors, and metals) based on their band structures (L2)
2. Describe the transport phenomena in semiconductors (L2)

UNIT-II 11 Lectures

Semi-Conductor Diode: Theory of PN junction, Open circuited PN junction, V-I characteristics of a PN diode, Diode current equation, basics on junction capacitance, Break down in PN diode, Applications of PN diodes. Zener diode, Zener regulator, Tunnel diode, Schottky diode.

Rectifying circuits: Half wave and full wave rectifiers, Bridge rectifiers, Efficiency, Ripple and regulation of each rectifier, Capacitor filters. [Textbook 2: Chapter 4 Section 4.1 – 4.5, 4.8; Chapter 5 Section 5.3, 5.4, 5.7; Chapter 8 Section 8.2 – 8.4, 8.6]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Explain the formation of PN junction and represent the band structure, interpret the Volt-ampere characteristics (L2)

2. Describe the operation of rectifiers, and evaluate their performance metrics like ripple factor and regulation characteristics (L2)
3. Explain the working principles of special diodes such as Zener diode, tunnel diodes and Schottky barrier diodes. (L2)

UNIT-III **11 Lectures**

Bi-Polar Junction Transistor: Introduction, construction, Operation of PNP and NPN Transistors, transistor configurations, Input and Output Characteristics of CE configuration, Comparison of CE, CB, and CC Configurations.

Transistor Biasing and thermal stabilization: Junction Biasing for Saturation, Cutoff and Active Region, Biasing circuits analysis, fixed bias, collector to base bias, emitter bias, voltage divider bias, thermal runaway. [Textbook 2: Chapter 6 Section 6.1 - 6.3, 6.6-6.9, 6.11, Chapter 10 Section 10.4 - 10.8]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Describe the characteristics of transistor in CE, CB, and CC configurations. (L2)
2. Understand the principals of transistor biasing and compensation methods (L2)
3. Identify the characteristics of different transistor biasing techniques (L3)

UNIT-IV **8 Lectures**

Transistor Amplifiers: CE, CB, CC amplifier configurations –Multistage amplifier – A Two Stage RC coupled amplifier – frequency response curve and bandwidth. [Textbook 2: Chapter -11 Section 11.9, 11.11, 11.12, 11.16, 11.17, 11.20]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Represent transistor with its equivalent h parameter model (L2)
2. Apply hybrid models to obtain the performance of transistor amplifiers (L3)

UNIT-V **10 Lectures**

Field Effect Transistors: Construction of JFET and its drain, transfer characteristics, pinch off Voltage, Drain Saturation Current, parameters of JFET, Construction of MOSFET – Enhancement and Depletion Modes, drain and transfer characteristics. [Textbook 2: Chapter -7 Section 7.1 – 7.5, 7.11, 7.12]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Comprehend the characteristics of BJT and FET(L2)
2. Explain the construction of JFET and MoSFETs (L2)
3. Describe the characteristics of JFET and MoSFET (L2)

Textbooks:

1. Jacob Millman, Christos C. Halkias, Integrated Electronics: Analog and Digital Circuits and Systems, McGRAW-HILL. 1972
2. Sanjeev Gupta, Electronic Devices and Circuits, 2nd Edition, Dhanpat Rai Publications,2005.

Reference Books:

1. Thomas L.Floyd, Electronic Devices, 9th Edition , Prentice Hall, 2012.
2. B. V. Rao and K. Raja Rajeswari, Electronic Devices and Circuits 2nd Edition, Pearson Education.,2010.
3. David A. Bell, Electronic Devices and Circuits, 5th Edition, Oxford University Press, 2008
4. Robert Boylestad, Louis Nashelsky, Electronic Devices and Circuit Theory, 7th Edition, Prentice Hall,1998

Web References:

1. https://onlinecourses.nptel.ac.in/noc21_ee80/preview
2. https://be-iitkgp.vlabs.ac.in/

FUNDAMENTALS OF COMPUTERS

I Year B. Tech. I semester
[Common to CSE, CSE (AI&ML), IT]

Course Code: 24CT11RC01

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, the student shall be able to:

CO1: Identify different I/O devices and their usage. (L3)

CO2: Compare different computer memory with their efficiency. (L3)

CO3: Relate different computer software's and programming languages for solving problems. (L2)

CO4: Summarize the use of operating system, database system, and computer network in the field of computing in engineering. (L2)

CO5: Infer the methods and applications of artificial intelligence (AI), machine learning (ML) and data science. (L3)

UNIT-I **10 Lectures**

Introduction to Computers: Computers, Stored Program Concept, Classification of Computers, Evolution and Development of Computers, Application Areas of Computers, Features/Characteristics of Computers, Basic Organization of a Computer.

Input and Output Devices: Input Devices, Output Devices, Soft Copy Devices, Hard Copy Devices, Voice Response Systems, Biometric Devices [TextBook-1: Chapter 1 (S-1.1 – S-1.7)]

https://oer-studentresources.gesci.org/wp-content/courses/Computer/CS-F1-Introduction-to-computers/evolution_and_development_of_computers.html (Development of Computers) [TextBook-1: Chapter 2 (S-2.1 – S-2.6)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Outline characteristics and classification of computers (L2)
2. Demonstrate different configurations of software and hardware used in computer (L2)
3. Model the computer by organizing different computer peripherals such as I/O, CPU, etc. (L3)

UNIT-II **10 Lectures**

Computer Memory: Introduction, Memory Organization, Memory Hierarchy, Sequential and Random Access, Processor Registers, Cache Memory, Primary Memory, Secondary Storage Devices, Magnetic Tapes, Floppy Disks, Hard Disks, External Hard Disks, Optical Disks, USB Flash Drives, Memory Cards, Mass Storage Devices. [TextBook-1: Chapter 3 (S-3.1 – S-3.16)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Summarize computer memory hierarchy. (L2)
2. Classify different memory with respect to speed and cost. (L2)
3. Illustrate different external storage devices and its applications. (L2)

UNIT-III **10 Lectures**

Computer Software: Introduction to Computer Software, Classification of Computer Software, System Software, Application software, Graphics Software, Multimedia Software, Database Management Software, Firmware, Middleware, Procuring Computer Software.

Problem Solving using Computers: Introduction, Program Development Life Cycle, Program Design Tools, Programming Languages, Generations of Programming Languages, Categorization of High-level Languages, Some Popular High-level Languages, Apps. [TextBook-1: Chapter 6 (S-6.1 – S-6.7), TextBook-1: Chapter 7 (S-7.1 – S-7.7)]

https://www.builder.ai/glossary/app#:~:text=An%20app%20is%20a%20type,enhance%20productivity%20and%20streamline%20communication (Apps)

Learning Outcomes:

At the end of the unit, the student will be able to

1. Compare different computer software's (L2)
2. Summarize different programming languages for solving problems. (L2)
3. Contrast Structured Programming Language, Logic-oriented Programming Language, and Object-oriented Programming. (L2)

UNIT-IV **10 Lectures**

Fundamental Operating Systems: Introduction, History of Operating Systems, Functions of Operating Systems, Types of Operating Systems, Providing User Interface, Popular Operating Systems

Database Systems: File-Oriented Approach, Database-oriented Approach, Database Views, Three-schema Architecture, Database Models, Components of Database Management, Retrieving Data Through Queries.

Computer Networks: Introduction to Computer Networks, Types of Networks, Physical Components of a Network, Wired Media, Wireless Media, Networking Devices, Network Topologies, Wireless Networks. [TextBook-2: Chapter 11 (S-11.1 / P-238 – S-11.11 / P-258), TextBook-1: Chapter 9 (S-9.1 – S-9.7), Chapter 10 (S-10.1 – S-10.8)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Explain fundamentals of operating systems. (L2)
2. Illustrate database system applications and its design concepts. (L2)

3. Outline fundamentals of computer networks and its applications. (L2)

UNIT-V **8 Lectures**

Introduction to Artificial Intelligence & Machine Learning (AI&ML) and Data Science: Introduction to AI & ML, and Data Science, Use Cases in Business and Scope, Modelling Concepts, CRISP-DM Method.

1. https://community.aws/content/2drbbXokwrIXivItJ8ZeCk3gT5F/introduction-to-artificial-intelligence-and-machine-learning?lang=en (Artificial Intelligence)
2. https://www.javatpoint.com/machine-learning-models (Machine Learning)
3. https://www.techtarget.com/searchenterpriseai/feature/Top-12-machine-learning-use-cases-and-business-applications (Machine Learning)
4. https://www.heavy.ai/learn/data-science (Data Science)
5. https://www.sv-europe.com/crisp-dm-methodology/ (CRISP-DM Method)

Learning Outcomes:

At the end of the unit, the student will be able to

1. Outline the main methods and applications of artificial intelligence (AI) concepts. (L2)
2. Outline the main methods and applications of machine learning (ML) concepts. (L2)
3. Outline the main methods and applications of data science concepts. (L2)

Textbooks:

1. Reema Thareja, Fundamentals of Computers, Second Edition, Oxford University Press, 2019.
2. E Balagurusamy, Fundamentals of Computers, Tata McGraw Hill Education Private Limited, 2009

Reference Books:

1. Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems, 4th Edition, McGraw-Hill, 2002.
2. Andrew S. Tanenbaum, Modern Operating Systems, 2nd edition, PHI, 1995.

Web References:

1. https://oer-studentresources.gesci.org/wp-content/courses/Computer/CS-F1-Introduction-to-computers/evolution_and_development_of_computers.html (Development of Computers)
2. https://www.builder.ai/glossary/app#:~:text=An%20app%20is%20a%20type,enhance%20productivity%20and%20streamline%20communication (Apps)
3. https://www.geeksforgeeks.org/what-is-an-operating-system/ (Operating System)
4. https://www.javatpoint.com/computer-network-tutorial (Computer Network)
5. https://community.aws/content/2drbbXokwrIXivItJ8ZeCk3gT5F/introduction-to-artificial-intelligence-and-machine-learning?lang=en (Artificial Intelligence)
6. https://www.javatpoint.com/machine-learning-models (Machine Learning)

7. https://www.techtarget.com/searchenterpriseai/feature/Top-12-machine-learning-use-cases-and-business-applications (Machine Learning)
8. https://www.heavy.ai/learn/data-science (Data Science)
9. https://www.sv-europe.com/crisp-dm-methodology/ (CRISP-DM Method)

PROBLEM SOLVING USING C

I Year B. Tech. I semester

[Common to CSE, CSE (AI&ML), IT, ECE]

L	T	P	C
3	0	0	3

Course Code: 24CT11RC02

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Explain the basic constructs of C through the use of simple applications. (L2)

CO2: Demonstrate the utilization of arrays and strings in the development of C programs. (L2)

CO3: Utilize functions and pointers to construct various applications in C. (L3)

CO4: Apply concepts of structures and unions to build and implement C applications. (L3)

CO5: Develop applications using sequential and random-access file processing techniques. (L3)

UNIT-I **10 Lectures**

Introduction to C: Basic structure of C program, Constants, Variables and data types, Operators and Expressions, Arithmetic Precedence and associativity, Type Conversions. Managing Input and Output Operations Formatted Input, Formatted Output. [TextBook-1: Chapter 2 (S-2.1 – S-2.12)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Outline the Basic Structure and Components of C Programs. (L2)
2. Demonstrate Variables, Data Types, Operators, and Expressions. (L2)
3. Illustrate Input and Output Operations. (L2)

UNIT-II **11 Lectures**

Decision Making, Branching, Looping: Decision making with if statement, Simple if statement, The if…else statement, Nesting of if…else statement, the else.. if ladder, switch statement, the (? :) operator, the goto statement, The while statement, the do statement, the for statement, Jumps in Loops.

Arrays & Strings: One, Two-dimensional Arrays, multi-dimensional Arrays, Character Arrays. Declaration and Initialization of Strings, reading and writing of strings, string handling functions. [TextBook-1: Chapter 3 (S-3.1 – S-3.8), TextBook-2: Chapter 13,14,15,16 (PP:215-283)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Classify Decision Making and Branching (L2)
2. Interpretation of Looping Constructs (L2)
3. Summarize Arrays and Strings (L2)

UNIT-III **10 Lectures**

Function and Dynamic Memory Allocation: Functions: Designing structured programs, declaring a function, Signature of a function, Parameters and return type of a function, passing parameters to functions, call by value, passing arrays to functions, recursion.

Introduction to Pointers, Pointer Arithmetic, Pointers for Inter-Function Communication, passing pointers to functions, call by reference, Dynamic Memory Allocation. [TextBook-1: Chapter 4 (S-4.1 – S-4.11), Chapter 5 (S-5.1 – S-5.12)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Utilize Functions (Understand and Implement Functions, Utilize Various Function Types, Advanced Function Techniques) (L3)
2. Experiment with Pointers (Basic Pointer Operations, Pointers and Data Structures) (L3)
3. Explain Advanced Pointer Usage (Pointers in Functions, Pointers to Complex Data Types) (L2)

UNIT-IV **9 Lectures**

Structure and Unions: Defining a structure and union, declaring structure variables, accessing structure members, structure initialization, copying and comparing structure variables, arrays of structures, arrays within structures, structures within structures, definition and usage of union, structures and unions using functions, size of structures and bit-fields. The Type Definition (Type def), Enumerated Types. [TextBook-1: Chapter 6 (S-6.1 – S-6.9)]

Learning Outcomes:

1. At the end of the unit, the student will be able to
2. Define Structures and Build C programs using Structures. (L3)
3. Explain Complex Data Structures. (L2)
4. Explain Unions and Bit-Fields. (L2)

UNIT-V **8 Lectures**

File handling: Introduction to Files, Modes of File operations, Text and Binary Files, Defining and opening a file, closing a file, Input/ Output operations on files, Error handling during I/O operations, random access to files and Command Line Arguments, user defined header files. [TextBook-2: Chapter 19 (PP:325-348)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Outline File Operations. (L2)
2. Summarize Error Handling and Random Access. (L2)
3. Utilize Command Line Arguments. (L3)

Text Books:

1. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, 2015, Pearson Education India, ISBN: 978-93-3254-944-9.
2. Yashavant P. Kanetkar, "Let Us C", 16th Edition, 2019, BPB Publications, ISBN: 978-93-8728-449-4.

Reference Books:

1. N. B. Venkateswarlu, E. V. Prasad, "C and Data Structures", 1st Edition, S. Chand Publishing, 2010, ISBN: 978-93-525-3356-5.
2. Pradip Dey, Manas Ghosh, "Programming in C", 2nd Edition, 2018, Oxford University Press, ISBN: 978-01-9949-147-6.
3. Jacqueline A. Jones and Keith Harrow, "Problem Solving with C", Pearson Education. ISBN: 978-93-325-3800-9.
4. E. Balagurusamy, "Programming in ANSI C", 8th Edition, 2019, McGraw Hill Education, ISBN: 978-93-5316-513-0.

Web References:

1. https://nptel.ac.in/courses/106105171
2. https://ocw.mit.edu/courses/6-087-practical-programming-in-c-january-iap-2010/pages/lecture-notes/
3. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013843237039374336345 17_shared/overview
4. https://cse02-iiith.vlabs.ac.in/List%20of%20experiments.html

ENGINEERING PHYSICS LAB

I Year B. Tech. I semester

[CSE(AI&ML)]

Course Code: 24BP11RC02

L	T	P	C
0	0	3	1.5

Course Outcomes: At the end of the course the student will be able to

CO1: Interpret the physical parameters based on optical phenomena. (L2)

CO2: Verify the behaviour of double refraction in birefringent material like quartz. (L2)

CO3: Demonstrate the concepts of diffraction through experiments. (L3)

CO4: Calibrate instruments like low range voltmeters and ammeters. (L3)

CO5: Design temperature sensors based on diodes and thermistors. (L3)

List of Experiments: (Any TEN of the following experiments shall be conducted)

1. Determination of Radius of Curvature of a given Convex Lens By forming Newton's Rings.
2. Determination of Thickness Given Paper Strip or hairline by Wedge Method.
3. Determination of Wavelength of Spectral Lines in the Mercury Spectrum by Normal Incidence method
4. Determination of Cauchy's Constants of a Given Material of the Prism using Spectrometer in minimum deviation position
5. Determination of Refractive Index of Ordinary ray and Extra-ordinary ray in quartz prism
6. Laser- Diffraction – determination of wavelength of laser source using diffraction grating
7. Determination of wavelength of laser source using Fraunhofer single slit diffraction
8. Melde's Apparatus – Frequency of electrically maintained Tuning Fork.
9. Study of Intensity Variation of the Magnetic Field along the axis of circular Current Carrying conductor using Stewart and Gee apparatus
10. Calibration of Low Range Voltmeter using Potentiometer Bridge
11. Calibration of Low Range Ammeter using Potentiometer Bridge
12. Determination of dielectric constant of material using charging discharging method with a parallel plate capacitor
13. Determination of energy band gap of semiconductor using PN junction diode in reverse bias
14. Determination of thermo electric coefficients for thermistor
15. Determination of Planck's constant using LED.

Textbooks:

1. Practical physics by CL Arora, S.chand publishing company, 1995.
2. Advanced Practical Physics For Students by B.l.worsnop And H.t.flint, 1923

Web References:

1. http://lo-au.vlabs.ac.in/laser-optics/Newtons_Rings_Wavelength_of_light/
2. http://ov-au.vlabs.ac.in/optics/Spectrometer_Refractive_Index/
3. http://ov-au.vlabs.ac.in/optics/Diffraction_Grating/
4. http://htv-au.vlabs.ac.in/heat-thermodynamics/Characteristics_of_Thermistor/
5. https://bop-iitk.vlabs.ac.in/exp/energy-band-gap/simulation.html

COMPUTER ENGINEERING WORKSHOP

I Year B. Tech. I semester
[Common to CSE, CSE (AI&ML), IT]

Course Code: 24CT11RC03

L	T	P	C
0	0	3	1.5

Course Outcomes: At the end of the Course, the student shall be able to:

CO1: Identify the peripherals of a computer. (L3)

CO2: Demonstrate the installation process of operating systems like MS Windows, LINUX. (L3)

CO3: Make use of MS-Office suite that comprises of various applications to create documents, organizes & analyses data and captivating presentations. (L3)

CO4: Categorize various UNIX/LINUX Commands to work on a modern operating system. (L3)

CO5: Experiment with GIT Commands and make use of LaTeX to prepare research articles. (L3)

Module-1: Hardware Concepts

1. Identify the peripherals of a computer, components in a CPU and its functions.
2. Draw the block diagram of the CPU along with the configuration of each peripheral.
3. Disassemble and assemble the PC back to working condition.

Module-2: Software Installations

1. Install operating systems like LINUX and MS windows on a personal computer.
2. The system should be configured as dual boot with both MS windows and LINUX.

Module-3: Office Suite

1. Creating Documents: Formatting Fonts/Texts, page layout, Applying Text effects, Character Spacing, Borders and Colours, Inserting Header and Footer, equation editor.
2. Spreadsheet Orientation: Accessing, overview of toolbars, saving spreadsheet files, Using help and resources. Creating a Scheduler, Gridlines, Format Cells, Summation, auto fill, Formatting Text, Renaming and Inserting worksheets, Hyper linking.
3. Excel Calculation: Calculating Average, Cell Referencing, Excel Formula, std. deviation, Charts, Count Function, Sorting, Conditional formatting, Excel Advanced-sumif, VLOOKUP, and Pivot Table.
4. Creating Power Point: Student should work on basic power point utilities and tools to create basic power point presentation. PPT Orientation, Slide Layouts, Inserting Text, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows, Hyperlinks, Inserting Images, Tables and charts.
5. Software as a service (SaaS): Usage of online office suite.

Module-4: Unix / Linux Commands

1. Study and practice on file system, handling files with commands, syntax, usage, application.
2. Practice on vi editor.
3. Study and practice on shells/shell programming with relevant programming constructs, syntax, usage, application.

Module-5: GIT Commands and LaTeX

1. Installation of GIT, Branch in Git Basic GIT Commands.
2. Installation of LaTeX and preparing research articles by creating overleaf account.
3. Introduction to Scratch Programming - Introduction, Stage, Sprite, Script, Block Palette.

Reference Books:

1. IT Essentials: PC Hardware and Software Companion Guide, Third Edition, David Anfinson, Ken Quamme.
2. UNIX concepts and applications by Sumitabha Das, TMH Publications.
3. Shell programming by Yashwanth Kanetkar.

Web References:

1. https://www.javatpoint.com/

PROBLEM SOLVING USING C LAB

I Year B. Tech. I semester

[Common to CSE, CSE (AI&ML), IT, ECE]

Course Code: 24CT11RC04

L	T	P	C
0	0	3	1.5

Course Outcomes: At the end of the Course, the student shall be able to:

CO1: Outline the use of basic constructs of C for simple applications. (L2)

CO2: Develop C programs for simple applications using Arrays and Strings. (L3)

CO3: Illustrate concepts such as functions, recursion, and pointers with suitable examples. (L2)

CO4: Build C programs involving Structures and Unions. (L3)

CO5: Develop applications using sequential and random-access file processing. (L3)

Module-1:

1. Write a C program to demonstrate Format Specifiers and Input/Output Statements.
2. Write a C program to demonstrate various Data Types.

Module-2:

1. Write a C program to demonstrate various Operators including Bitwise Operator.
2. Write a C program to demonstrate Arithmetic Expressions and Type Casting.

Module-3:

1. Write a C program to demonstrate decision making statements.
2. Write a C program to demonstrate iterative statements.
3. Write a C program to demonstrate break and continue Statement.

Module-4:

1. Write a C program to demonstrate arrays (one-dimensional and two-dimensional).
2. Write a C program to demonstrate string handling functions using built-in and user defined functions.

Module-5:

1. Write a C program to demonstrate user defined functions.
2. Write a C program to demonstrate nested functions.

Module-6:

1. Write a C program to demonstrate arithmetic expressions using pointers.
2. Write a C program to demonstrate Pointers to Arrays.
3. Write a C program to demonstrate manipulate strings using pointers.
4. Write a C program to demonstrate dynamic memory allocation.

Module-7:

1. Write a C program to demonstrate Call-by-value, Call-by-reference.
2. Write a C program to demonstrate recursive function.
3. Write a C program to demonstrate Functions with Storage Classes (Static).

Module-8:

1. Write a C program to demonstrate structures.
2. Write a C program to demonstrate structures within structures.
3. Write a C program to demonstrate pointer to a structure.
4. Write a C program to demonstrate unions.

Module-9:

1. Write a C program to demonstrate I/O operations on files.
2. Write a C program to demonstrate concatenating two files.
3. Write a C program to demonstrate copy content of one file to another file.

Case Study: Select any one application mentioned below.

Note: A report has to be submitted by every student at the end of the semester that includes design, coding, output, etc.

1. Develop a library management system to add, delete, and search for books efficiently.
2. Develop an ATM system to check balance, deposit money, and withdraw funds.
3. Develop a C program to calculate salary increments using a lookup table which stores the percentage of increment based on the current salary.
4. Develop a voting system where users can vote for candidates and view results.
5. Develop a basic calculator for arithmetic operations like addition, subtraction, multiplication, and division.
6. Develop a contact management system to store and manage details like name, phone number, and email.
7. Develop a banking system supporting multiple users for account management and transactions.
8. Develop a C program to calculate SGPA and CGPA based on students' marks across semesters.
9. Develop a registration page in C using file handling to securely store usernames and passwords.
10. Develop an encryption and decryption algorithm to securely transform and restore data by using the GNU C Library: crypt.

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, 2015, Pearson Education India, ISBN: 978-93-3254-944-9.
2. Yashavant P. Kanetkar, "Let Us C", 16th Edition, 2019, BPB Publications, ISBN: 978- 93- 8728-449-4.
3. E. Balaguruswamy, "Programming in ANSI C", 8th Edition, 2019, McGraw Hill Education, ISBN: 978-93-5316-513-0.
4. Pradip Dey, Manas Ghosh, "Programming in C", 2nd Edition, 2018, Oxford University Press, ISBN: 978-01-9949-147-6.
5. N.B. Venkateswarulu, "C programming", 1st Edition, S.Chand Publishing, 2017, ISBN: 978-93-525-3356-5.
6. Jacqueline A Jones and Keith Harrow, "Problem Solving with C", Pearson Education. ISBN: 978-93-325-3800-9.

Web References:

1. https://nptel.ac.in/courses/106105171
2. https://ocw.mit.edu/courses/6-087-practical-programming-in-c-january-iap-2010/pages/lecture-notes/
3. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013843237039374336345 17_shared/overview
4. https://cse02-iiith.vlabs.ac.in/List%20of%20experiments.html

LINEAR ALGEBRA AND VECTOR CALCULUS

I Year B. Tech. II Semester

[Common to EEE, ECE, CSE, IT, CSE (AI&ML)]

Course Code: 24BM11RC02

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Test for consistency and solve linear system of equations, also determine unknown currents in the electrical circuits. (L5)

CO2: Find the Eigen values and Eigen vectors of a matrix and apply Cayley- Hamilton theorem to find the inverse of a matrix. (L3)

CO3: Reduce quadratic form to canonical form and examine the nature of quadratic form. (L4)

CO4: Interpret the meaning and evaluate gradient of a scalar valued, curl and divergence of vector valued functions. (L5)

CO5: Apply line integrals, surface integrals, volume integrals and their relations using Green's theorem, Stoke's theorem, Gauss Divergence theorems in various engineering applications. (L3)

UNIT-I: **10 Lectures**

Matrix Algebra: Rank of a matrix- Echelon form, Normal Form - Solution of Linear System of Equations - Consistency of Linear System of Equations – Gauss elimination and Gauss Jordan methods, LU Factorization method.

Applications: Finding the current in electrical circuits. [Sections: 2.7, 2.10, 28.6 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Find the rank of a matrix. (L1)
2. Test for consistency and solve a system of linear equations. (L4)
3. Apply Gauss elimination and Gauss Jordan methods, LU factorization to solve linear systems. (L3)
4. Determine unknown currents in electrical circuits. (L5)

UNIT-II: **10 Lectures**

Eigen Values and Eigen Vectors: Eigen Values and Eigen Vectors of a real Matrix – Properties - Cayley- Hamilton theorem (without proof) - Inverse and Powers of a Matrix using Cayley-Hamilton's theorem – Pseudo inverse of a matrix, Singular value decomposition. [Sections: 2.13 - 2.15 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Find eigenvalues and corresponding eigenvectors of a matrix. (L1)
2. Apply Cayley-Hamilton theorem to find powers and the inverse of a matrix. (L3)
3. Calculate the Pseudo Inverse of a matrix. (L3)
4. Calculate the singular values of a matrix. (L3)

UNIT-III: **9 Lectures**

Quadratic Forms: Inner Product – Orthogonal Vectors – Orthogonal matrix – Diagonalization of a Matrix-Quadratic Forms - Reduction of Quadratic Form to Canonical Form (Orthogonal Transformation) - Nature of a Quadratic Form. [Sections: 2.16 - 2.18 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Make use of Eigen values and eigen vectors to diagonalize the matrix. (L3)
2. Reduce the Quadratic form to canonical form examine the nature of a quadratic form. (L4)

UNIT-IV: Vector Differentiation **9 Lectures**

Introduction - Scalar and Vector point functions, General rules for vector differentiation - Vector operator ∇ applied to scalar point functions- Gradient, ∇ applied to vector point functions- divergence and curl. Physical interpretation of gradient, divergence and curl(i.e., ∇f, $\nabla . \overline{F}$, $\nabla \times \overline{F}$), Irrotational and Solenoidal fields, Vector Identities. [Sections: 8.1, 8.4 - 8.9 of Text Book]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Find the gradient of a scalar point function, divergence and curl of a vector point function. (L1)
2. Determine the directional derivative of scalar point function. (L5)

UNIT-V: Vector Integration **10 Lectures**

Integration of vectors - Line integral – Circulation - work done - surface integral-flux - Green's theorem in the plane - Stoke's theorem - Volume integral - Gauss Divergence theorem (All theoremswithout proofs). [Sections: 8.10 - 8.16, 8.18 of Text Book]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Determine the work done in a moving particle along a path. (L5)
2. Interpret surface and volume integrals. (L2)

3. Apply vector integral theorems to multiple integral. (L3)

Textbooks:

1. B. S. Grewal, Higher Engineering Mathematics, 45th Edition, Khanna Publishers, 2024.

Reference Books:

1. David Poole, Linear Algebra- A modern introduction, 4th edition, 2015.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th edition, John Wiley & Sons, 2011.
3. Peter V. O'Neil, Advanced Engineering Mathematics, 7th edition, Cengage Learning, 2011.
4. Greenberg, Advanced Engineering Mathematics, 2nd Edition, Pearson, 2017.

Web References:

1. https://nptel.ac.in/courses/111107112

GREEN CHEMISTRY

I Year B. Tech. II semester
[Common to CSE (AI&ML), ECE]

L	T	P	C
3	0	0	3

Course Code: 24BC11RC01

Course Outcomes: At the end of the Course, the student shall be able to

CO1: To develop knowledge about water and its treatment for industrial and potable purpose. (L3)

CO2: Utilize the theory of construction and discharge reactions of various types of batteries are used in commercial society. (L3)

CO3: Explain the importance of working principle, fabrication of electrodes and other components, advantages, disadvantages and environmental aspects of fuel cells. (L4)

CO4: Classify the corrosion mechanism of metals and factors influenced by rate and extent of corrosion and categorize the reasons for corrosion control methods. (L4)

CO5: Apply green chemistry technology processes the knowledge for solving existing challenges faced in various engineering and societal areas. (L5)

UNIT-I **10 Lectures**

Water-Technology: Sources of Water – Impurities and their influence of living systems – WHO Limits – Hardness and its Determination – Boiler Troubles and their removal – Water Softening Methods – Lime-Soda, Zeolite and Ion Exchange - Municipal Water Treatment-Break Point Chlorination – Desalination of Sea Water –Reverse Osmosis Method Electro-dialysis. Chemical analysis of water. [TB1: Chapter1]

Learning Outcomes:

At the end of the unit the student will be able to

1. Explain the principles of reverse osmosis (L4)
2. Compare the quality of drinking water with BIS and WHO standards (L4)
3. Illustrate problems associated with Boiler Troubles (L2)
4. Demonstrate the estimation of hardness of water (L3)

UNIT-II **10 Lectures**

Batteries: Primary batteries: The Chemistry-Types: Zinc-carbon (Leclanche type), zinc alkaline

(Duracell), zinc/air batteries; Lithium primary cells and lithium-ferrous sulphide cells.

Secondary batteries: Lead acid and VRLA (valve regulated (sealed) lead acid), nickel cadmium, nickel-zinc, nickel- metal hydride batteries, lithium-ion batteries, ultrathin lithium polymer cells. Advanced Batteries for electric vehicles, requirements of the battery – sodium-beta and redox batteries. [TB1: Chapter6]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Deduct the working mechanism of various types of cells (L5)
2. Illustrate difference between primary and secondary cells (L2)
3. List the environmental applications of Various types of batteries (L4)
4. Utilize the manufacturing methods of advanced batteries for electric vehicles (L3)

UNIT-III **8 Lectures**

Fuel Cells: Description, working principle, anodic, cathodic and cell reactions, fabrication of electrodes and other components, applications, advantages, disadvantages and environmental aspects of the following types of fuel cells: Proton Exchange Membrane Fuel Cells, alkaline fuel cells, phosphoric acid, solid oxide, molten carbonate, direct methanol fuel cells- Membranes and Fuels, Electrochemical Sensors and Optical fibres. [TB1: Chapter 6]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Explain the fundamental theories of fuel cells (L2)
2. Classify types of fuel cells (L4)
3. Make use of the various components fabrication of fuel cells (L3)
4. Distinguish the advantages, disadvantages and environmental aspects of fuel cells(L4)

UNIT-IV **10 Lectures**

Corrosion: Origin and Theory – Types of Corrosion: Chemical and Electrochemical; Pitting, inter granular, Waterline, Stress – Galvanic Series – Factors Effecting Corrosion. Corrosion Controlling Methods, Protective Coatings, Electroplating and Electroless Plating, Paints, Varnishes, Lacquers, Enamels. [TB1: Chapter 7]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Explain the Mechanism of corrosion (L4)
2. List the various types of Corrosion (L4)

3. Describe the Factors Effecting Corrosion (L5)
4. Differentiate between Paints Lacquers Enamels (L4)

UNIT-V **10 Lectures**

Green-Chemistry and Technology: Introduction and significance of green chemistry, Goals of green chemistry, 12 principles of green chemistry, toxicity of chemicals, concept of zero pollution technologies; Aqueous phase method, Super critical fluid method, Phase transfer catalytic method, atom economy, functional toxicity vs non- functional toxicity, functional group approaches to green chemistry, Elimination of toxic functional group, optimization of frameworks for the design of greener synthetic pathways -Green synthesis of Adipic acid and Paracetamol- energy minimization-Microwave synthesis, ultra sound assisted method Bio catalyzed reaction and Only explanation with examples Processes involving solid catalysts – zeolites, ion exchange resins, applications of Green Chemistry, Green solvents, green fuels & propellants. [TB2: Chapter- 2,3,4&5]

Learning Outcomes:

At the end of the unit the student will be able to

1. Processes involving Green Chemistry and apply the knowledge for solving existing
2. Challenges faced in various engineering and societal areas (L-5)
3. Differentiate between functional toxicity vs non- functional toxicity (L-4)
4. Explain the green chemistry, 12 principles (L-2)

Textbooks:

1. Engineering Chemistry – PC Jain and M. Jain –15th Edition, Dhanpath Rai and Sons, New Delhi.
2. Anastas, P. T., Warner, J. C. Green Chemistry: Theory and Practice, Oxford UniversityPress Inc., New York, 1998.

Reference Books:

1. M. Aulice Scibioh and B. Viswanathan ‘Fuel Cells – principles and applications’, University Press India (2006).
2. A Textbook of Engineering Chemistry – S. S. Dara – S. Chand & Co. New Delhi
3. Handbook of Green Chemistry and Technology; by James Clarke and Duncan Macquarrie; Blakwell Publishing.

Web References:

1. https://archive.nptel.ac.in/course.html
2. https://nptel.ac.in/courses/engineering

ENGLISH

I Year B. Tech II Semester

[Common to ECE, EEE & CSE(AI&ML)]

L	T	P	C
3	0	0	3

Course Code: 24HE11RC01

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Develop moral values and inner peace(L3), Demonstrate the use of LSRW skills, Vocabulary and basic grammar concepts. (L3)

CO2: Identify the impact of different social backgrounds (L3), recognize the poet's insights. (L4) Demonstrate the use of LSRW skills, Vocabulary and basic grammar concepts. (L3)

CO3: Analyse socio-cultural context(L4), Establish effective interpersonal and communication skills(L3), Demonstrate the use of LSRW skills, Vocabulary and basic grammar concepts(L3)

CO4: Focus on value of education(L4), Relate to the poet's nostalgia(L4), Demonstrate the use of LSRW skills, Vocabulary and basic grammar concepts (L3)

CO5: Determine the central idea of the text(L3), Identify one's resilience(L3), Demonstrate the use of LSRW skills, Vocabulary and basic grammar concepts (L3)

UNIT-I **10 Lectures**

Prose:	Swami Vivekananda: The Secret of Work
Poetry:	Grenville Kleiser: Stay Calm
Grammar & Vocabulary:	Synonyms & Antonyms
Listening:	Listening for Context and Specific Information
Speaking:	Introducing Oneself and Others
Writing:	Basics of writing

Learning Outcomes:

At the end of the unit, the student will be able to

1. Interpret the spiritual growth and capacity building of the individual in the 21st century. (L3)
2. Use appropriate synonyms and antonyms to communicate effectively. (L3)
3. Listen and understand for specific information in the audio(L2)
4. Establish connections between oneself and others(L3)
5. Apply appropriate punctuation marks for clarity and organization of written text (L3)

UNIT-II **10 Lectures**

Prose:	Katherine Mansfield: The Doll's House
Poetry: Rabindranath Tagore:	Where the Mind Is Without Fear
Grammar & Vocabulary:	Phrasal Verbs
Listening:	Listening for Main Idea and Supporting Ideas
Speaking:	Getting Someone's Attention and Interrupting
Writing:	Formal Letters

Learning Outcomes:

At the end of the unit, the student will be able to

1. Relate to the world through adult & child's points of view (L3)
2. Identify the sense of self dignity & rationality in the poem (L4)
3. Utilize appropriate phrasal verbs for effective communication(L3)
4. Listen & identify main and supporting ideas in the audio(L3)
5. Practice conversational etiquette(L3)
6. Write formal letters(L3)

UNIT-III **10 Lectures**

Prose:	O. Henry: The Last Leaf
Poetry:	Rudyard Kipling: If
Grammar & Vocabulary:	Idiomatic Expressions
Listening:	Listening for Global Comprehension
Speaking:	Asking for Information and Giving Information
Writing:	Note-Making

Learning Outcomes:

At the end of the unit, the student will be able to:

1. Analyze strategies to face challenges in life (L4)
2. Develop one's own personality (L3)
3. Use idiomatic expressions in oral & written communication (L3)
4. Listen & Interpret the audio for Global Comprehension (L3)
5. Ask & provide information (L3)
6. Practice note making study skills(L3)

UNIT-IV **10 Lectures**

Prose:	Francis Bacon: Of Studies
Poetry:	Toru Dutt: Our Casuarina Tree
Grammar & Vocabulary:	Remedial Grammar I
Listening:	Listening to Make Inferences
Speaking:	Expressing Opinions, and Agreeing and Disagreeing with Opinions
Writing:	Essay Writing

Learning Outcomes:

At the end of the unit, the student will be able to

1. Prioritize the habits of continuous learning(L4)
2. Recognize the significance of Indian philosophy (L4)
3. Identify and correct common errors in English grammar and usage(L3)
4. Draw inferences from the audio(L3)
5. Articulate one's own opinions(L3)
6. Develop different types of essays (DEAN)(L3)

UNIT-V **8 Lectures**

Prose:	Mark Twain: Whitewashing the Fence
Poetry:	William Ernest Henley: Invictus
Grammar & Vocabulary:	Remedial Grammar II
Listening:	Listening for Key Ideas
Speaking:	Telephone Etiquette
Writing:	E-mail Etiquette

Learning Outcomes:

At the end of the unit, the student will be able to

1. Discover the humour & moral lessons in the text (L3)
2. Show resilience in adverse situations. (L3)
3. Modify sentences with appropriate grammar, vocabulary and usage (L3)
4. Identify key ideas (L3)
5. Practice telephone Etiquette (L3)
6. Apply the knowledge of E-mail Etiquette (L3)

Text Books:

1. English for Engineers: Theory to practice. Board of Editors, Orient Black Swan Publishers, India.2024.

Reference Books:

1. English Grammar in Use by Raymond Murphy
2. Oxford English Grammar Course by Michael Swan
3. Word Power Made Easy by Norman Lewis
4. Cambridge Vocabulary for IELTS by Pauline Cullen
5. The Elements of Style by William Strunk Jr. and E.B. White
6. English Vocabulary in Use by Michael McCarthy and Felicity O'Dell
7. Practical English Usage by Michael Swan
8. The Only Grammar Book You'll Ever Need by Susan Thurman
9. Advanced English Grammar: A Linguistic Approach by Ilse Depraetere and Chad Langford

DIGITAL LOGIC DESIGN

I Year B. Tech. II semester

[Common to ECE, CSE, CSE(AI&ML), IT]

Course Code: 24EC11RC05

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Represent different number systems & binary codes and perform conversions & binary arithmetic. (L2)

CO2: Apply different simplification methods for minimizing Boolean functions. (L3)

CO3: Model various combinational circuits using gates and PLD's. (L3)

CO4: Outline the concept of latches and flip-flops. Construct sequential logic circuits like counters and registers using flip-flops. (L3)

CO5: Categorize Mealy & Moore models and Design Synchronous Sequential machines. (L3)

UNIT-I **9 Lectures**

Number systems: Number systems, Base conversion methods, Representation of signed numbers and Binary Arithmetic.

Codes: Binary, Non binary, Decimal, Alphanumeric, XS-3, Gray. Error detecting and error correcting codes.

Logic Gates: AND, OR, NOT, NAND, NOR, XOR, EX-NOR. [Textbook1: Chapter1, Chapter 2: section 2.1 to 2.8]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand the advantages of using different number systems. (L2)
2. Describe the usefulness of different binary codes. (L2)
3. Summarize the error detection and correction concepts. (L2).

UNIT-II **10 Lectures**

Minimization of Boolean Functions: Fundamental postulates of Boolean algebra, Basic theorems, Simplification of Boolean equations, Min terms, Max terms, Standard form of Boolean functions. Simplification of functions using Karnaugh map method (2,3,4,5 variables) Don't care conditions, AOI implementation, NAND and NOR Realizations. [Textbook1: Chapter 2: Sections 2.11 to 2.19,2.21,2.22,2.23, Chapter 3: sections 3.2 to 3.6,3.7]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Apply basic laws and theorems to simplify Boolean expressions and construct logic circuits. (L3)
2. Understand concepts of sum-of-products and product-of-sums representations. (L2)
3. Apply K- Map for minimizing logic functions and build logic circuits. (L3)

UNIT-III **12 Lectures**

Combinational Logic-Circuit Design-I: Logic design of combinational circuits: Adders and Subtractors: Binary, BCD, Excess-3 and Look–ahead-carry adder, Code converters, Multiplexers, De multiplexers, Encoders, Decoders and priority encoders, Realization of Boolean functions using multiplexers and Decoders.

Combinational Logic-Circuit Design-II: Design of 4-bit comparator, Parity checker/Generator. Basics of PLDs: Basic structure of PROM, PAL, PLA, Realization of Boolean functions with PLDs and their merits and demerits. [Textbook1: Chapter 4: section 4.1 to 4.27, Chapter 5 Sections 5.1 to 5.11]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Apply Boolean algebra for describing combinational digital circuits (L3)
2. Describe standard combinational circuits such as adders, subtractors, comparators etc. (L2)
3. Develop the digital circuits using PLDs (L3)

UNIT-IV **10 Lectures**

Sequential Circuits: Classification of sequential circuits, SR-latch, Gated latches, Flip flops: RS, JK, D, T and Master slave flip flops, Excitation tables, flip flop conversion from one type to another. Design of counters: Ripple counters, Synchronous counters, asynchronous counters, up-down counters, Johnson counter, ring counter. Design of registers: Buffer registers, Shift registers, Bi directional shift registers, Universal shift register. [Textbook1: Chapter 6]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand the principle of Flip-Flops and Latches. (L2)
2. Summarize the concepts of Shift Registers and Counters. (L2)
3. Construct different sequential logic circuits using Flipflops. (L3)

UNIT-V **7 Lectures**

Analysis and Design of Synchronous Sequential Machines: Moore and Mealy machine models, State Equations, State Table, State diagram, State reduction & assignment, Synthesis of synchronous sequential circuits- sequence detector and generator. [Textbook1: Chapter 7 Sections 7.1 to 7.5]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand Moore and Mealy machine models (L2)
2. Discuss the concepts of State assignment & Reduction (L2)
3. Analyse the design and synthesis of synchronous sequential circuits (L3)

Textbooks:

1. Anand Kumar, Switching Theory and Logic Design. PHI, 2014.
2. M. Morris Mano and Michael D. Ciletti, Digital Design, 4th Edition, Pearson Education, 2013.

Reference Books:

1. Foundation of Switching theory and Logic Design, A k Singh, New age International Publishers,2008
2. Modern Digital Electronics, R P Jain, 4th Edition, Tata McGraw Hill Education Pvt. Ltd, New Delhi,2010
3. Fundamentals of Logic Design, Charles. R. Roth, Thomson Publications,5th edition,2004.

Web References:

1. https://nptel.ac.in/courses/108105132 (Digital Electronic Circuits)
2. https://onlinecourses.nptel.ac.in/noc24_ee147/preview (Digital Circuits)
3. https://nptel.ac.in/courses/117105080 (Digital Systems Design)
4. https://onlinecourses.swayam2.ac.in/nou24_ec07/preview (Digital electronic and System design)

PYTHON PROGRAMMING

I Year B. Tech. II Semester

[Common to CSE, IT, CSE (AI&ML)]

Course Code: 24CT11RC06

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, the student shall be able to:

CO1: Understand the historical development, necessity, applications, and basic concepts of python programming. (L2)

CO2: Identify and implement appropriate control structures to solve a particular programming problem. (L3)

CO3: Examine various data structures and apply to solve real world problems. (L3)

CO4: Build simple functions and packages used in python for solving real world problems. (L3)

CO5: Outline Object Oriented concepts in python and illustrate Exception handling. (L2)

UNIT-I **8 Lectures**

Introduction: History of Python, Need of Python Programming, Applications of Python, Variables, Assignment, Comments, Keywords, Data types, Input-Output, Indentation. [TextBook-1: Chapter 3 (S-3.1 – S-3.12)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand the Evolution of Python [L2]
2. Recall the Need and Applications of Python [L1]
3. Outline python's Input and Output Functions[L2]

UNIT-II **10 Lectures**

Operators and Expressions: Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations, Control Flow- if, if-elif-else, for, while, break, continue, pass [TextBook-1: Chapter 3 (S-3.12), Chapter 4 (S-4.1 – S-4.7)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Illustrate python operators: arithmetic, comparison, assignment, logical, bitwise, membership, identity [L2]
2. Make use of control flow statements: if, if-elif-else, for, while, break, continue, pass. [L3]

UNIT-III **10 Lectures**

Data Structures: Strings, Lists, Tuples, Sets, Dictionaries. Data Structures manipulations - create, Index, Negative indexing, Slicing, update, add elements, delete or remove elements, operations, Comprehension, Membership Test, Iteration. [TextBook-1: Chapter 6 (S-6.1 – S-6.9), Chapter 8 (S-8.1 – S-8.6)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understanding basic operations on lists, including indexing and slicing [L2]
2. Utilize methods of lists, tuples, sets, and dictionaries to solve problems [L3]
3. Compare and apply appropriate use cases for lists, tuples, sets, and dictionaries. [L2]

UNIT-IV **10 Lectures**

Functions - Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Lambda Functions, Function Returning Values, Built-in functions, Scope of the Variables in a Function - Global and Local Variables.

Modules: Creating modules, import statement, from…import statement, namespaces. Python packages: Introduction to PIP, Installing Packages via PIP [TextBook-1: Chapter 5 (S-5.1 – S-5.8,5.12)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understanding and implementing various types of function arguments and scopes in Python. [L2]
2. Utilize Python modules to understanding the import mechanisms [L3]

UNIT-V **10 Lectures**

Object Oriented Programming (OOP) in Python: Classes and Objects, Class Method and self-Argument, The __init() Method (The Class Constructor), Class Variables and Object Variables, Public and Private Data Members, Inheritance, Overriding Methods.

Error and Exceptions: Introduction to Errors and Exceptions, Handling Exception, try except block, finally block, Raising Exceptions.

File Handling: Type of files, Opening and Closing files, Reading and Writing files.

TextBook-1: Chapter 9 (S-9.1 – S-9.8), Chapter 10 (S-10.1 – S-10.3)

TextBook-1: Chapter 7 (S-7.1 – S-7.5), Chapter 12 (S-12.1 – S-12.10)

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand and implement classes, methods, and the 'self' variable in Python [L2]
2. Demonstrate concepts of inheritance, method overriding, and data hiding in OOP [L2]

3. List the differences between errors and exceptions, and handle exceptions using try-except blocks [L1]
4. Illustrate file operations including reading, writing, and manipulating file pointers in Python. [L2]

Textbooks:

1. Reema Thareja, “Python Programming: Using Problems Solving Approach”, Oxford University Press, 2017
2. Fundamentals of Python First Programs, Kenneth. A. Lambert, Cengage.

Reference Books:

1. Fundamentals of Data Structures using Python, P Lalitha Surya Kumari, P. S. Avadhani, Lambert Academic Publishing
2. Introduction to Python Programming, Gowrishankar.S, Veena A, CRC Press.
3. Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

Web References:

1. https://www.tutorialspoint.com/python3/python_tutorial.pdf
2. https://www.python.org/doc/

COMMUNICATION SKILLS LAB

I Year B. Tech. II Semester

[Common to ECE, EEE, CSE (AI&ML)]

Course Code: 24HE11RC02

L	T	P	C
0	0	3	1.5

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Identify and pronounce the sounds of English; choose the accurate stress in connected speech for proper intonation. (L3)

CO2: Apply the main theme and ideas of the audio/video to take notes and summarize. (L3)

CO3: Develop speaking skills by taking part in Just A Minute (JAM) – Picture Prompts-Narratives-Role Play. (L3)

CO4: Practice discussions and debates. (L3)

CO5: Demonstrate Presentation Skills. (L3)

ACTIVITY-I

Introduction to Phonetics: The Sounds of English (Speech sound – vowels and consonants) - Stress and Intonation - Accent and Rhythm.

Learning Outcomes:

At the end of the unit, the student will be able to

1. Apply the knowledge of Phonetics for better pronunciation and articulation. (L3)
2. Choose appropriate stress, intonation and rhythm of English language for clear communication. (L3)

ACTIVITY-II

Listening Skills: Listening for gist and specific information - listening for Note taking, Summarizing and for opinions - Listening to the speeches of eminent personalities.

Learning Outcomes:

At the end of the unit, the student will be able to

1. Develop effective listening skills for better comprehension of academic lectures and English spoken by native speakers. (L3).
2. Apply effective strategies for good writing. (L3)
3. Demonstrate writing skills in note taking and summarizing. (L3)

ACTIVITY-III

Speaking Skills: Just A Minute (JAM) session –Picture Prompts- Narrating stories and anecdotes-Role Play

Learning Outcomes:

At the end of the unit, the student will be able to

1. Make use of dialogues for different roles. (L3)
2. Develop communication skills in formal and informal situations. (L3)
3. Practice speaking skills through participation in activities such as narrating stories and role plays(L3)

ACTIVITY-IV

Speaking skills: Group Discussions-Arguments-Debates

Learning Outcomes:

At the end of the unit, the student will be able to

1. Organize one's own ideas for various Group-Discussion formats. (L3)
2. Develop ideas and arguments to debate. (L3)

ACTIVITY-V

Presentation skills: Verbal and non-verbal communication - Body Language - Making a Presentation

Learning Outcomes:

At the end of the unit, the student will be able to

1. Design presentations with PowerPoint slides(L3)
2. Apply appropriate body language (postures, gestures, facial expressions and eye contact) in formal presentations. (L3)

LIST OF LAB ACTIVITIES:

1. Identification and pronunciation of Vowel sounds and Consonant sounds (CO1)
2. Identification of word stress, Intonation and Rhythm (CO1)
3. Listening for specific information & Note taking (CO2)
4. Listening to the speeches of eminent personalities and summarizing (CO2)
5. Just A Minute sessions (CO3)
6. Picture Prompts (CO3)
7. Narrating Stories& anecdotes (CO3)
8. Role-Plays (CO3)
9. Group Discussions (CO4)
10. Debates (CO4)
11. Presentation Skills-I (CO5)
12. Presentation Skills-II (CO5)

Reference Books:

1. Language and Life: A Skills Approach Board of Editors, Orient Black swan Publishers, India.2018.
2. A Textbook of English Phonetics for Indian Students, T.Balasubramanian, Macmillan India Ltd.
3. Ashraf Rizvi. Effective Technical Communication. Tata McGraw Hill Education Private Limited, New Delhi.
4. Speak Well. Orient Black swan Publishers, Hyderabad.
5. Allan Pease. Body Language. Manjul Publishing House, New Delhi.

Web References:

1. https://www.englishlanguageclub.co.uk
2. https://www.ted.ed.com/
3. https://learningenglish.voanews.com/
4. https://www.bbc.co.uk/learningenglish/
5. https://www.abc.net.au/education/learn-english
6. NDTV News

PYTHON PROGRAMMING LAB

I Year B. Tech. II semester

[Common to CSE, CSE (AI&ML), IT]

Course Code: 24CT11RC07

L	T	P	C
0	0	3	1.5

Course Outcomes: At the end of the Course, the student shall be able to:

CO1: Understand core programming basics and various Operators of Python. (L2)

CO2: Implement programs using conditional statements and loops and strings. (L3)

CO3: Develop functions and strings to perform simple tasks. (L3)

CO4: Make use of various data structures like lists, tuples, sets and dictionaries. (L3)

CO5: Implement Python programs with files, Classes and objects. (L3)

Module-1: Basics of Python

1. Write a program to display the statements.
2. Demonstrate about fundamental Data types in Python Programming. (i.e., int, float, complex, bool and string types)
3. Write a Python program to demonstrate various type conversion functions.
4. Write a program to demonstrate the inbuilt Math function

Module-2: Operators in Python

1. Demonstrate the following Operators in Python with suitable examples.

   i) Arithmetic Operators ii) Relational Operators

   iii) Assignment Operators iv) Logical Operators

   v) Bit wise Operators vi) Ternary Operator

   vii) Membership Operators viii) Identity Operators

Module-3: Conditional Branching Statements

1. Write a program to check whether the given number is even or odd
2. Write a program to read marks of a student and display the corresponding grade
3. Write a program to find the largest element among the given numbers (multi-way if-elif-else statements.)

Module-4: Looping/Iterative Statements

1. Implement the following programs using while loop and for loop

   i. Display all prime numbers up to n. ii. Print the nth multiplication table.

   iii. Print different patterns using loops:

2. Demonstrate the following control transfer statements in Python with suitable examples.
   i. break ii. continue iii. Pass

Module-5: Functions

1. Write a function to find the multiplication of two numbers and demonstrate the usage of parameters and arguments of a function.
2. Write a program to define a function using default arguments.
3. Demonstrate lambda functions in Python with suitable example programs.

Module-6: Strings

1. Write a program to manage and analyse customer feedback using string operations include:

   i. Create feedback with name, email, comment ii. Collecting feedback.
   iii. Normalizing feedback (e.g., removing extra spaces, converting to lowercase).
   iv. Extracting key in formation (e.g., names, email addresses, and comments).
   v. Searching for keywords. vi. Replacing certain words.
   vii. Formatting feedback for display. viii. Summarizing feedback.

Module-7: Lists:

1. Write a program to create a list and perform the following operations:
   i. + ii. * iii. slicing iv. del
2. Inventory Management: You have a list of items in your warehouse along with their quantities. Write a program to find out which items are low in stock (quantity less than 10). (use only comprehensions)
3. Employee Performance: You have a list of employee names and their corresponding performance scores. Write a program to sort the list based on the performance scores in descending order.
4. Sales Analysis: you have a list of sales figures for the past week. Write a program to find the total sales, the highest sale, the lowest sale, and the average sale.
5. Write a program to calculate the length of each element in a list using map function in python.

Module-8: Tuples

1. Write a program to return the top n's most frequently occurring chars and their respective counts. e.g. string=aaaaaabbbbcccc, n=2 should return [(a 6) (b 4)].
2. Write a program to create n iterables of varied sizes and group the values using zip function in python.
3. Student Information: Write a program to create a list of tuples where each tuple contains the student ID, name, and grade and find the student with the highest grade.

4. Course Enrolment: Write a program to create list of tuples where each tuple contains the course ID and the number of students enrolled and find the total number of students enrolled across all courses
5. Faculty Information: Write a program to create a list of tuples where each tuple contains the faculty ID, name, and department and find all faculty members in a given department.
6. Library Book Tracking: You have a list of tuples where each tuple contains the book ID, title, and number of copies available. Write a program to find all books with fewer than 5 copies available.

Module-9: Sets & Dictionaries

1. Write a program to create two sets and perform the following operations:

i. Union ii. Intersection iii. Difference iv. Asymmetric Difference

2. Write a program to generate a dictionary that contains numbers (between 1 and n) in the form of (x,x*x).
3. Write a program to implement a shopping cart where you can add items with their prices and quantities, and then calculate the total cost.
4. Banking System: Write a program to create dictionary with customer name and balance and retrieve the balance for a given customer, deposit a specified amount into a customer's account, Withdraw a specified amount from a customer's account if sufficient balance is available, Transfer a specified amount from one customer's account to another's and Remove a customer from the bank's system.

Module-10: Classes and objects

1. Create a class to represent menu items in a restaurant with attributes like name, price, and category. Implement methods to display menu details and calculate the total cost of a selected list of items.
2. Write a program to read 3 subject marks and display pass or failed using class and object.

Module-11: Files

1. Write a program to copy the contents of a file to another file.
2. Write a program to compute the number of characters, words and lines in a file.

Case Study:

Select any one application mentioned below

Note: A report has to be submitted by every student at the end of the semester that includes design, coding, output, etc.

1. Design a Python program to manage inventory, process orders, and handle customer information for an online store.
2. Create a library system to track books, manage member accounts, and handle book loans and returns.
3. Implement a personal finance management tool to track income, expenses, and generate monthly reports.
4. Create a system to manage student grades, calculate GPAs, and generate academic reports.

5. Develop a Python-based movie recommendation system using collaborative filtering.
6. Build a to-do list application that allows users to add, update, delete, and prioritize tasks..
7. Build a patient management system to handle appointments, medical records, and billing.
8. Design a digital menu for a restaurant with options for ordering, bill generation, and inventory management.
9. Implement a fitness tracking application to log workouts, track progress, and suggest exercise plans.
10. Build a secure online voting platform with user authentication and vote tallying.
11. Create a program to manage recipes, including ingredients, instructions, and nutritional information.
12. Build a travel planning application to manage itineraries, bookings, and budget tracking.
13. Develop an e-learning application with course creation, student enrolment, and progress tracking.
14. Build a car rental management system to handle bookings, returns, and vehicle maintenance.
15. Build a budget planning application to track expenses, income, and financial goals.
16. Develop a cryptocurrency tracking application to monitor prices, market trends, and portfolio performance.

Reference Books:

1. Python Programming: Using Problem Solving Approach by Reema Theraja , Oxford publications
2. Ashok N Kamthane, Amit Ashok Kamthane, Programming and Problem Solving with Python, 1st Edition, McGraw Hill Education (India), 2018.

Web References:

1. https://www.python.org/doc/
2. https://www.w3schools.com/python/python_reference.asp
3. https://thepythonguru.com/
4. https://www.programiz.com/python-programming

WEB TECHNOLOGIES LAB

I Year B. Tech. II semester

[Common to CSE, CSE (AI&ML), IT]

Course Code: 24CT11RC08

L	T	P	C
0	0	3	1.5

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Develop professional web pages for an application using HTML elements like lists, navigations, tables, various form elements, and embedded media, including images, audio, and video. (L3)

CO2: Build inline, internal, and external CSS to enhance the visual presentation of web pages, including layout, fonts, colors, and backgrounds. (L3)

CO3: Utilize JavaScript to develop interactive HTML web pages and validate form data. (L3)

CO4: Apply JavaScript functions and events to enhance user interaction and provide a dynamic user experience. (L3)

CO5: Experiment with XML files to store and display structured data and write a DTD to perform well-formed and validated XML documents. (L3)

Module-1:

Design a web page using Basic HTML Elements – Structure of HTML, Headings, Paragraph, Division and Span, List, Link, Image, Table, Form, Input, Iframe, and Media Elements.

Module-2:

Design the following static web pages required for an online book store website.

1. **HOME PAGE:**
   i. The static home page must contain three frames.

   Top frame: Logo and the college name and links to the Home page, Login page, Registration page, Catalogue page, and Cart page (the description of these pages will be given below).

   Left frame: At least four links for navigation, which will display the catalogue of respective links.For e.g.: When you click the link "CSE" the catalogue for CSE Books should be displayed in the Right frame.

   Right frame: The pages to the links in the left frame must be loaded here. Initially, this page contains a description of the website.

   ii. Add media content in a frame using audio, video, and iframe elements to the Home page of an online bookstore website. The page should include:

   iii. Audio Element: An audio player to play background music or a podcast.

   iv. Video Element: A video player to display a promotional video about the bookstore.

v. Iframe Element: An iframe to embed a Google Maps location of the bookstore.

2. **LOGIN PAGE**
3. **CATALOGUE PAGE:** The catalogue page should contain the details of all the books available on the website in a table: The details should contain the following:

   i) Snapshot of Cover Page. ii)Author Name. iii)Publisher.

   iv) Price. v)Add to cart button.
4. **REGISTRATION PAGE:** Create a "registration form "with the following fields

   i) **Username:** Text input field ii) **Password:** Password input field

   iii) **Email:** Email input field iv) **Phone number:** Text input field

   v) **Birthday:** Date picker vi) **Favorite Color:** Color picker

   vii) **Gender:** Select an element with options (Male, Female, Other).

Module-3:

Develop and demonstrate the usage of inline, internal, and external style sheets using CSS.

Module-4:

Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next to the list. Add CSS to customize the properties of the font of the capital (colour, bold, and font size).

Module-5:

Develop and demonstrate JavaScript with POP-UP boxes and functions for the following problems:

1. Input: Click on the Display Date button using onclick( ) function

   Output: Display the date in the textbox.
2. Input: A number n obtained using prompt

   Output: Factorial of n number using alert.
3. Input: A number n obtained using prompt

   Output: A multiplication table of numbers from 1 to 10 of n using alert.
4. Input: A number n obtained using prompt and add another number using confirm

   Output: Sum of the entire n numbers using alert.

Module-6:

Write JavaScript to validate the following fields of the Registration page.

1. First Name (Name should contain alphabets and the length should not be less than 6 characters).
2. Password (Password should not be less than 6 characters in length).
3. E-mail ID (should not contain any invalid and must follow the standard pattern name@domain.com)
4. Mobile Number (The phone number should contain 10 digits only).

5. Last Name and Address (should not be Empty).

Module-7:

Write an HTML page including any required JavaScript that takes a number from the text field in the range of 0 to 999 and shows it in words. It should not accept four and above digits, alphabets, and special characters.

Module-8:

Create an 'Employee' class extending from a base class 'Person'. The task should include:

1. Create a class 'Person' with attributes 'name' and 'age' and add a constructor to initialize these values.
2. Create a class 'Employee' that extends 'Person' and includes an additional attribute 'role,' with a constructor to initialize 'name,' 'age,' and 'role.'

Module-9:

Create an array of objects representing book details in an online bookstore. Each object should include the book title, author, genre, and price. Render the details of the books on the page using this array, demonstrating array creation, accessing array elements, and applying array methods.

Module-10:

Write an XML file which will display the Book information which includes the following:

a) Title of the Book	b) Author Name	c) ISBN Name
d) Publisher Name	e) Edition	f) Price

Write a Document Type Definition (DTD) to validate the above XML file.

Case Study:

Select any one practical application mentioned below.

Note: A report has to be submitted by every student at the end of the semester, including design, coding, output, etc.

1. Portfolio Website: Create a personal portfolio website showcasing projects, skills, and experience using HTML, CSS, and JavaScript for interactive features.
2. Responsive Blog: Design a responsive blog template with multiple pages, utilizing HTML for structure, CSS for styling, and JavaScript for dynamic content.
3. E-commerce Site: Develop a basic e-commerce website with product listings, shopping cart functionality, and user authentication using HTML, CSS, and JavaScript.
4. Quiz Game: Create an interactive quiz game with multiple-choice questions, scoring, and feedback using HTML, CSS, and JavaScript for functionality.

5. To-Do List: Develop a to-do list application allowing users to add, edit, and delete tasks, with data persistence using JavaScript local storage.
6. Interactive Resume: Design a dynamic resume with sections for education, experience, and skills, including interactive elements powered by JavaScript.
7. Photo Gallery: Create an interactive photo gallery with image lightbox effects, using CSS for styling and JavaScript for functionality.
8. Recipe Finder: Build a recipe search application that fetches and displays recipes from an API, using JavaScript for dynamic content updates.
9. Expense Tracker: Develop an expense tracker app to log and categorize expenses, with data visualization using charts and graphs created with JavaScript.
10. Event Countdown: Create a countdown timer for upcoming events with HTML structure, CSS styling, and JavaScript for the timer logic.
11. Contact Form: Create a contact form with validation and submission handling using JavaScript, styled with CSS to match the site's theme.
12. Memory Game: Develop a memory matching game with cards that flip and match, using CSS for design and JavaScript for game logic.
13. Interactive Story: Design an interactive storytelling website where users make choices that affect the narrative, using JavaScript for decision logic.
14. Fitness Tracker: Build a fitness tracker to log workouts and track progress, with dynamic charts and data visualization using JavaScript.
15. Task Manager: Create a task manager application with features for adding, editing, and prioritizing tasks, using JavaScript for interactivity.
16. Interactive Timelines: Design interactive timelines to visualize historical events or project milestones, using HTML, CSS, and JavaScript.
17. Product Landing Page: Develop a product landing page with animations and interactive elements, using CSS for styling and JavaScript for effects.
18. Calculator: Build a fully functional calculator with basic arithmetic operations, using JavaScript for logic and CSS for design.
19. Job Board: Develop a job board where users can post and search for jobs, with dynamic content updates using JavaScript.
20. Interactive Form: Create a multi-step interactive form with validation and progress indicators, using JavaScript for form handling and CSS for styling.

References:

1. Internet and Web Technologies by Raj Kamal, Tata McGraw-Hill.
2. Programming the World Wide Web by Robert W. Sebesta, Pearson Education.

3. An Introduction to Web Design and Programming by Paul S Wang, Sanda S Katila, 1st Edition, Cengage Learning.

Web Links:

1. https://onlinecourses.swayam2.ac.in/nou24_cs18/preview
2. https://infyspringboard.onwingspan.com/en/app/toc/lex_17739732834840810000_shared /overview (HTML5)
3. https://infyspringboard.onwingspan.com/en/app/toc/lex_18109698366332810000_shared /overview (JavaScript)

GAYATRI VIDYA PARISHAD COLLEGE OF ENGINEERING FOR WOMEN

(Autonomous)

(Approved by AICTE, New Delhi and Permanently Affiliated to Andhra University, Visakhapatnam)

Madhurawada :: Visakhapatnam – 530 048

COURSE STRUCTURE

(Applicable for the Academic Year 2024-25 onwards)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

B.Tech. Electronics and Communication Engineering

SCHEME AND SYLLABI

(With effect from 2024-25 admitted batch)

I Year - I Semester

Course Code	Category	Course Title	Hours per Week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
24BM11RC01	BS	Calculus and Differential Equations	3	0	30	70	100	3
24BP11RC01	BS	Engineering Physics	3	0	30	70	100	3
24EE11RC02	ES	Network Theory and Machines	3	0	30	70	100	3
24CT11RC02	ES	Problem Solving using C	3	0	30	70	100	3
24EC11RC01	ES	Electronic Devices and Circuits	3	0	30	70	100	3
24BP11RC02	BS	Engineering Physics Lab	0	3	50	50	100	1.5
24CT11RC04	ES	Problem Solving using C Lab	0	3	50	50	100	1.5
24EC11RC02	ES	Electronic Devices and Circuits Lab	0	3	50	50	100	1.5
							Total Credits	**19.5**

I Year - II Semester

Course Code	Category	Course Title	Hours per Week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
24BM11RC02	BS	Linear Algebra and Vector Calculus	3	0	30	70	100	3
24BC11RC01	BS	Green Chemistry	3	0	30	70	100	3
24HE11RC01	HSS	English	3	0	30	70	100	3
24EC11RC05	ES	Digital Logic Design	3	0	30	70	100	3
24EC11RC06	ES	Electronic Circuit Analysis	3	0	30	70	100	3
24HE11RC02	HSS	Communication Skills Lab	0	3	50	50	100	1.5
24EC11RC07	ES	Digital Logic Design Lab	0	3	50	50	100	1.5
24EC11RC08	ES	Electronic Circuit Analysis Lab	0	3	50	50	100	1.5
							Total Credits	**19.5**

CALCULUS AND DIFFERENTIAL EQUATIONS

I Year B. Tech. I Semester

[Common to EEE, ECE, CSE, IT, CSE (AI&ML)]

L	T	P	C
3	0	0	3

Course Code: 24BM11RC01

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Examine the functional dependency and utilize Taylor's theorem to expand the function of two variables. (L3)

CO2: Determine extrema of multivariable functions. (L5)

CO3: Utilize double and triple integrals to evaluate areas of plane curves and the volumes of solids. (L5)

CO4: Solve the first order differential equations and higher order differential equations with constant coefficients, apply the techniques to solve problems related to various engineering fields. (L3)

CO5: Find the Laplace Transforms of various functions and apply it to solve ordinary differential Equations with initial conditions. (L3)

UNIT-I: **8 Lectures**

Partial Differentiation: Functions of two or more variables: Introduction - Partial derivatives - Total derivative - Change of variables - Jacobians – Functional dependence - Taylor's theorem for function of two variables. [Sections: 5.1, 5.2, 5.5, 5.6, 5.7, 5.9 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Examine the functional dependencies using the Jacobian. (L3)
2. Make use of Taylor's theorem to write series expansion of function of two variables. (L3)

UNIT-II: **7 Lectures**

Applications of Partial Differentiation: Maxima and minima of function of two and three variables - Constrained maximum/minimum problems using Lagrange's method of multipliers. [Sections: 5.11, 5.12 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Determine the critical points, maxima and minima of functions several variables. (L5)

UNIT-III: **11 Lectures**

Integral Calculus: Introduction - Double integrals - Change of order of integration - Double integrals in polar Coordinates - Triple integrals - Change of variables.

Applications: Area enclosed by plane curves - Volumes of solids. [Sections: 7.1 – 7.7 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Evaluate double integrals and triple integrals in Cartesian and polar coordinates also over the given region. (L5)
2. Evaluate the double integrals by change of order of integration. (L5)
3. Evaluate double and triple integrals by change of variables. (L5)
4. Determine the areas and volumes using multiple integrals. (L5)

UNIT-IV: **11 Lectures**

Differential Equations and its Applications: Exact differential equations - Equations reducible to exact equations - Solutions of higher order linear ordinary differential equations with constant coefficients - Method of variation of parameters.

Applications: Orthogonal Trajectories - Newton's law of cooling - Law of Natural growth and decay. [Sections: 11.11, 11.12, 12.3, 12.6, 12.8, 13.1 – 13.8 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Solve the first-order differential equations and higher order Linear differential equations with constant coefficients. (L3)
2. Apply the techniques to solve problems related to various engineering fields. (L3)

UNIT-V: **11 Lectures**

Laplace Transforms: Introduction - Existence conditions - Transforms of elementary functions - Properties of Laplace transforms - Transforms of derivatives - Transforms of

integrals - Multiplication by t - Division by t– Evaluation of integrals by Laplace transforms - Laplace transforms of Unit step function, Unit impulse function and Laplace transforms of periodic functions - Inverse Laplace transforms - Convolution theorem - Second shifting theorem.

Applications: Laplace Transforms to ordinary differential Equations. [Sections: 21.1 – 21.5, 21.7 – 21.15, 21.17, 21.18 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Find the Laplace transform of the function. (L1)
2. Find the Inverse Laplace transform of a function. (L1)
3. Make use of convolution theorem to find the Inverse Laplace transform of a function. (L3)
4. Apply Laplace transform to solve ordinary differential equations. (L3)

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 45th Edition, Khanna Publishers, 2024.

Reference Books:

1. R K Jain and SRK Iyengar, Advanced Engineering Mathematics, Narosa Publishers, 5th Edition, 2016.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th edition, John Wiley & Sons, 2011.
3. Peter V. O'Neil, Advanced Engineering Mathematics, 7th edition, Cengage Learning, 2011.
4. Greenberg, Advanced Engineering Mathematics, 2nd Edition, Pearson, 2017.

Web References:

1. https://nptel.ac.in/courses/111104125
2. https://nptel.ac.in/courses/111105160

ENGINEERING PHYSICS

I Year B. Tech. I Semester

[Common to ECE, EEE, CSE (AI&ML)]

Course Code: 24BP11RC01

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, the student shall be able to:

CO1: Apply the principles of interference, diffraction, and polarization in wave optics, and utilize optical instruments for practical applications. (L3)

CO2: Familiarize the basic concepts of Thermodynamics relevant to engineering applications. (L2)

CO3: Outline the knowledge of basic principles of Electromagnetism and EM Waves. (L2)

CO4: Describe the basic principles of lasers, optical fibres and their use in technological applications. (L2)

CO5: Understand the basic principles of Quantum mechanics, Quantum computing. (L2)

UNIT-I **10 Lectures**

Interference: Principle of superposition, Young's Experiment (qualitative treatment), Coherence, Interference in thin films (reflected light), Newton's Rings, Michelson's Interferometer and its applications (thickness of thin sheet, determination of wavelength).

Diffraction: Introduction, Differences between Interference and Diffraction, Differences between Fresnel and Fraunhoffer diffraction, Fraunhoffer diffraction at a single slit (Qualitative and Quantitative treatment)

Polarization: Introduction - types of Polarization. Polarization by reflection, Brewster's law, refraction and double refraction in uniaxial crystals, Nicol Prism, Quarter wave plate and Half wave plate, Applications of Polarization.

Text Book 1: 5.16,5.17,5.18, 5.20, 6.1, 6.2, 6.8.(1-3), 6.11, 6.13, 6.14.1, 6.14.3, 7.1, 7.2, 7.3, 7.4, 7.5, 8.1, 8.2,8.5, 8.6,8.11,8.12, 8.16,8.20.

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand the principles of interference patterns and apply Michelson's Interferometer to measure physical quantities such as thickness and wavelength. (L2)
2. Distinguish between interference and diffraction and perform qualitative and quantitative analysis of Fraunhoffer diffraction at a single slit. (L2)

3. Apply polarization concepts through various optical devices to explore and solve problems related to polarized light. (L3)

UNIT-II **7 Lectures**

Thermodynamics: Heat and Work, First law of thermodynamics and its applications, Reversible and Irreversible process, Carnot cycle and Efficiency, Second law of thermodynamics, Carnot's Theorem, Entropy, Second law in terms of Entropy, Entropy and disorder, Third law of thermodynamics (statement only). [TextBook-1: 16.3,16.5.1,16.6,16.8,16.11,16.12,16.14,16.16,16.17, 16.17.1, 16.18]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Apply the first and second laws of thermodynamics to analyse energy transformations and process efficiencies. (L3)
2. Understand the Carnot cycle and its efficiency and calculate entropy changes to explain thermodynamic processes. (L2)
3. Differentiate between reversible and irreversible processes and relate entropy to disorder. (L2)
4. State the third law of thermodynamics and understand its implications for materials at absolute zero. (L2)

UNIT-III **11 Lectures**

Electromagnetism: Concept of electric flux, Gauss' law, applications of Gauss' law (wire, sheet, sphere), Magnetic Field, Gauss' law in magnetostatics, Faraday's law of induction, Lenz's law, Induced magnetic fields, Displacement current, Maxwell's equations (no derivation, qualitative treatment), Electromagnetic wave equations, Introduction to EM waves, The Biot-Savart's law, magnetic field near a long wire, magnetic field for a circular Current loop, Ampere's law. [TextBook-1: 2.12,2.14,2.18, 3.5, 3.8, 3.9,3.12, 3.13,3.14, 3.10, 3.12, 3.3,3.4]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Apply Gauss's law and Faraday's law of induction to solve problems involving electric and magnetic fields. (L3)
2. Use Maxwell's equations to understand electromagnetic wave phenomena. (L2)

3. Analyse magnetic fields using Biot-Savart's law, Ampere's law, and apply e magnetostatic field distributions. (L3)

UNIT-IV **10 Lectures**

Lasers: Characteristics of laser beam, Spontaneous and stimulated emission of radiation, population inversion, Ruby laser, He-Ne laser, Semiconductor laser (homojunction), Applications of lasers.

Optical fibres: principle of propagation of light in optical fibres, Acceptance Angle and cone of a fibre, Numerical aperture, Modes of propagation, Classification of fibres based on refractive index profile and modes, Losses in optical fibres- scattering and bending losses, Fibre optics in communication- Block diagram, Applications of optical fibres. [TextBook-1: 24.12, 24.2, 24.5,24.6, 24.7, 24.11.1, 24.11.3, 24.11.5.1, 24.13, 10.2, 10.3, 10.4, 10.5, 10.6, 10.10, 10.11, 10.19,10.20 (only for list of applications]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand the principles of laser operation, including spontaneous and stimulated emission, and analyse various types of lasers such as Ruby, He-Ne, and Semiconductor lasers. (L2)
2. Describe the fundamentals of optical fibre technology, including light propagation, acceptance angle, numerical aperture, and classification of fibres. (L2)
3. Apply these concepts to fibre optics communication systems and explore their practical applications. (L2)

UNIT-V **10 Lectures**

Quantum Physics: de Broglie concept of matter waves, Heisenberg's uncertainty principle, Schrödinger time independent wave equation, Physical significance of wave function, particle in a one-dimensional box.

Quantum Computing Quantum bits, Introduction to Pauli spin matrices, Bloch sphere, Entanglement, Qubit Vs classical bit, Single Qubit gates, Quantum Teleportation – Basic Idea. [Textbook-1 20.5, 20.11, 20.17, 20.18, 20.22; Textbook -3 Sec 1.8, 1.9, 1.10.1]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand the concepts quantum mechanics such as the de Broglie wavelength and Heisenberg's uncertainty principle and use the Schrödinger equation (L2).

2. Describe the fundamentals of quantum computing (L2)

Textbooks:

1. M. N. Avadhanulu, P. G. Kshirsagar, and T. V. S. Arun Murthy, A textbook of Engineering Physics, 11th edition, S. Chand and Company Ltd., 2019.
2. H. K. Malik and A. K. Singh, Engineering Physics, 2nd Edition, McGraw Hill Education Pvt Ltd. ,2018.
3. P.K. Palanisamy, Engineering Physics, SCITECH Publications, 2011.

Reference Books:

1. Modern Engineering Physics by A.S. Vasudeva S. Chand and Company Ltd., 2010
2. University Physics by Young and Freedman Pearson Education, 2010.
3. Michael A. Nielsen, Isaac L. Chuang, Quantum Computation and Quantum Information Cambridge University Press, 10 th Ed., 2010

Web References:

1. https://nptel.ac.in/courses/115105537 (Wave optics)
2. https://nptel.ac.in/courses/115106122 (Electromagnetism)
3. https://nptel.ac.in/courses/112102255 (Thermodynamics)
4. https://nptel.ac.in/courses/115107095 (Fiber Optics)
5. https://nptel.ac.in/courses/104104085 (Lasers)
6. https://nptel.ac.in/courses/104104082 (Quantum Computing)
7. https://www.intechopen.com/online-first/73811 (Quantum Computing)
8. https://lewisla.gitbook.io/learning-quantum/quantum-circuits/single-qubit-gates (Quantum Computing)
9. https://profmcruz.wordpress.com/wp-content/uploads/2017/08/quantum-computation-and-quantum-information-nielsen-chuang.pdf (Quantum Computing)

NETWORK THEORY AND MACHINES

I Year B. Tech. I semester

[ECE]

Course Code: 24EE11RC02

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, the student shall be able to:

CO1: Analyze DC circuits using Kirchhoff's laws, nodal and mesh analysis methods. (L2)

CO2: Summarize network theorems and two-port network parameters. (L2)

CO3: Analyze circuits with AC excitations. (L2)

CO4: Determine the transient response of first and second-order circuits. (L2)

CO5: Understand the Construction and Principle of Operation of DC and AC machines. (L2)

UNIT-I **10 Lectures**

Introduction to Electrical Circuits: Circuit Concept – Types of elements and their V-I relations; Kirchhoff's laws, Network Reduction Techniques- Series, Parallel, Series-Parallel, Star-delta transformation, Source transformation, Nodal analysis method and Mesh analysis method including super node and super mesh analysis. [TextBook-1: Chapter 1 (S-1.1 – S-1.6), Chapter 2 (S-2.1 – S-2.7), Chapter 3 (S-3.1- S-3.5)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand the active and passive elements and their VI characteristics. (L2)
2. Analyse the electrical circuits using KVL and KCL. (L2)
3. Analyse the electrical circuits using mesh and nodal analysis. (L2)

UNIT-II **10 Lectures**

Network theorems: Superposition theorem, Thevinin's theorem, Norton's theorems, Maximum power transfer theorem and Reciprocity theorem (DC Excitations). Two-port Networks: Z-parameters, Y-parameters, Transmission line parameters, h- parameters, Parallel & series connection of two port networks, cascading of two port networks, problem solving using dependent sources also. [TextBook-1: Chapter 4 (S-4.1 – S-4.8), Chapter 19 (S-19.1 – S-19.6)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Summarize various network theorems. (L2)
2. Summarize the various two-port networks parameters. (L2)
3. Analyze the interconnected two port networks. (L2)

UNIT-III **10 Lectures**

Single Phase A.C Circuits: Periodic and non-periodic wave forms, R.M.S, Average Values and Form Factor for Alternating Quantities. Phase and Phase Difference, Steady State Analysis of R, L and C (In Series, Parallel and Series Parallel Combinations) with Sinusoidal Excitation. Phasor diagrams. Concept of Reactance, Impedance, Susceptance and Admittance. Power Triangle - Apparent Power, Active and Reactive Power - Concept of Power Factor.

Resonance: Introduction, Series resonance and parallel resonance, Definition of Q, Bandwidth and selectivity. [TextBook-1: Chapter 11 (S-11.1 – S-11.7), Chapter 9 (S-9.1 – S-9.7), Chapter 16 (S-16.1– S-16.4)]

Learning Outcomes:

1. At the end of the unit, the student will be able to
2. Analyse periodic and non-periodic waveforms. (L2)
3. Analyze RLC circuits for AC excitations. (L2)
4. Determine bandwidth and selectivity in resonant circuits. (L2)

UNIT-IV **9 Lectures**

DC Transients: Evaluation of initial conditions, First order circuits, Definition of time constant, R-L circuit, R-C circuit with excitation, second order circuits, problem-solving. [TextBook-1: Chapter 7 (S-7.1– S-7.6), Chapter 8 (S-8.1– S-8.6)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Evaluate initial conditions in electrical circuits. (L2)
2. Analyse first-order circuits. (L2)
3. Analyse second-order circuits. (L2)

UNIT-V **9 Lectures**

DC Machines:

Principle of operation of DC machines, Constructional Details, EMF equation, DC motor - Torque Equation, Speed control of shunt motor (Field and armature-controlled methods), Applications of DC Machines.

AC Machines:

Transformer construction Details, Principle of operation, EMF equation, Three phase Induction Motors-Construction Details, Principle of operation. Single phase induction motor - Constructional Details, Principle of operation, Double Field Revolving Theory. Applications. [TextBook-3: Chapter 26 (S-26.1 – S-26.10 & S-26.33), Chapter 29 (S-29.6 – S-29.8), Chapter 30 (S-30.1 – S-30.2), Chapter 32 (S-32.1 – S-32.6 & S-32.20-S-32.22), Chapter 34 (S-34.1 – S-34.6), Chapter 36 (S-36.1 – S-36.3)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand the Construction and principle of operation of DC and AC machines. (L2)
2. Understand the speed control methods of electrical motors. (L2)
3. Summarize the applications of DC and AC machines. (L2)

Text Books:

1. Fundamentals of Electric Circuits Charles K. Alexander and Matthew. N. O. Sadiku, Mc Graw Hill, 5th Edition, 2013.
2. Engineering circuit analysis William Hayt and Jack E. Kemmerly, Mc Graw Hill Company, 7th Edition, 2006.
3. A Textbook of Electrical Technology: Ac and Dc Machines (volume - 2) by B L Theraja and A K Theraja.

Reference Books:

1. Circuit Theory Analysis & Synthesis A. Chakrabarti, Dhanpat Rai & Sons, 7th Revised Edition, 2018.
2. Electric Circuits (Schaum's outline Series), Mahmood Nahvi, Joseph Edminister, and K. Rao, Mc Graw Hill Education, 2010, Fifth Edition.
3. Electric Machines, D. P. Kothari, I. J. Nagrath Tata McGraw-Hill, 2004.

Web References:

1. https://archive.nptel.ac.in/courses/108/105/108105159/
2. https://nptel.ac.in/courses/108104139

PROBLEM SOLVING USING C

I Year B. Tech. I semester

[Common to CSE, CSE (AI&ML), IT, ECE]

Course Code: 24CT11RC02

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Explain the basic constructs of C through the use of simple applications. (L2)

CO2: Demonstrate the utilization of arrays and strings in the development of C programs. (L2)

CO3: Utilize functions and pointers to construct various applications in C. (L3)

CO4: Apply concepts of structures and unions to build and implement C applications. (L3)

CO5: Develop applications using sequential and random-access file processing techniques. (L3)

UNIT-I **10 Lectures**

Introduction to C: Basic structure of C program, Constants, Variables and data types, Operators and Expressions, Arithmetic Precedence and associativity, Type Conversions. Managing Input and Output Operations Formatted Input, Formatted Output. [TextBook-1: Chapter 2 (S-2.1 – S-2.12)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Outline the Basic Structure and Components of C Programs. (L2)
2. Demonstrate Variables, Data Types, Operators, and Expressions. (L2)
3. Illustrate Input and Output Operations. (L2)

UNIT-II **11 Lectures**

Decision Making, Branching, Looping: Decision making with if statement, Simple if statement, The if…else statement, Nesting of if…else statement, the else.. if ladder, switch statement, the (? :) operator, the goto statement, The while statement, the do statement, the for statement, Jumps in Loops.

Arrays & Strings: One, Two-dimensional Arrays, multi-dimensional Arrays, Character Arrays. Declaration and Initialization of Strings, reading and writing of strings, string handling functions. [TextBook-1: Chapter 3 (S-3.1 – S-3.8), TextBook-2: Chapter 13,14,15,16 (PP:215-283)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Classify Decision Making and Branching (L2)
2. Interpretation of Looping Constructs (L2)
3. Summarize Arrays and Strings (L2)

UNIT-III **10 Lectures**

Function and Dynamic Memory Allocation: Functions: Designing structured programs, declaring a function, Signature of a function, Parameters and return type of a function, passing parameters to functions, call by value, passing arrays to functions, recursion.

Introduction to Pointers, Pointer Arithmetic, Pointers for Inter-Function Communication, passing pointers to functions, call by reference, Dynamic Memory Allocation. [TextBook-1: Chapter 4 (S-4.1 – S-4.11), Chapter 5 (S-5.1 – S-5.12)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Utilize Functions (Understand and Implement Functions, Utilize Various Function Types, Advanced Function Techniques) (L3)
2. Experiment with Pointers (Basic Pointer Operations, Pointers and Data Structures) (L3)
3. Explain Advanced Pointer Usage (Pointers in Functions, Pointers to Complex Data Types) (L2)

UNIT-IV **9 Lectures**

Structure and Unions: Defining a structure and union, declaring structure variables, accessing structure members, structure initialization, copying and comparing structure variables, arrays of structures, arrays within structures, structures within structures, definition and usage of union, structures and unions using functions, size of structures and bit-fields. The Type Definition (Type def), Enumerated Types. [TextBook-1: Chapter 6 (S-6.1 – S-6.9)]

Learning Outcomes:

1. At the end of the unit, the student will be able to
2. Define Structures and Build C programs using Structures. (L3)
3. Explain Complex Data Structures. (L2)
4. Explain Unions and Bit-Fields. (L2)

UNIT-V **8 Lectures**

File handling: Introduction to Files, Modes of File operations, Text and Binary Files, Defining and opening a file, closing a file, Input/ Output operations on files, Error handling during I/O operations, random access to files and Command Line Arguments, user defined header files. [TextBook-2: Chapter 19 (PP:325-348)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Outline File Operations. (L2)
2. Summarize Error Handling and Random Access. (L2)
3. Utilize Command Line Arguments. (L3)

Text Books:

1. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, 2015, Pearson Education India, ISBN: 978-93-3254-944-9.
2. Yashavant P. Kanetkar, "Let Us C", 16th Edition, 2019, BPB Publications, ISBN: 978-93-8728-449-4.

Reference Books:

1. N. B. Venkateswarlu, E. V. Prasad, "C and Data Structures", 1st Edition, S. Chand Publishing, 2010, ISBN: 978-93-525-3356-5.
2. Pradip Dey, Manas Ghosh, "Programming in C", 2nd Edition, 2018, Oxford University Press, ISBN: 978-01-9949-147-6.
3. Jacqueline A. Jones and Keith Harrow, "Problem Solving with C", Pearson Education. ISBN: 978-93-325-3800-9.
4. E. Balagurusamy, "Programming in ANSI C", 8th Edition, 2019, McGraw Hill Education, ISBN: 978-93-5316-513-0.

Web References:

1. https://nptel.ac.in/courses/106105171
2. https://ocw.mit.edu/courses/6-087-practical-programming-in-c-january-iap-2010/pages/lecture-notes/
3. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013843237039374336 34517_shared/overview
4. https://cse02-iiith.vlabs.ac.in/List%20of%20experiments.html

ELECTRONIC DEVICES AND CIRCUITS

I Year B. Tech I semester

[ECE]

L	T	P	C
3	0	0	3

Course Code: 24EC11RC01

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Outline the concepts of basic semiconductor devices(L2)

CO2: Understand the characteristics of different semiconductor diodes and their applications(L2)

CO3: Analyse the operation of BJT under different biasing methods(L4)

CO4: Analyse BJT amplifier circuits with small signal low frequency model(L4)

CO5: Understand the construction and working of FET(L2)

UNIT-I **10 Lectures**

Energy band theory of solids and transport phenomenon in semiconductors: Energy Band Theory of Solids, Insulators, Semiconductors, Metals, Intrinsic and Extrinsic Semiconductors, donor and acceptor impurities, band diagrams, mass action law, intrinsic carrier concentration, continuity equation, Hall effect, Carrier Mobility, Conductivity, Drift and Diffusion currents. Band structure of PN Junction, PN diode biasing, diode current equation, Volt – Amp. Characteristics, Temperature Dependence, Transition and Diffusion Capacitance of PN Junction. [Textbook 1: Chapter -1 Section 1.5 - 1.8, Chapter- 2 Section 2.1 - 2.3 & 2.6 – 2.10, Chapter -19 Section 19.5, Chapter -3 Section 3.1 - 3.9, Chapter -19 Section 19.10]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Explain the energy band theory of solids (insulators, semiconductors, and metals) based on their band structures(L2)
2. Describe the transport phenomena in semiconductors. (L2)
3. Understand the band structure representation of PN junction, interpret the Volt-Ampere characteristics along with the temperature effects. (L2)

UNIT-II **9 Lectures**

Rectifiers and special diodes: Half-wave, Full-wave, and Bridge Rectifiers with and without Filters: Series inductor filter and shunt capacitor filter, Ripple Factor and Regulation Characteristics. Zener and Avalanche Breakdowns, Characteristics of Zener diode, voltage

regulator, Tunnel Diode, Varactor Diode, Schottky Barrier Diode. [Textbook 3: Chapter-8 Section 8.2-8.6, Chapter-5 Section 5.3, 5.4, 5.6, 5.7]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Describe the operation of rectifiers and evaluate their performance metrics like ripple factor and regulation characteristics. (L2)
2. Explain the working principles of special diodes such as Zener diode, tunnel diodes, varactor diodes, and Schottky barrier diodes(L2)

UNIT-III **10 Lectures**

Transistor Characteristics and Transistor Biasing: Operation of NPN and PNP junction Transistor, Current components in a transistor, Input and Output Characteristics of CB, CE, CC, relation between α, β, γ, typical transistor junction voltages, Comparison of CE, CB, and CC Configurations. Junction Biasing for Saturation, Cutoff and Active Region, Biasing circuits analysis, fixed bias, collector to base bias, emitter bias, voltage divider bias, thermal runaway, thermal stability, stability factors. [Textbook 1: Chapter 5 Section 5.4 - 5.11, Textbook 3: Chapter 10 Section 10.1-10.8]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Describe the characteristics of transistor in CE, CB, and CC configurations. (L2)
2. Understand the principals of transistor biasing and stabilization(L2)
3. Analyse the transistor operation with different biasing techniques(L4)

UNIT-IV **10 Lectures**

Transistor at Low Frequencies: Small Signal: Transistor as an Amplifier, h – parameter model, Analysis of Transistor Amplifier Circuits using h –parameters, CB, CE and CC Amplifier configurations and performance factors, effects of Bypass and Coupling Capacitors. Multistage transistor Amplifier, RC Coupled Amplifier, Frequency Response and band width, Emitter – Follower. [Textbook 3: Chapter -11 Section 11.9 - 11.14 & 11.17 - 11.20

Learning Outcomes:

At the end of the unit, the student will be able to

1. Represent transistor with its equivalent h parameter model(L2)
2. Analyse the performance of transistor amplifiers with h Models(L4)

UNIT-V **9 Lectures**

Field Effect Transistors:

Construction of JFET and its drain, transfer characteristics, pinch off Voltage, Drain Saturation Current, Construction of MOSFET –Enhancement and Depletion Modes, drain and transfer characteristics. JFET Configurations, Common Source JFET biasing, fixed bias, self-bias, voltage divider bias. [Textbook 2: Chapter 5 Section 5.1 - 5.3, 5.7, 5.8, Chapter 6 Section 6.2, 6.3, 6.4]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Comprehend the characteristics of BJT and FET(L2)
2. Explain the construction of JFET and MoSFETs (L2)
3. Describe the characteristics of JFET and MoSFET (L2)
4. Understand various biasing methods for FETs (L2)

Text Books:

1. Jacob Millman, Christos C. Halkias, Integrated Electronics: Analog and Digital Circuits and Systems, McGraw-Hill.
2. Robert Boylestad, Louis Nashelsky, Electronic Devices and Circuit Theory, 7th Edition, Prentice Hall,1998
3. Sanjeev Gupta, Electronic Devices and Circuits, 2nd Edition, Dhanpat Rai Publications,2005.

Reference Books:

1. Thomas L. Floyd, Electronic Devices, 9th Edition, Prentice Hall, 2012.
2. B. V. Rao and K. Raja Rajeswari, Electronic Devices and Circuits 2nd Edition, Pearson Education,2010
3. Electronic Devices and Circuits, G. S. N. Raju, I. K. International Publications, New Delhi, 2006.
4. David A. Bell, Electronic Devices and Circuits, 5th Edition, Oxford University Press, 2008.

Web References:

1. https://onlinecourses.nptel.ac.in/noc21_ee80/preview
2. https://be-iitkgp.vlabs.ac.in/

ENGINEERING PHYSICS LAB

I Year B. Tech I Semester

[Common to ECE, EEE, CSE(AI&ML)]

Course Code: 24BP11RC02

L	T	P	C
0	0	3	1.5

Course Outcomes: At the end of the course the student will be able to

CO1: Interpret the physical parameters based on optical phenomena. (L2)

CO2: Verify the behaviour of double refraction in birefringent material like quartz. (L2)

CO3: Demonstrate the concepts of diffraction through experiments. (L3)

CO4: Calibrate instruments like low range voltmeters and ammeters. (L3)

CO5: Design temperature sensors based on diodes and thermistors. (L3)

List of Experiments: (Any TEN of the following experiments shall be conducted)

1. Determination of Radius of Curvature of a given Convex Lens By forming Newton's Rings.
2. Determination of Thickness Given Paper Strip or hairline by Wedge Method.
3. Determination of Wavelength of Spectral Lines in the Mercury Spectrum by Normal Incidence method
4. Determination of Cauchy's Constants of a Given Material of the Prism using Spectrometer in minimum deviation position
5. Determination of Refractive Index of Ordinary ray and Extra-ordinary ray in quartz prism
6. Laser- Diffraction – determination of wavelength of laser source using diffraction grating
7. Determination of wavelength of laser source using Fraunhofer single slit diffraction
8. Melde's Apparatus – Frequency of electrically maintained Tuning Fork.
9. Study of Intensity Variation of the Magnetic Field along the axis of circular Current Carrying conductor using Stewart and Gee apparatus
10. Calibration of Low Range Voltmeter using Potentiometer Bridge
11. Calibration of Low Range Ammeter using Potentiometer Bridge
12. Determination of dielectric constant of material using charging discharging method with a parallel plate capacitor
13. Determination of energy band gap of semiconductor using PN junction diode in reverse bias
14. Determination of thermo electric coefficients for thermistor
15. Determination of Planck's constant using LED.

Textbooks:

1. Practical physics by CL Arora, S.chand publishing company, 1995.
2. Advanced Practical Physics For Students by B.l.worsnop And H.t.flint, 1923

Web References:

1. http://lo-au.vlabs.ac.in/laser-optics/Newtons_Rings_Wavelength_of_light/
2. http://ov-au.vlabs.ac.in/optics/Spectrometer_Refractive_Index/
3. http://ov-au.vlabs.ac.in/optics/Diffraction_Grating/
4. http://htv-au.vlabs.ac.in/heat-thermodynamics/Characteristics_of_Thermistor/
5. https://bop-iitk.vlabs.ac.in/exp/energy-band-gap/simulation.html

PROBLEM SOLVING USING C LAB

I Year B. Tech. I semester

[Common to CSE, CSE (AI&ML), IT, ECE]

Course Code: 24CT11RC04

L	T	P	C
0	0	3	1.5

Course Outcomes: At the end of the Course, the student shall be able to:

CO1: Outline the use of basic constructs of C for simple applications. (L2)

CO2: Develop C programs for simple applications using Arrays and Strings. (L3)

CO3: Illustrate concepts such as functions, recursion, and pointers with suitable examples. (L2)

CO4: Build C programs involving Structures and Unions. (L3)

CO5: Develop applications using sequential and random-access file processing. (L3)

Module-1:

1. Write a C program to demonstrate Format Specifiers and Input/Output Statements.
2. Write a C program to demonstrate various Data Types.

Module-2:

1. Write a C program to demonstrate various Operators including Bitwise Operator.
2. Write a C program to demonstrate Arithmetic Expressions and Type Casting.

Module-3:

1. Write a C program to demonstrate decision making statements.
2. Write a C program to demonstrate iterative statements.
3. Write a C program to demonstrate break and continue Statement.

Module-4:

1. Write a C program to demonstrate arrays (one-dimensional and two-dimensional).
2. Write a C program to demonstrate string handling functions using built-in and user defined functions.

Module-5:

1. Write a C program to demonstrate user defined functions.
2. Write a C program to demonstrate nested functions.

Module-6:

1. Write a C program to demonstrate arithmetic expressions using pointers.
2. Write a C program to demonstrate Pointers to Arrays.
3. Write a C program to demonstrate manipulate strings using pointers.

4. Write a C program to demonstrate dynamic memory allocation.

Module-7:

1. Write a C program to demonstrate Call-by-value, Call-by-reference.
2. Write a C program to demonstrate recursive function.
3. Write a C program to demonstrate Functions with Storage Classes (Static).

Module-8:

1. Write a C program to demonstrate structures.
2. Write a C program to demonstrate structures within structures.
3. Write a C program to demonstrate pointer to a structure.
4. Write a C program to demonstrate unions.

Module-9:

1. Write a C program to demonstrate I/O operations on files.
2. Write a C program to demonstrate concatenating two files.
3. Write a C program to demonstrate copy content of one file to another file.

Case Study: Select any one application mentioned below.

Note: A report has to be submitted by every student at the end of the semester that includes design, coding, output, etc.

1. Develop a library management system to add, delete, and search for books efficiently.
2. Develop an ATM system to check balance, deposit money, and withdraw funds.
3. Develop a C program to calculate salary increments using a lookup table which stores the percentage of increment based on the current salary.
4. Develop a voting system where users can vote for candidates and view results.
5. Develop a basic calculator for arithmetic operations like addition, subtraction, multiplication, and division.
6. Develop a contact management system to store and manage details like name, phone number, and email.
7. Develop a banking system supporting multiple users for account management and transactions.
8. Develop a C program to calculate SGPA and CGPA based on students' marks across semesters.
9. Develop a registration page in C using file handling to securely store usernames and passwords.

10. Develop an encryption and decryption algorithm to securely transform and restore data by using the GNU C Library: crypt.

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, 2015, Pearson Education India, ISBN: 978-93-3254-944-9.
2. Yashavant P. Kanetkar, "Let Us C", 16th Edition, 2019, BPB Publications, ISBN: 978-93- 8728-449-4.
3. E. Balaguruswamy, "Programming in ANSI C", 8th Edition, 2019, McGraw Hill Education, ISBN: 978-93-5316-513-0.
4. Pradip Dey, Manas Ghosh, "Programming in C", 2nd Edition, 2018, Oxford University Press, ISBN: 978-01-9949-147-6.
5. N.B. Venkateswarulu, "C programming", 1st Edition, S.Chand Publishing, 2017, ISBN: 978-93-525-3356-5.
6. Jacqueline A Jones and Keith Harrow, "Problem Solving with C", Pearson Education. ISBN: 978-93-325-3800-9.

Web References:

1. https://nptel.ac.in/courses/106105171
2. https://ocw.mit.edu/courses/6-087-practical-programming-in-c-january-iap-2010/pages/lecture-notes/
3. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01384323703937433634517_shared/overview
4. https://cse02-iiith.vlabs.ac.in/List%20of%20experiments.html

ELECTRONIC DEVICES AND CIRCUITS LAB

I Year B. Tech I semester

[ECE]

L	T	P	C
0	0	3	1.5

Course Code: 24EC11RC02

Course Outcomes: At the end of the Course the student shall be able to:

CO1: Understand the operation of CRO for signal measurements. (L2)

CO2: Analyze the characteristics of P-N junction diode and special diodes. (L4)

CO3: Build the rectifier circuits and regulator circuits using diode. (L3)

CO4: Analyze the operation and characteristics of BJT and FET. (L4)

CO5: Construct and analyze the performance of BJT and FET amplifier circuits. (L4)

List of Experiments:

1. Study of CRO and Applications.
2. Characteristics of PN Junction Diode
3. Characteristics of Zener Diode and Zener Voltage regulator.
4. Characteristics of Photo diode
5. Half-wave and full-wave rectifiers with diodes
6. Half-wave and full-wave rectifiers with capacitor filter
7. Characteristics of BJT CE configuration, h-parameters
8. Characteristics of BJT CB configuration, h-parameters
9. Voltage gain, input impedance and output impedance of emitter follower
10. Drain and transfer characteristics of JFET
11. Frequency response of CE amplifier
12. Demonstration of virtual tool for simulation of electronic device characteristics.

Reference Books:

1. Thomas L.Floyd, “Laboratory Exercises for Electronic Devices”, 9th ed., Prentice Hall.
2. Robert Boylestad, Louis Nashelsky, Electronic Devices and Circuit Theory, 7th ed., Prentice Hall.
3. David A. Bell, “Laboratory manual for electronic devices and circuits”, 4th ed., 2001.

Web References:

1. https://be-iitkgp.vlabs.ac.in/
2. https://www.multisim.com/content/t6fPJvwcHYMD4qzJSYpGHQ/edc-lab1/

LINEAR ALGEBRA AND VECTOR CALCULUS

I Year B. Tech. II Semester

[Common to EEE, ECE, CSE, IT, CSE (AI&ML)]

Course Code: 24BM11RC02

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Test for consistency and solve linear system of equations, also determine unknown currents in the electrical circuits. (L5)

CO2: Find the Eigen values and Eigen vectors of a matrix and apply Cayley- Hamilton theorem to find the inverse of a matrix. (L3)

CO3: Reduce quadratic form to canonical form and examine the nature of quadratic form. (L4)

CO4: Interpret the meaning and evaluate gradient of a scalar valued, curl and divergence of vector valued functions. (L5)

CO5: Apply line integrals, surface integrals, volume integrals and their relations using Green's theorem, Stoke's theorem, Gauss Divergence theorems in various engineering applications. (L3)

UNIT-I: **10 Lectures**

Matrix Algebra: Rank of a matrix- Echelon form, Normal Form - Solution of Linear System of Equations - Consistency of Linear System of Equations – Gauss elimination and Gauss Jordan methods, LU Factorization method.

Applications: Finding the current in electrical circuits. [Sections: 2.7, 2.10, 28.6 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Find the rank of a matrix. (L1)
2. Test for consistency and solve a system of linear equations. (L4)
3. Apply Gauss elimination and Gauss Jordan methods, LU factorization to solve linear systems. (L3)
4. Determine unknown currents in electrical circuits. (L5)

UNIT-II: **10 Lectures**

Eigen Values and Eigen Vectors: Eigen Values and Eigen Vectors of a real Matrix – Properties - Cayley- Hamilton theorem (without proof) - Inverse and Powers of a Matrix using

Cayley-Hamilton's theorem – Pseudo inverse of a matrix, Singular value decomposition. [Sections: 2.13 - 2.15 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Find eigenvalues and corresponding eigenvectors of a matrix. (L1)
2. Apply Cayley-Hamilton theorem to find powers and the inverse of a matrix. (L3)
3. Calculate the Pseudo Inverse of a matrix. (L3)
4. Calculate the singular values of a matrix. (L3)

UNIT-III: **9 Lectures**

Quadratic Forms: Inner Product – Orthogonal Vectors – Orthogonal matrix – Diagonalization of a Matrix-Quadratic Forms - Reduction of Quadratic Form to Canonical Form (Orthogonal Transformation) - Nature of a Quadratic Form. [Sections: 2.16 - 2.18 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Make use of Eigen values and eigen vectors to diagonalize the matrix. (L3)
2. Reduce the Quadratic form to canonical form examine the nature of a quadratic form. (L4)

UNIT-IV: Vector Differentiation **9 Lectures**

Introduction - Scalar and Vector point functions, General rules for vector differentiation - Vector operator ∇ applied to scalar point functions- Gradient, ∇ applied to vector point functions- divergence and curl. Physical interpretation of gradient, divergence and curl (i.e., ∇f, $\nabla . \overline{F}$, $\nabla \times \overline{F}$), Irrotational and Solenoidal fields, Vector Identities.

(Sections: 8.1, 8.4 - 8.9 of Text Book)

Learning Outcomes:

At the end of the unit, the student will be able to

1. Find the gradient of a scalar point function, divergence and curl of a vector point function. (L1)
2. Determine the directional derivative of scalar point function. (L5)

UNIT-V: Vector Integration **10 Lectures**

Integration of vectors - Line integral – Circulation - work done - surface integral-flux - Green's theorem in the plane - Stoke's theorem - Volume integral - Gauss Divergence theorem (All theoremswithout proofs). (Sections: 8.10 - 8.16, 8.18 of Text Book)

Learning Outcomes:

At the end of the unit, the student will be able to

1. Determine the work done in a moving particle along a path. (L5)
2. Interpret surface and volume integrals. (L2)
3. Apply vector integral theorems to multiple integral. (L3)

Textbooks:

1. B. S. Grewal, Higher Engineering Mathematics, 45th Edition, Khanna Publishers, 2024.

Reference Books:

1. David Poole, Linear Algebra- A modern introduction, 4th edition, 2015.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th edition, John Wiley & Sons, 2011.
3. Peter V. O'Neil, Advanced Engineering Mathematics, 7th edition, Cengage Learning, 2011.
4. Greenberg, Advanced Engineering Mathematics, 2nd Edition, Pearson, 2017.

Web References:

1. https://nptel.ac.in/courses/111107112

GREEN CHEMISTRY

I Year B. Tech. II semester
[Common to CSE (AI&ML), ECE]

Course Code: 24BC11RC01

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, the student shall be able to

CO1: To develop knowledge about water and its treatment for industrial and potable purpose. (L3)

CO2: Utilize the theory of construction and discharge reactions of various types of batteries are used in commercial society. (L3)

CO3: Explain the importance of working principle, fabrication of electrodes and other components, advantages, disadvantages and environmental aspects of fuel cells. (L4)

CO4: Classify the corrosion mechanism of metals and factors influenced by rate and extent of corrosion and categorize the reasons for corrosion control methods. (L4)

CO5: Apply green chemistry technology processes the knowledge for solving existing challenges faced in various engineering and societal areas. (L5)

UNIT-I **10 Lectures**

Water-Technology: Sources of Water – Impurities and their influence of living systems – WHO Limits – Hardness and its Determination – Boiler Troubles and their removal – Water Softening Methods – Lime-Soda, Zeolite and Ion Exchange - Municipal Water Treatment-Break Point Chlorination – Desalination of Sea Water –Reverse Osmosis Method Electro-dialysis. Chemical analysis of water. [TB1: Chapter1]

Learning Outcomes:

At the end of the unit the student will be able to

1. Explain the principles of reverse osmosis (L4)
2. Compare the quality of drinking water with BIS and WHO standards (L4)
3. Illustrate problems associated with Boiler Troubles (L2)
4. Demonstrate the estimation of hardness of water (L3)

UNIT-II **10 Lectures**

Batteries: Primary batteries: The Chemistry-Types: Zinc-carbon (Leclanche type), zinc alkaline (Duracell), zinc/air batteries; Lithium primary cells and lithium-ferrous sulphide cells. Secondary batteries: Lead acid and VRLA (valve regulated (sealed) lead acid), nickel cadmium, nickel-zinc, nickel- metal hydride batteries, lithium-ion batteries, ultrathin lithium polymer cells. Advanced Batteries for electric vehicles, requirements of the battery – sodium-beta and redox batteries. [TB1: Chapter6]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Deduct the working mechanism of various types of cells (L5)
2. Illustrate difference between primary and secondary cells (L2)
3. List the environmental applications of Various types of batteries (L4)
4. Utilize the manufacturing methods of advanced batteries for electric vehicles (L3)

UNIT-III **8 Lectures**

Fuel Cells: Description, working principle, anodic, cathodic and cell reactions, fabrication of electrodes and other components, applications, advantages, disadvantages and environmental aspects of the following types of fuel cells: Proton Exchange Membrane Fuel Cells, alkaline fuel cells, phosphoric acid, solid oxide, molten carbonate, direct methanol fuel cells-Membranes and Fuels, Electrochemical Sensors and Optical fibres. [TB1: Chapter 6]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Explain the fundamental theories of fuel cells (L2)
2. Classify types of fuel cells (L4)
3. Make use of the various components fabrication of fuel cells (L3)
4. Distinguish the advantages, disadvantages and environmental aspects of fuel cells(L4)

UNIT-IV **10 Lectures**

Corrosion: Origin and Theory – Types of Corrosion: Chemical and Electrochemical; Pitting, inter granular, Waterline, Stress – Galvanic Series – Factors Effecting Corrosion. Corrosion Controlling Methods, Protective Coatings, Electroplating and Electroless Plating, Paints, Varnishes, Lacquers, Enamels. [TB1: Chapter 7]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Explain the Mechanism of corrosion (L4)
2. List the various types of Corrosion (L4)
3. Describe the Factors Effecting Corrosion (L5)
4. Differentiate between Paints Lacquers Enamels (L4)

UNIT-V **10 Lectures**

Green-Chemistry and Technology: Introduction and significance of green chemistry, Goals of green chemistry, 12 principles of green chemistry, toxicity of chemicals, concept of zero pollution technologies; Aqueous phase method, Super critical fluid method, Phase transfer catalytic method, atom economy, functional toxicity vs non- functional toxicity, functional group approaches to green chemistry, Elimination of toxic functional group, optimization of frameworks for the design of greener synthetic pathways -Green synthesis of Adipic acid and Paracetamol- energy minimization-Microwave synthesis, ultra sound assisted method Bio catalyzed reaction and Only explanation with examples Processes involving solid catalysts – zeolites, ion exchange resins, applications of Green Chemistry, Green solvents, green fuels & propellants. [TB2: Chapter- 2,3,4&5]

Learning Outcomes:

At the end of the unit the student will be able to

1. Processes involving Green Chemistry and apply the knowledge for solving existing
2. Challenges faced in various engineering and societal areas (L-5)
3. Differentiate between functional toxicity vs non- functional toxicity (L-4)
4. Explain the green chemistry, 12 principles (L-2)

Textbooks:

1. Engineering Chemistry – PC Jain and M. Jain –15th Edition, Dhanpath Rai and Sons, New Delhi.
2. Anastas, P. T., Warner, J. C. Green Chemistry: Theory and Practice, Oxford UniversityPress Inc., New York, 1998.

Reference Books:

1. M. Aulice Scibioh and B. Viswanathan ‘Fuel Cells – principles and applications’, University Press India (2006).

2. A Textbook of Engineering Chemistry – S. S. Dara – S. Chand & Co. New Delhi
3. Handbook of Green Chemistry and Technology; by James Clarke and Duncan Macquarrie; Blakwell Publishing.

Web References:

1. https://archive.nptel.ac.in/course.html
2. https://nptel.ac.in/courses/engineering

ENGLISH

I Year B. Tech II Semester

[Common to ECE, EEE & CSE(AI&ML)]

L	T	P	C
3	0	0	3

Course Code: 24HE11RC01

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Develop moral values and inner peace(L3), Demonstrate the use of LSRW skills, Vocabulary and basic grammar concepts. (L3)

CO2: Identify the impact of different social backgrounds (L3), recognize the poet's insights. (L4) Demonstrate the use of LSRW skills, Vocabulary and basic grammar concepts. (L3)

CO3: Analyse socio-cultural context(L4), Establish effective interpersonal and communication skills(L3), Demonstrate the use of LSRW skills, Vocabulary and basic grammar concepts(L3)

CO4: Focus on value of education(L4), Relate to the poet's nostalgia(L4), Demonstrate the use of LSRW skills, Vocabulary and basic grammar concepts (L3)

CO5: Determine the central idea of the text(L3), Identify one's resilience(L3), Demonstrate the use of LSRW skills, Vocabulary and basic grammar concepts (L3)

UNIT-I **10 Lectures**

Prose:	Swami Vivekananda: The Secret of Work
Poetry:	Grenville Kleiser: Stay Calm
Grammar & Vocabulary:	Synonyms & Antonyms
Listening:	Listening for Context and Specific Information
Speaking:	Introducing Oneself and Others
Writing:	Basics of writing

Learning Outcomes:

At the end of the unit, the student will be able to

1. Interpret the spiritual growth and capacity building of the individual in the 21st century. (L3)
2. Use appropriate synonyms and antonyms to communicate effectively. (L3)
3. Listen and understand for specific information in the audio(L2)
4. Establish connections between oneself and others(L3)

5. Apply appropriate punctuation marks for clarity and organization of written text (L3)

UNIT-II **10 Lectures**

Prose:	Katherine Mansfield: The Doll's House
Poetry: Rabindranath Tagore:	Where the Mind Is Without Fear
Grammar & Vocabulary:	Phrasal Verbs
Listening:	Listening for Main Idea and Supporting Ideas
Speaking:	Getting Someone's Attention and Interrupting
Writing:	Formal Letters

Learning Outcomes:

At the end of the unit, the student will be able to

1. Relate to the world through adult & child's points of view (L3)
2. Identify the sense of self dignity & rationality in the poem (L4)
3. Utilize appropriate phrasal verbs for effective communication(L3)
4. Listen & identify main and supporting ideas in the audio(L3)
5. Practice conversational etiquette(L3)
6. Write formal letters(L3)

UNIT-III **10 Lectures**

Prose:	O. Henry: The Last Leaf
Poetry:	Rudyard Kipling: If
Grammar & Vocabulary:	Idiomatic Expressions
Listening:	Listening for Global Comprehension
Speaking:	Asking for Information and Giving Information
Writing:	Note-Making

Learning Outcomes:

At the end of the unit, the student will be able to:

1. Analyze strategies to face challenges in life (L4)
2. Develop one's own personality (L3)
3. Use idiomatic expressions in oral & written communication (L3)
4. Listen & Interpret the audio for Global Comprehension (L3)
5. Ask & provide information (L3)
6. Practice note making study skills(L3)

UNIT-IV **10 Lectures**

Prose:	Francis Bacon: Of Studies
Poetry:	Toru Dutt: Our Casuarina Tree
Grammar & Vocabulary:	Remedial Grammar I
Listening:	Listening to Make Inferences
Speaking:	Expressing Opinions, and Agreeing and Disagreeing with Opinions
Writing:	Essay Writing

Learning Outcomes:

At the end of the unit, the student will be able to

1. Prioritize the habits of continuous learning(L4)
2. Recognize the significance of Indian philosophy (L4)
3. Identify and correct common errors in English grammar and usage(L3)
4. Draw inferences from the audio(L3)
5. Articulate one's own opinions(L3)
6. Develop different types of essays (DEAN)(L3)

UNIT-V **8 Lectures**

Prose:	Mark Twain: Whitewashing the Fence
Poetry:	William Ernest Henley: Invictus
Grammar & Vocabulary:	Remedial Grammar II
Listening:	Listening for Key Ideas
Speaking:	Telephone Etiquette
Writing:	E-mail Etiquette

Learning Outcomes:

At the end of the unit, the student will be able to

1. Discover the humour & moral lessons in the text (L3)
2. Show resilience in adverse situations. (L3)
3. Modify sentences with appropriate grammar, vocabulary and usage (L3)
4. Identify key ideas (L3)
5. Practice telephone Etiquette (L3)
6. Apply the knowledge of E-mail Etiquette (L3)

Text Books:

1. English for Engineers: Theory to practice. Board of Editors, Orient Black Swan Publishers, India.2024.

Reference Books:

1. English Grammar in Use by Raymond Murphy
2. Oxford English Grammar Course by Michael Swan
3. Word Power Made Easy by Norman Lewis
4. Cambridge Vocabulary for IELTS by Pauline Cullen
5. The Elements of Style by William Strunk Jr. and E.B. White
6. English Vocabulary in Use by Michael McCarthy and Felicity O'Dell
7. Practical English Usage by Michael Swan
8. The Only Grammar Book You'll Ever Need by Susan Thurman
9. Advanced English Grammar: A Linguistic Approach by Ilse Depraetere and Chad Langford

DIGITAL LOGIC DESIGN

I Year B. Tech. II semester

[Common to ECE, CSE, CSE(AI&ML), IT]

Course Code: 24EC11RC05

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Represent different number systems & binary codes and perform conversions & binary arithmetic (L2)

CO2: Apply different simplification methods for minimizing Boolean functions. (L3)

CO3: Model various combinational circuits using gates and PLD's. (L3)

CO4: Outline the concept of latches and flip-flops. Construct sequential logic circuits like counters and registers using flip-flops. (L3)

CO5: Categorize Mealy & Moore models and Design Synchronous Sequential machines. (L3)

UNIT-I **9 Lectures**

Number systems: Number systems, Base conversion methods, Representation of signed numbers and Binary Arithmetic.

Codes: Binary, Non binary, Decimal, Alphanumeric, XS-3, Gray. Error detecting and error correcting codes.

Logic Gates: AND, OR, NOT, NAND, NOR, XOR, EX-NOR. [Textbook1: Chapter1, Chapter 2: section 2.1 to 2.8]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand the advantages of using different number systems. (L2)
2. Describe the usefulness of different binary codes. (L2)
3. Summarize the error detection and correction concepts. (L2).

UNIT-II **10 Lectures**

Minimization of Boolean Functions: Fundamental postulates of Boolean algebra, Basic theorems, Simplification of Boolean equations, Min terms, Max terms, Standard form of Boolean functions. Simplification of functions using Karnaugh map method (2,3,4,5 variables) Don't care conditions, AOI implementation, NAND and NOR Realizations. [Textbook1: Chapter 2: Sections 2.11 to 2.19,2.21,2.22,2.23, Chapter 3: sections 3.2 to 3.6,3.7]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Apply basic laws and theorems to simplify Boolean expressions and construct logic circuits. (L3)
2. Understand concepts of sum-of-products and product-of-sums representations. (L2)
3. Apply K- Map for minimizing logic functions and build logic circuits. (L3)

UNIT-III **12 Lectures**

Combinational Logic-Circuit Design-I: Logic design of combinational circuits: Adders and Subtractors: Binary, BCD, Excess-3 and Look–ahead-carry adder, Code converters, Multiplexers, De multiplexers, Encoders, Decoders and priority encoders, Realization of Boolean functions using multiplexers and Decoders.

Combinational Logic-Circuit Design-II: Design of 4-bit comparator, Parity checker/Generator. Basics of PLDs: Basic structure of PROM, PAL, PLA, Realization of Boolean functions with PLDs and their merits and demerits. [Textbook1: Chapter 4: section 4.1 to 4.27, Chapter 5 Sections 5.1 to 5.11]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Apply Boolean algebra for describing combinational digital circuits (L3)
2. Describe standard combinational circuits such as adders, subtractors, comparators etc. (L2)
3. Develop the digital circuits using PLDs (L3)

UNIT-IV **10 Lectures**

Sequential Circuits: Classification of sequential circuits, SR-latch, Gated latches, Flip flops: RS, JK, D, T and Master slave flip flops, Excitation tables, flip flop conversion from one type to another. Design of counters: Ripple counters, Synchronous counters, asynchronous counters, up-down counters, Johnson counter, ring counter. Design of registers: Buffer registers, Shift registers, Bi directional shift registers, Universal shift register. [Textbook1: Chapter 6]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand the principle of Flip-Flops and Latches. (L2)
2. Summarize the concepts of Shift Registers and Counters. (L2)
3. Construct different sequential logic circuits using Flipflops. (L3)

UNIT-V **7 Lectures**

Analysis and Design of Synchronous Sequential Machines: Moore and Mealy machine models, State Equations, State Table, State diagram, State reduction & assignment, Synthesis of synchronous sequential circuits- sequence detector and generator. [Textbook1: Chapter 7 Sections 7.1 to 7.5]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand Moore and Mealy machine models (L2)
2. Discuss the concepts of State assignment & Reduction (L2)
3. Analyse the design and synthesis of synchronous sequential circuits (L3)

Textbooks:

1. Anand Kumar, Switching Theory and Logic Design. PHI, 2014.
2. M. Morris Mano and Michael D. Ciletti, Digital Design, 4th Edition, Pearson Education, 2013.

Reference Books:

1. Foundation of Switching theory and Logic Design, A k Singh, New age International Publishers,2008
2. Modern Digital Electronics, R P Jain, 4th Edition, Tata McGraw Hill Education Pvt. Ltd, New Delhi,2010
3. Fundamentals of Logic Design, Charles. R. Roth, Thomson Publications,5th edition,2004.

Web References:

1. https://nptel.ac.in/courses/108105132 (Digital Electronic Circuits)
2. https://onlinecourses.nptel.ac.in/noc24_ee147/preview (Digital Circuits)
3. https://nptel.ac.in/courses/117105080 (Digital Systems Design)
4. https://onlinecourses.swayam2.ac.in/nou24_ec07/preview (Digital electronic and System design)

ELECTRONIC CIRCUIT ANALYSIS

I Year B. Tech. II semester

[ECE]

Course Code: 24EC11RC06

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Formulate small signal high frequency amplifiers using BJT and FET. (L3)

CO2: Classify multistage amplifiers. (L2)

CO3: Design different types of feedback amplifiers. (L3)

CO4: Interpret the condition for oscillations in oscillators and design different types of oscillators. (L3)

CO5: Analyse and examine different types of power amplifiers and Tuned amplifiers, compare them in terms of efficiency. (L4)

UNIT-I **10 Lectures**

Small Signal High Frequency Transistor Amplifier models: BJT: Transistor at high frequencies, Hybrid- π common emitter transistor model, Hybrid-π conductance's, Hybrid-π capacitances, validity of Hybrid-π model, determination of high frequency parameters in terms of low frequency parameters, Millers Theorem and its Dual, CE short circuit current gain, current gain with resistive load, cut-off frequencies, frequency response and gain bandwidth product. FET: Analysis of common source and common drain amplifier circuits at high frequencies. [Textbook 1: Chapter -11, Chapter -8: Section 8.11, Chapter -10:Section 10-10 & 10-11]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Explain the Hybrid-π model of BJT and FET. (L2)
2. Apply Hybrid-π model to BJT and FET amplifiers. (L3)
3. Analyze BJT and FET amplifiers with Hybrid-π model. (L3)

UNIT-II **10 Lectures**

Multistage Amplifiers: BJT and FET RC Coupled Amplifiers – Frequency Response. Cascaded Amplifiers. high input resistance transistor amplifiers- Darlington and Bootstrap

circuits, Calculation of Band Width of Single and Multistage Amplifiers. Concept of Gain Bandwidth Product. [Textbook 1: Chapter -10]

Learning Outcomes:

At the end of the unit, the student will be able to

1. List the various multistage amplifiers. (L1)
2. Interpret the frequency response and relationship between gain and bandwidth in amplifiers. (L2)
3. Design and analyze different multistage amplifiers. (L2)

UNIT-III **10 Lectures**

Feedback Amplifiers: Classification of Amplifiers, Concept of Feedback Amplifiers – Effect of Negative feedback on the amplifier Characteristics. Four Feedback Amplifier Topologies. Method of Analysis of Voltage Series, Current Series, Voltage Shunt and Current Shunt feedback Amplifiers. [Textbook 1: Chapter -13]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Outline the basic amplifiers and fundamental concepts of Feedback amplifiers. (L2)
2. Design and analyze feedback amplifiers using each of the four topologies. (L3)
3. Compare the advantages and disadvantages of each feedback topology in different applications. (L3)

UNIT-IV **9 Lectures**

Sinusoidal Oscillators: Condition for oscillations – RC Oscillators -- RC Phase Shift and Wein bridge Oscillators (BJT and JFET models), LC Oscillators – Hartley, Colpitts, Clapp and Tuned Collector Oscillators, Frequency and amplitude Stability of Oscillators– Crystal Oscillators. [Textbook 1: Chapter -14: Section 14-15 to 14-21]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Describe the significance of the loop gain and phase shift in sustaining oscillations. (L2)
2. Determine the frequency of oscillation and design criteria for RC, LC and crystal oscillators. (L3)
3. Compare the performance of crystal oscillators with other types of oscillators. (L3)

UNIT-V **9 Lectures**

Tuned Voltage Amplifiers and Power Amplifiers: Single Tuned and Stagger Tuned Amplifiers – Analysis, Double Tuned Amplifier, and Bandwidth Calculation. Classification of Power Amplifiers – Class A, Class B and Class AB power Amplifiers. Series Fed, Single Ended Transformer Coupled Class A Power Amplifiers. Harmonic Distortions, Class B Push-pull amplifiers and their analysis, Complementary symmetry push pull amplifier, Class AB power amplifier. [Textbook 1: Chapter -18, RB1: Chapter -13]

Learning Outcomes:

At the end of the unit, the student will be able to

1. List the varieties of Tuned and Power Amplifiers. (L1)
2. Illustrate the operation of Tuned and power amplifiers. (L2)
3. Design and analyze various Tuned and power amplifiers. (L4)

Text Books:

1. Jacob Millman and C.Halkias, Integrated Electronics, Analog Digital Circuits and systems McGraw Hill, 1972.
2. Adel S. Sedra, Kenneth C. Smith, Arun N. Chandorkar, Microelectronic Circuits, 6/e, Oxford University Press, 2013.
3. B.V.Rao, K. RajaRajeswari et.al, Electronic Circuit Analysis ,Pearson Publishers,2010.

Reference Books:

1. Salivahanan, N.Suresh Kumar,Electronic Devices and Circuits, TMH, 4th Edition,2017
2. G.K.Mithal, Electronic Devices and Circuits, Khanna Publishers, 23rd Edition, 2004.
3. Robert L. Boylestad and Louis Nashelsky Electronic Devices and Circuits Theory, Pearson/Prentice Hall, Tenth Edition,2009.

Web References:

1. https://onlinecourses.nptel.ac.in/noc23_ee106.
2. https://onlinecourses.nptel.ac.in/noc24_ee140.

COMMUNICATION SKILLS LAB

I Year B. Tech. II Semester

[Common to ECE, EEE, CSE (AI&ML)]

Course Code: 24HE11RC02

L	T	P	C
0	0	3	1.5

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Identify and pronounce the sounds of English; choose the accurate stress in connected speech for proper intonation. (L3)

CO2: Apply the main theme and ideas of the audio/video to take notes and summarize. (L3)

CO3: Develop speaking skills by taking part in Just A Minute (JAM) – Picture Prompts-Narratives-Role Play. (L3)

CO4: Practice discussions and debates. (L3)

CO5: Demonstrate Presentation Skills. (L3)

ACTIVITY-I

Introduction to Phonetics: The Sounds of English (Speech sound – vowels and consonants) - Stress and Intonation - Accent and Rhythm.

Learning Outcomes:

At the end of the unit, the student will be able to

1. Apply the knowledge of Phonetics for better pronunciation and articulation. (L3)
2. Choose appropriate stress, intonation and rhythm of English language for clear communication. (L3)

ACTIVITY-II

Listening Skills: Listening for gist and specific information - listening for Note taking, Summarizing and for opinions - Listening to the speeches of eminent personalities.

Learning Outcomes:

At the end of the unit, the student will be able to

1. Develop effective listening skills for better comprehension of academic lectures and English spoken by native speakers. (L3).
2. Apply effective strategies for good writing. (L3)
3. Demonstrate writing skills in note taking and summarizing. (L3)

ACTIVITY-III

Speaking Skills: Just A Minute (JAM) session –Picture Prompts- Narrating stories and anecdotes-Role Play

Learning Outcomes:

At the end of the unit, the student will be able to

1. Make use of dialogues for different roles. (L3)
2. Develop communication skills in formal and informal situations. (L3)
3. Practice speaking skills through participation in activities such as narrating stories and role plays(L3)

ACTIVITY-IV

Speaking skills: Group Discussions-Arguments-Debates

Learning Outcomes:

At the end of the unit, the student will be able to

1. Organize one's own ideas for various Group-Discussion formats. (L3)
2. Develop ideas and arguments to debate. (L3)

ACTIVITY-V

Presentation skills: Verbal and non-verbal communication - Body Language - Making a Presentation

Learning Outcomes:

At the end of the unit, the student will be able to

1. Design presentations with PowerPoint slides(L3)
2. Apply appropriate body language (postures, gestures, facial expressions and eye contact) in formal presentations. (L3)

LIST OF LAB ACTIVITIES:

1. Identification and pronunciation of Vowel sounds and Consonant sounds (CO1)
2. Identification of word stress, Intonation and Rhythm (CO1)
3. Listening for specific information & Note taking (CO2)
4. Listening to the speeches of eminent personalities and summarizing (CO2)
5. Just A Minute sessions (CO3)
6. Picture Prompts (CO3)
7. Narrating Stories& anecdotes (CO3)

8. Role-Plays (CO3)
9. Group Discussions (CO4)
10. Debates (CO4)
11. Presentation Skills-I (CO5)
12. Presentation Skills-II (CO5)

Reference Books:

1. Language and Life: A Skills Approach Board of Editors, Orient Black swan Publishers, India.2018.
2. A Textbook of English Phonetics for Indian Students, T.Balasubramanian, Macmillan India Ltd.
3. Ashraf Rizvi. Effective Technical Communication. Tata McGraw Hill Education Private Limited, New Delhi.
4. Speak Well. Orient Black swan Publishers, Hyderabad.
5. Allan Pease. Body Language. Manjul Publishing House, New Delhi.

Web References:

1. https://www.englishlanguageclub.co.uk
2. https://www.ted.ed.com/
3. https://learningenglish.voanews.com/
4. https://www.bbc.co.uk/learningenglish/
5. https://www.abc.net.au/education/learn-english
6. NDTV News

DIGITAL LOGIC DESIGN LAB

I Year B. Tech. II semester

[ECE]

Course Code: 24EC11RC07

L	T	P	C
0	0	3	1.5

Course Outcomes: At the end of the Course the student shall be able to:

CO1: Verify the functional behavior of different logic gates and realize the Boolean expressions using these gates. (L3)

CO2: Build combinational circuits to implement different logic functions. (L3)

CO3: Verify the functional behavior of different Flipflops (L3)

CO4: Construct sequential circuits like counters and registers using flip-flops. (L3)

CO5: Make use of Digital ICs for verification and design of Digital circuits. (L3)

List of Hardware Experiments:

1. Verification of Logic Gates
2. Verification of Demorgan's Laws
3. Realization of Gates by using universal building blocks
4. Realization of SOP and POS
5. Half Adder & Full adder
6. Implementation of a function by using Decoders
7. Implementation of a function by using Multiplexers.
8. 3 bit Parity Generator
9. Verification of Flip - flops
10. Mod-8 Synchronous counter
11. Johnson Counter
12. 4 - bit Shift-register

Reference Books:

1. Digital Electronics- A Comprehensive Lab Manual by Cherry Bhargava, BS Publications, 2019.
2. Switching theory and Logic Design by Prof. K. Sivani and Prof. B. Ramadevi, BlueRose publishers, 2020.

Web References:

1. https://dec-iitkgp.vlabs.ac.in/
2. https://de-iitr.vlabs.ac.in/
3. https://de-iitg.vlabs.ac.in/

ELECTRONIC CIRCUIT ANALYSIS LAB

I Year B. Tech. II semester

[ECE]

Course Code: 24EC11RC08

L	T	P	C
0	0	3	1.5

Course Outcomes: At the end of the Course the student shall be able to:

CO1: Design and analyze feedback amplifiers (voltage series and current shunt feedback amplifiers). (L3)

CO2: Design and analyze various oscillators (RC phase shift oscillator and Colpitt's oscillator. (L3)

CO3: Design and analyze various amplifiers (Multistage amplifiers and Single tuned amplifier). (L3)

CO4: Design and analyze power amplifiers (Class A and Class B complimentary symmetry). (L3)

CO5: Become expert with computer skills (Multisim, OrCAD Pspice and Capture) for the analysis and design of circuits. (L3)

List of Experiments:

Cycle I (Hardware)

1. Voltage-Series Feedback Amplifier
2. Current-Shunt Feedback Amplifier
3. RC Phase Shift Oscillator
4. Colpitt's Oscillator
5. Two Stage RC Coupled Amplifier
6. Darlington Pair Amplifier

Cycle II (Software)

1. Class A Series-fed Power Amplifier
2. Transformer-coupled Class A Power Amplifier
3. Wien Bridge Oscillator
4. Hartley Oscillator
5. Complementary Symmetry Class B Push-Pull Power Amplifier
6. Single Tuned Voltage Amplifier

Equipment required:

Hardware:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Digital Multimeters
5. Decade Résistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Active & Passive Electronic Components

Software:

1. Multisim/ Equivalent Industrial Standard Licensed simulation software tool.
2. Computer Systems with required specifications

Reference Books:

1. Electronic Devices, Thomas L.Floyd, Tenth edition,2012
2. Electronic Devices and Circuits, David A. Bell, Fifth Edition,2008

Web References:

1. https://www.circuitlab.com

GAYATRI VIDYA PARISHAD COLLEGE OF ENGINEERING FOR WOMEN

(Autonomous)

(Approved by AICTE, New Delhi and Permanently Affiliated to Andhra University, Visakhapatnam)

Madhurawada :: Visakhapatnam – 530 048

COURSE STRUCTURE

(Applicable for the Academic Year 2024-25 onwards)

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.Tech Electrical and Electronics Engineering

SCHEME AND SYLLABI

(With effect from 2024-25 admitted batch)

I Year - I Semester

Course Code	Category	Course Title	Hours per Week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
24BM11RC01	BS	Calculus and Differential Equations	3	0	30	70	100	3
24BP11RC01	BS	Engineering Physics	3	0	30	70	100	3
24BC11RC01	BS	Green Chemistry	3	0	30	70	100	3
24EC11RC03	ES	Basic Electronics Engineering	3	0	30	70	100	3
24EE11RC01	ES	Fundamentals of Electrical Engineering	3	0	30	70	100	3
24BP11RC02	BS	Engineering Physics Lab	0	3	50	50	100	1.5
24BC11RC02	BS	Green Chemistry Lab	0	3	50	50	100	1.5
24CT11RC05	ES	IT Essentials Lab	0	3	50	50	100	1.5
							Total Credits	**19.5**

I Year - II Semester

Course Code	Category	Course Title	Hours per Week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
24BM11RC02	BS	Linear Algebra and Vector Calculus	3	0	30	70	100	3
24HE11RC01	HSS	English	3	0	30	70	100	3
24CT11RC02	ES	Problem Solving Using C	3	0	30	70	100	3
24EE11RC03	ES	Electrical Circuits – 1	3	0	30	70	100	3
24EE11RC04	ES	Thermal & Hydro Prime Movers	3	0	30	70	100	3
24HE11RC02	HSS	Communication Skills Lab	0	3	50	50	100	1.5
24CT11RC04	ES	Problem Solving Using C Lab	0	3	50	50	100	1.5
24EE11RC05	ES	Electrical Engineering Workshop	0	3	50	50	100	1.5
							Total Credits	**19.5**

CALCULUS AND DIFFERENTIAL EQUATIONS

I Year B. Tech. I Semester

[Common to EEE, ECE, CSE, IT, CSE (AI&ML)]

Course Code: 24BM11RC01

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Examine the functional dependency and utilize Taylor's theorem to expand the function of two variables. (L3)

CO2: Determine extrema of multivariable functions. (L5)

CO3: Utilize double and triple integrals to evaluate areas of plane curves and the volumes of solids. (L5)

CO4: Solve the first order differential equations and higher order differential equations with constant coefficients, apply the techniques to solve problems related to various engineering fields. (L3)

CO5: Find the Laplace Transforms of various functions and apply it to solve ordinary differential Equations with initial conditions. (L3)

UNIT-I: **8 Lectures**

Partial Differentiation: Functions of two or more variables: Introduction - Partial derivatives - Total derivative - Change of variables - Jacobians – Functional dependence - Taylor's theorem for function of two variables. [Sections: 5.1, 5.2, 5.5, 5.6, 5.7, 5.9 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Examine the functional dependencies using the Jacobian. (L3)
2. Make use of Taylor's theorem to write series expansion of function of two variables. (L3)

UNIT-II: **7 Lectures**

Applications of Partial Differentiation: Maxima and minima of function of two and three variables - Constrained maximum/minimum problems using Lagrange's method of multipliers. [Sections: 5.11, 5.12 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Determine the critical points, maxima and minima of functions several variables. (L5)

UNIT-III: **11 Lectures**

Integral Calculus: Introduction - Double integrals - Change of order of integration - Double integrals in polar Coordinates - Triple integrals - Change of variables.

Applications: Area enclosed by plane curves - Volumes of solids. [Sections: 7.1 – 7.7 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Evaluate double integrals and triple integrals in Cartesian and polar coordinates also over the given region. (L5)
2. Evaluate the double integrals by change of order of integration. (L5)
3. Evaluate double and triple integrals by change of variables. (L5)
4. Determine the areas and volumes using multiple integrals. (L5)

UNIT-IV: **11 Lectures**

Differential Equations and its Applications: Exact differential equations - Equations reducible to exact equations - Solutions of higher order linear ordinary differential equations with constant coefficients - Method of variation of parameters.

Applications: Orthogonal Trajectories - Newton's law of cooling - Law of Natural growth and decay. [Sections: 11.11, 11.12, 12.3, 12.6, 12.8, 13.1 – 13.8 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Solve the first-order differential equations and higher order Linear differential equations with constant coefficients. (L3)
2. Apply the techniques to solve problems related to various engineering fields. (L3)

UNIT-V: **11 Lectures**

Laplace Transforms: Introduction - Existence conditions - Transforms of elementary functions - Properties of Laplace transforms - Transforms of derivatives - Transforms of integrals - Multiplication by t - Division by t– Evaluation of integrals by Laplace

transforms - Laplace transforms of Unit step function, Unit impulse function and Laplace transforms of periodic functions - Inverse Laplace transforms - Convolution theorem - Second shifting theorem.

Applications: Laplace Transforms to ordinary differential Equations. [Sections: 21.1 – 21.5, 21.7 – 21.15, 21.17, 21.18 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Find the Laplace transform of the function. (L1)
2. Find the Inverse Laplace transform of a function. (L1)
3. Make use of convolution theorem to find the Inverse Laplace transform of a function. (L3)
4. Apply Laplace transform to solve ordinary differential equations. (L3)

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 45th Edition, Khanna Publishers, 2024.

Reference Books:

1. R K Jain and SRK Iyengar, Advanced Engineering Mathematics, Narosa Publishers, 5th Edition, 2016.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th edition, John Wiley & Sons, 2011.
3. Peter V. O'Neil, Advanced Engineering Mathematics, 7th edition, Cengage Learning, 2011.
4. Greenberg, Advanced Engineering Mathematics, 2nd Edition, Pearson, 2017.

Web References:

1. https://nptel.ac.in/courses/111104125
2. https://nptel.ac.in/courses/111105160

ENGINEERING PHYSICS

I Year B. Tech. I Semester

[Common to ECE, EEE, CSE (AI&ML)]

Course Code: 24BP11RC01

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, the student shall be able to:

CO1: Apply the principles of interference, diffraction, and polarization in wave optics, and utilize optical instruments for practical applications. (L3)

CO2: Familiarize the basic concepts of Thermodynamics relevant to engineering applications. (L2)

CO3: Outline the knowledge of basic principles of Electromagnetism and EM Waves. (L2)

CO4: Describe the basic principles of lasers, optical fibres and their use in technological applications. (L2)

CO5: Understand the basic principles of Quantum mechanics, Quantum computing. (L2)

UNIT-I **10 Lectures**

Interference: Principle of superposition, Young's Experiment (qualitative treatment), Coherence, Interference in thin films (reflected light), Newton's Rings, Michelson's Interferometer and its applications (thickness of thin sheet, determination of wavelength).

Diffraction: Introduction, Differences between Interference and Diffraction, Differences between Fresnel and Fraunhoffer diffraction, Fraunhoffer diffraction at a single slit (Qualitative and Quantitative treatment)

Polarization: Introduction - types of Polarization. Polarization by reflection, Brewster's law, refraction and double refraction in uniaxial crystals, Nicol Prism, Quarter wave plate and Half wave plate, Applications of Polarization. [Text Book 1: 5.16,5.17,5.18, 5.20, 6.1, 6.2, 6.8.(1-3), 6.11, 6.13, 6.14.1, 6.14.3, 7.1, 7.2, 7.3, 7.4, 7.5, 8.1, 8.2,8.5, 8.6,8.11,8.12, 8.16,8.20]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand the principles of interference patterns and apply Michelson's Interferometer to measure physical quantities such as thickness and wavelength. (L2)

2. Distinguish between interference and diffraction and perform qualitative and quantitative analysis of Fraunhoffer diffraction at a single slit. (L2)
3. Apply polarization concepts through various optical devices to explore and solve problems related to polarized light. (L3)

UNIT-II **7 Lectures**

Thermodynamics: Heat and Work, First law of thermodynamics and its applications, Reversible and Irreversible process, Carnot cycle and Efficiency, Second law of thermodynamics, Carnot's Theorem, Entropy, Second law in terms of Entropy, Entropy and disorder, Third law of thermodynamics (statement only). [TextBook-1: 16.3,16.5.1,16.6,16.8,16.11,16.12,16.14,16.16,16.17, 16.17.1, 16.18]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Apply the first and second laws of thermodynamics to analyse energy transformations and process efficiencies. (L3)
2. Understand the Carnot cycle and its efficiency and calculate entropy changes to explain thermodynamic processes. (L2)
3. Differentiate between reversible and irreversible processes and relate entropy to disorder. (L2)
4. State the third law of thermodynamics and understand its implications for materials at absolute zero. (L2)

UNIT-III **11 Lectures**

Electromagnetism: Concept of electric flux, Gauss' law, applications of Gauss' law (wire, sheet, sphere), Magnetic Field, Gauss' law in magnetostatics, Faraday's law of induction, Lenz's law, Induced magnetic fields, Displacement current, Maxwell's equations (no derivation, qualitative treatment), Electromagnetic wave equations, Introduction to EM waves, The Biot-Savart's law, magnetic field near a long wire, magnetic field for a circular Current loop, Ampere's law. [TextBook-1: 2.12,2.14,2.18, 3.5, 3.8, 3.9,3.12, 3.13,3.14, 3.10, 3.12, 3.3,3.4]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Apply Gauss's law and Faraday's law of induction to solve problems involving electric and magnetic fields. (L3)
2. Use Maxwell's equations to understand electromagnetic wave phenomena. (L2)

3. Analyse magnetic fields using Biot-Savart's law, Ampere's law, and apply e magnetostatic field distributions. (L3)

UNIT-IV **10 Lectures**

Lasers: Characteristics of laser beam, Spontaneous and stimulated emission of radiation, population inversion, Ruby laser, He-Ne laser, Semiconductor laser (homojunction), Applications of lasers.

Optical fibres: principle of propagation of light in optical fibres, Acceptance Angle and cone of a fibre, Numerical aperture, Modes of propagation, Classification of fibres based on refractive index profile and modes, Losses in optical fibres- scattering and bending losses, Fibre optics in communication- Block diagram, Applications of optical fibres. [TextBook-1: 24.12, 24.2, 24.5,24.6, 24.7, 24.11.1, 24.11.3, 24.11.5.1, 24.13, 10.2, 10.3, 10.4, 10.5, 10.6, 10.10, 10.11, 10.19,10.20 (only for list of applications]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand the principles of laser operation, including spontaneous and stimulated emission, and analyse various types of lasers such as Ruby, He-Ne, and Semiconductor lasers. (L2)
2. Describe the fundamentals of optical fibre technology, including light propagation, acceptance angle, numerical aperture, and classification of fibres. (L2)
3. Apply these concepts to fibre optics communication systems and explore their practical applications. (L2)

UNIT-V **10 Lectures**

Quantum Physics: de Broglie concept of matter waves, Heisenberg's uncertainty principle, Schrödinger time independent wave equation, Physical significance of wave function, particle in a one-dimensional box.

Quantum Computing Quantum bits, Introduction to Pauli spin matrices, Bloch sphere, Entanglement, Qubit Vs classical bit, Single Qubit gates, Quantum Teleportation – Basic Idea. [Textbook-1 20.5, 20.11, 20.17, 20.18, 20.22; Textbook -3 Sec 1.8, 1.9, 1.10.1]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand the concepts quantum mechanics such as the de Broglie wavelength and Heisenberg's uncertainty principle and use the Schrödinger equation (L2).

2. Describe the fundamentals of quantum computing (L2)

Textbooks:

1. M. N. Avadhanulu, P. G. Kshirsagar, and T. V. S. Arun Murthy, A textbook of Engineering Physics, 11th edition, S. Chand and Company Ltd., 2019.
2. H. K. Malik and A. K. Singh, Engineering Physics, 2nd Edition, McGraw Hill Education Pvt Ltd. ,2018.
3. P.K. Palanisamy, Engineering Physics, SCITECH Publications, 2011.

Reference Books:

1. Modern Engineering Physics by A.S. Vasudeva S. Chand and Company Ltd., 2010
2. University Physics by Young and Freedman Pearson Education, 2010.
3. Michael A. Nielsen, Isaac L. Chuang, Quantum Computation and Quantum Information Cambridge University Press, 10 th Ed., 2010.

Web References:

1. https://nptel.ac.in/courses/115105537 (Wave optics)
2. https://nptel.ac.in/courses/115106122 (Electromagnetism)
3. https://nptel.ac.in/courses/112102255 (Thermodynamics)
4. https://nptel.ac.in/courses/115107095 (Fiber Optics)
5. https://nptel.ac.in/courses/104104085 (Lasers)
6. https://nptel.ac.in/courses/104104082 (Quantum Computing)
7. https://www.intechopen.com/online-first/73811 (Quantum Computing)
8. https://lewisla.gitbook.io/learning-quantum/quantum-circuits/single-qubit-gates (Quantum Computing)
9. https://profmcruz.wordpress.com/wp-content/uploads/2017/08/quantum-computation-and- quantum-information-nielsen-chuang.pdf (Quantum Computing)

GREEN CHEMISTRY

I Year B. Tech. I semester
[Common to CSE, EEE, IT]

Course Code: 24BC11RC01

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, the student shall be able to

CO1: To develop knowledge about water and its treatment for industrial and potable purpose. (L3)

CO2: Utilize the theory of construction and discharge reactions of various types of batteries are used in commercial society. (L3)

CO3: Explain the importance of working principle, fabrication of electrodes and other components, advantages, disadvantages and environmental aspects of fuel cells. (L4)

CO4: Classify the corrosion mechanism of metals and factors influenced by rate and extent of corrosion and categorize the reasons for corrosion control methods. (L4)

CO5: Apply green chemistry technology processes the knowledge for solving existing challenges faced in various engineering and societal areas. (L5)

UNIT-I **10 Lectures**

Water-Technology: Sources of Water – Impurities and their influence of living systems – WHO Limits – Hardness and its Determination – Boiler Troubles and their removal – Water Softening Methods – Lime-Soda, Zeolite and Ion Exchange - Municipal Water Treatment-Break Point Chlorination – Desalination of Sea Water –Reverse Osmosis Method Electro-dialysis. Chemical analysis of water. [TB1: Chapter1]

Learning Outcomes:

At the end of the unit the student will be able to

1. Explain the principles of reverse osmosis (L4)
2. Compare the quality of drinking water with BIS and WHO standards (L4)
3. Illustrate problems associated with Boiler Troubles (L2)
4. Demonstrate the estimation of hardness of water (L3)

UNIT-II **10 Lectures**

Batteries: Primary batteries: The Chemistry-Types: Zinc-carbon (Leclanche type), zinc alkaline (Duracell), zinc/air batteries; Lithium primary cells and lithium-ferrous sulphide cells.

Secondary batteries: Lead acid and VRLA (valve regulated (sealed) lead acid), nickel cadmium, nickel-zinc, nickel- metal hydride batteries, lithium-ion batteries, ultrathin lithium polymer cells. Advanced Batteries for electric vehicles, requirements of the battery – sodium-beta and redox batteries. [TB1: Chapter6]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Deduct the working mechanism of various types of cells (L5)
2. Illustrate difference between primary and secondary cells (L2)
3. List the environmental applications of Various types of batteries (L4)
4. Utilize the manufacturing methods of advanced batteries for electric vehicles (L3)

UNIT-III **8 Lectures**

Fuel Cells: Description, working principle, anodic, cathodic and cell reactions, fabrication of electrodes and other components, applications, advantages, disadvantages and environmental aspects of the following types of fuel cells: Proton Exchange Membrane Fuel Cells, alkaline fuel cells, phosphoric acid, solid oxide, molten carbonate, direct methanol fuel cells- Membranes and Fuels, Electrochemical Sensors and Optical fibres. [TB1: Chapter 6]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Explain the fundamental theories of fuel cells (L2)
2. Classify types of fuel cells (L4)
3. Make use of the various components fabrication of fuel cells (L3)
4. Distinguish the advantages, disadvantages and environmental aspects of fuel cells(L4)

UNIT-IV **10 Lectures**

Corrosion: Origin and Theory – Types of Corrosion: Chemical and Electrochemical; Pitting, inter granular, Waterline, Stress – Galvanic Series – Factors Effecting Corrosion. Corrosion Controlling Methods, Protective Coatings, Electroplating and Electroless Plating, Paints, Varnishes, Lacquers, Enamels. [TB1: Chapter 7]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Explain the Mechanism of corrosion (L4)
2. List the various types of Corrosion (L4)
3. Describe the Factors Effecting Corrosion (L5)
4. Differentiate between Paints Lacquers Enamels (L4)

UNIT-V **10 Lectures**

Green-Chemistry and Technology: Introduction and significance of green chemistry, Goals of green chemistry, 12 principles of green chemistry, toxicity of chemicals, concept of zero pollution technologies; Aqueous phase method, Super critical fluid method, Phase transfer catalytic method, atom economy, functional toxicity vs non- functional toxicity, functional group approaches to green chemistry, Elimination of toxic functional group, optimization of frameworks for the design of greener synthetic pathways -Green synthesis of Adipic acid and Paracetamol- energy minimization-Microwave synthesis, ultra sound assisted method Bio catalyzed reaction and Only explanation with examples Processes involving solid catalysts – zeolites, ion exchange resins, applications of Green Chemistry, Green solvents, green fuels & propellants. [TB2: Chapter- 2,3,4&5]

Learning Outcomes:

At the end of the unit the student will be able to

1. Processes involving Green Chemistry and apply the knowledge for solving existing
2. Challenges faced in various engineering and societal areas (L-5)
3. Differentiate between functional toxicity vs non- functional toxicity (L-4)
4. Explain the green chemistry, 12 principles (L-2)

Textbooks:

1. Engineering Chemistry – PC Jain and M. Jain –15th Edition, Dhanpath Rai and Sons, New Delhi.
2. Anastas, P. T., Warner, J. C. Green Chemistry: Theory and Practice, Oxford UniversityPress Inc., New York, 1998.

Reference Books:

1. M. Aulice Scibioh and B. Viswanathan ‘Fuel Cells – principles and applications’, University Press India (2006).

2. A Textbook of Engineering Chemistry – S. S. Dara – S. Chand & Co. New Delhi
3. Handbook of Green Chemistry and Technology; by James Clarke and Duncan Macquarrie; Blakwell Publishing.

Web References:

1. https://archive.nptel.ac.in/course.html
2. https://nptel.ac.in/courses/engineering

BASIC ELECTRONICS ENGINEERING

I Year B. Tech I semester

[EEE]

Course Code: 24EC11RC03

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Brief evolution and impact of electronics. (L2)

CO2: Comprehend the characteristics of semiconductors, devices, and their applications. (L2)

CO3: Analyze the transistor operation with different biasing techniques. (L4)

CO4: Understand the characteristics of FET. (L2)

CO5: Outline the basic concepts and applications of op-amps. (L2)

UNIT-I **10 Lectures**

Introduction: Evolution and Impact of Electronics in industries and in society, Familiarization of Resistors, Capacitors, Inductors, Transformers and Cathode ray oscilloscope. [TB3: Chapter -1, RB1: Chapter -1]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Explain the importance of Electronics. (L2)
2. Illustrate the basic elements of Electronics. (L1)
3. Understand the basic construction and working operation of CRO. (L1)

UNIT-II **10 Lectures**

Semiconductor Diodes: Semiconductor materials- intrinsic and extrinsic types, Ideal Diode, Terminal characteristics of diodes: p-n junction under open circuit condition p-n junction under forward bias and reverse bias conditions p-n junction in breakdown region, Diode small signal model, Zener diode and applications, Rectifier Circuits. [TB1: Chapter -4,5,6]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Explain the energy band theory of solids (insulators, semiconductors, and metals) based on their band structures. (L1)
2. Describe the transport phenomena in semiconductors. (L1)

3. Understand the band structure representation of PN junction, interpret the Volt-Ampere characteristics along with the temperature effects. (L2)

UNIT-III **10 Lectures**

Bipolar Junction Transistors (BJTs): Physical structure and operation modes, Active region operation of transistor, D.C. analysis of transistor circuits, Transistor as an amplifier, Transistor as a switch: cut-off and saturation modes.

Biasing the BJT: fixed bias, emitter feedback bias, collector feedback bias. Basic BJT amplifier configuration: common emitter, common base and common collector amplifiers. [TB1: Chapter -7, Chapter -8]

Learning Outcomes:

At the end of the unit, the student will be able to

1. List the various amplifier configurations. (L1)
2. Interpret the frequency response and relationship between gain and bandwidth in amplifiers. (L2)
3. Design and analyze different amplifier configurations. (L4)

UNIT-IV **10 Lectures**

Field Effect Transistor (FET): Junction Field-Effect Transistor (JFET), structure and physical operation, current-voltage characteristics, Enhance type MOSFET, Depletion-type MOSFET, D.C. operation of MOSFET circuits, Biasing in MOSFET amplifiers, Basic JFET amplifier configuration: common source, common gate and common drain types. [TB1: Chapter -12]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Comprehend the characteristics of BJT and FET. (L1)
2. Explain the construction of JFET and MOSFETs. (L2)
3. Describe the characteristics of JFET and MOSFET. (L2)
4. Understand various biasing methods for FETs. (L2)

UNIT-V **8 Lectures**

Operation Amplifier (Op-amps): Ideal Op-amp, Differential amplifier: differential and common mode operation common mode rejection ratio (CMRR), Practical op-amp circuits: inverting amplifier, non -inverting amplifier, weighted summer, integrator, differentiator. [RB 3: Chapter -1,2]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand the basic parameters of Op-amp. (L1)
2. Illustrate the applications of Operation Amplifiers. (L2)

Text Books:

1. Integrated Electronics, Jacob Millman and C.C.Halkias, McGraw Hill, 1972.
2. Bell, D. A., Electronic Devices and Circuits, Oxford University Press.20013.

Reference Books:

1. Electronic Devices and Circuits by Salivahanan, N.Suresh Kumar andA.Vallava Raj, TMH, 2nd Edition, 1998.
2. Electronic Devices and Circuits – G.K.Mithal, Khanna Publishers, 23rd Edition, 2004.
3. Linear integrated circuit 2nd edition D. Roy Choudhary, 2017.
4. Principles of Electronics, V.K.Mehta, S.Chand Publications,2022.

Web References:

1. https://onlinecourses.nptel.ac.in/noc24_ee143/preview
2. https://onlinecourses.nptel.ac.in/noc24_ee73/preview

FUNDAMENTALS OF ELECTRICAL ENGINEERING

I Year B. Tech. I semester
[EEE]

Course Code: 24EE11RC01

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Summarize the basic concepts in electric circuits.(L2)

CO2: Apply the fundamental laws in Electrical Engineering. (L3)

CO3: Summarize the operation of various measuring instruments. (L2)

CO4: Summarize the concepts of various magnetic and dielectric materials.(L2)

CO5: Design the wiring schemes for house hold appliances using appropriate wiring components. (L2)

UNIT-I **10 Lectures**

Electrical Engineering Fundamentals: Electrical circuit elements, DC sources (independent and dependent), Ohm's law, effect of temperature on resistance, temperature coefficient, Kirchhoff's laws, Power and Energy Calculations for DC circuits, Series-parallel connection of elements, Concept of Potential difference, Star - Delta conversion with R only. [TextBook-1: Chapter 1 (Pg. 1-31), Chapter 2 (Pg. 32-75), Chapter 4 (Pg. 130-147)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand the concepts of active and passive elements. (L2)
2. Determine the power and energy for the given electrical elements. (L2)

UNIT-II **10 Lectures**

Fundamental Laws of Electrical Engineering: Coulombs law of Electrostatics (1st and 2nd laws), Faradays laws of Electromagnetic induction, Concepts of self and mutual induced emfs, Fleming Left hand and Right-hand rules, Lenz's law, Biot - Savart's law, Ampere circuital law, Maxwell's corkscrew rule. [TextBook-1: Chapter 5 (Pg. 151), Chapter 7 (Pg. 217-219, 224-225), Chapter 9 (Pg. 255-270)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Summarize the Basic Laws of electrostatics. (L2)

2. Understand the concepts of self and mutual induced emfs. (L2)
3. Summarize the Basic Laws of electromagnetic induction. (L2)
4. Analyse the Basic Electric Circuits. (L3)

UNIT-III **10 Lectures**

Fundamentals of Electrical Measurements (no need to explain types of errors and compensations): Classification of measuring instruments, various forces in indicating instruments (deflection, control and damping), construction and operation of MC and MI type instruments for voltage and current measurement, Construction and operation of single-phase electro dynamometer type wattmeter, Construction and operation of single-phase induction type energy meter, basic concept of digital energy meter. [TextBook-1: Chapter 25 (Pg. 670-718)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Summarize different types of the Measuring Instruments. (L2)
2. Understand the operation of Measuring Instruments. (L2)
3. Summarize the various operating forces involved in the Measuring instruments. (L2)

UNIT-IV **10 Lectures**

Dielectric and Magnetic Materials: Dielectric as an electric field medium, leakage currents, dielectric loss, dielectric strength, breakdown voltage, effects of breakdown, Ferroelectric materials, properties of ferroelectric materials, spontaneous polarization, piezoelectric materials, pyroelectric materials. classification of magnetic materials, properties of ferromagnetic materials, spontaneous magnetization, magnetic anisotropy, characteristics of soft and hard magnetic materials, ageing of magnets. [TextBook-2: Chapter 5 (S-5.1-5.4), Chapter 7 (S-7.4-7.18)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand the dielectric materials and their properties. (L2)
2. Understand the magnetic materials and their properties. (L2)
3. Summarize the knowledge on materials used in electrical applications. (L2)

UNIT-V **8 Lectures**

Electric Wiring: Symbols of various electrical equipment, Various types of conductors, conductor sizes and current ratings, Service mains, meter board and distribution board,

Types of wirings and their Installations, House wiring (one lamp-one switch, Stair case, Corridor wiring, Power wiring), Basic LT panel wiring diagram, Elementary discussion on Circuit protective devices: fuse and Miniature Circuit Breaker (MCB's). [TextBook-3: Chapter 2 (Pg.19-102), Chapter 7 (Pg. 181-220)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Identify and interpret various electrical wiring symbols. (L2)
2. Acquire knowledge on different types of wiring and their installations. (L2)
3. Learn about various types of protective devices. (L2)

Text Books:

1. V. K. Mehta, Rohit Mehta, Principle of electrical Engineering and electronics, 3rd edition, S. Chand Publishing, New Delhi, 2016.
2. R.K. Rajput, A course in Electrical Engineering Materials, Laxmi Publications 2009.
3. S L Uppal and G C Garg, "Electrical Wiring, Estimating & Costing", Khanna Publishers, 2015.

Reference Books:

1. Fundamentals of Electrical Engineering Rajendra Prasad PHI Third Edition 2014.
2. V. N. Mittal and Arvind Mittal, "Basic Electrical Engineering" McGraw Hill.
3. A.K. Sawhney, A Course in Electrical and Electronics Measurements and Instruments Dhanpat Rai and Sons, Delhi, 2005.

Web References:

1. https://archive.nptel.ac.in/courses/108/105/108105153/
2. https://archive.nptel.ac.in/courses/108/105/108105112/
3. http://182.160.97.198:8080/xmlui/handle/123456789/853?show=full

ENGINEERING PHYSICS LAB

I Year B. Tech I Semester

[Common to ECE, EEE, CSE(AI&ML)]

Course Code: 24BP11RC02

L	T	P	C
0	0	3	1.5

Course Outcomes: At the end of the course the student will be able to

CO1: Interpret the physical parameters based on optical phenomena. (L2)

CO2: Verify the behaviour of double refraction in birefringent material like quartz. (L2)

CO3: Demonstrate the concepts of diffraction through experiments. (L3)

CO4: Calibrate instruments like low range voltmeters and ammeters. (L3)

CO5: Design temperature sensors based on diodes and thermistors. (L3)

List of Experiments: (Any TEN of the following experiments shall be conducted)

1. Determination of Radius of Curvature of a given Convex Lens By forming Newton's Rings.
2. Determination of Thickness Given Paper Strip or hairline by Wedge Method.
3. Determination of Wavelength of Spectral Lines in the Mercury Spectrum by Normal Incidence method
4. Determination of Cauchy's Constants of a Given Material of the Prism using Spectrometer in minimum deviation position
5. Determination of Refractive Index of Ordinary ray and Extra-ordinary ray in quartz prism
6. Laser- Diffraction – determination of wavelength of laser source using diffraction grating
7. Determination of wavelength of laser source using Fraunhofer single slit diffraction
8. Melde's Apparatus – Frequency of electrically maintained Tuning Fork.
9. Study of Intensity Variation of the Magnetic Field along the axis of circular Current Carrying conductor using Stewart and Gee apparatus
10. Calibration of Low Range Voltmeter using Potentiometer Bridge
11. Calibration of Low Range Ammeter using Potentiometer Bridge
12. Determination of dielectric constant of material using charging discharging method with a parallel plate capacitor

13. Determination of energy band gap of semiconductor using PN junction diode in reverse bias
14. Determination of thermo electric coefficients for thermistor
15. Determination of Planck's constant using LED.

Textbooks:

1. Practical physics by CL Arora, S.chand publishing company, 1995.
2. Advanced Practical Physics For Students by B.l.worsnop And H.t.flint, 1923

Web References:

1. http://lo-au.vlabs.ac.in/laser-optics/Newtons_Rings_Wavelength_of_light/
2. http://ov-au.vlabs.ac.in/optics/Spectrometer_Refractive_Index/
3. http://ov-au.vlabs.ac.in/optics/Diffraction_Grating/
4. http://htv-au.vlabs.ac.in/heat-thermodynamics/Characteristics_of_Thermistor/
5. https://bop-iitk.vlabs.ac.in/exp/energy-band-gap/simulation.html

GREEN CHEMISTRY LAB

I Year B. Tech I semester

[EEE]

Course Code: 24BC11RC02

L	T	P	C
0	0	3	1.5

Course Outcomes: At the end of the Course, the student shall be able to:

CO1: Make use of experimental skills for quantitatively with accuracy analysis in acid-base titrations using suitable indicators. (L3)

CO2: Apply the principals of redox titrations Chromium (VI) by Mohr's Salt Solution in different samples. (L3)

CO3: Utilize with complex metric titrations to determine hardness of water and estimate the amount of impurities present in the samples. (L3)

CO4: Perform experiments with instrument novel materials to be used as zeolite for removal of hardness of water to acquire skills of different methods of chemical analysis. (L3)

CO5: Develop the skills of green synthesis through the preparation of a polymer/ drug. (L3)

TITLE OF THE EXPERIMENTS

1. Determination of Sodium Hydroxide with HCl (Na2CO3)Primary Standard)
2. Determination of Alkalinity (Carbonate and Hydroxide) of water sample
3. Determination of Chromium (VI) by Mohr's Salt Solution
4. Determination of Hardness of Water sample by EDTA method
5. Zeolite column for removal of hardness of water/ Ion exchange-Method
6. Green Synthesis of Polymer/ drug
7. Determination of Oxalic Acid by Permanganometry
8. Determination of the concentration of strong acid vs strong base (by conductometric method)
9. Determination of Fe(II)/Mohr's Salt by Potassium dichromate (by redox-method)
10. Determination of Cu+2using standard hypo solution (Iodometry)
11. Estimation of chorine by using bleaching powder
12. Estimation of vitamin-C

Of the above experiments at-least 10 assessment experiments should be completed in a semester.

Text Books:

1. Vogel's Quantitative Chemical Analysis – V – Edition – Longman.
2. Experiments in Applied Chemistry (For Engineering Students) – Sirita Rattan – S. K. Kataria & Sons, New Delhi.

IT ESSENTIALS LAB

I Year B. Tech I semester

[EEE]

Course Code: 24CT11RC05

L	T	P	C
0	0	3	1.5

Course Outcomes: At the end of the Course, the student shall be able to:

CO1: Identify the peripherals of a computer. (L3)

CO2: Demonstrate the installation process of operating systems like MS Windows, LINUX. (L3)

CO3: Make use of Office suite that comprises with various applications to create documents, and captivating presentations. (L3)

CO4: Make use of Office suite that comprises with various applications to organize & analyse data. (L3)

CO5: Categorize various UNIX/LINUX Commands to work on a modern operating system and Make use of LaTeX tool to prepare research articles. (L3)

Module-1: Hardware Concepts

1. Identify the peripherals of a computer, components in a CPU and its functions.
2. Draw the block diagram of the CPU along with the configuration of each peripheral.
3. Disassemble and assemble the PC back to working condition**.**

Module-2: Software Installations and configurations

1. Install operating systems like LINUX and MS windows on a personal computer.
2. The system should be configured as dual boot with both MS windows and LINUX.

Module-3: Word and PowerPoint

1. Creating Documents: Formatting Fonts/Texts, page layout, Applying Text effects, Character Spacing, Borders and Colors, Inserting Header and Footer, equation editor.
2. Creating Power Point: Student should work on basic power point utilities and tools to create basic power point presentation. PPT Orientation, Slide Layouts, Inserting Text, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows, Hyperlinks, Inserting Images, Tables and charts.

Module-4: Spreadsheets

1. Spreadsheet Orientation: Accessing, overview of toolbars, saving spreadsheet files, Using help and resources. Creating a Scheduler, Gridlines, Format Cells, Summation, auto fill, Formatting Text, Renaming and Inserting worksheets, Hyper linking.
2. Excel Calculation: Calculating Average, Cell Referencing, Excel Formula, std. deviation, Charts, Count Function, Sorting, Conditional formatting, Excel Advanced-sumif, VLOOKUP, and Pivot Table.
3. Software as a service (SaaS): Usage of online office suite.

Module-5: UNIX/LINUX Commands and LaTeX

1. Study and practice on file system, handling files with commands, syntax, usage, application.
2. Installation of LaTeX and preparation of research article.

Reference Books:

1. IT Essentials: PC Hardware and Software Companion Guide, Third Edition, David Anfinson, Ken Quamme.
2. UNIX concepts and applications by Sumitabha Das, TMH Publications.

Web References:

1. https://www.javatpoint.com/

LINEAR ALGEBRA AND VECTOR CALCULUS

I Year B. Tech. II Semester

[Common to EEE, ECE, CSE, IT, CSE (AI&ML)]

Course Code: 24BM11RC02

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Test for consistency and solve linear system of equations, also determine unknown currents in the electrical circuits. (L5)

CO2: Find the Eigen values and Eigen vectors of a matrix and apply Cayley-Hamilton theorem to find the inverse of a matrix. (L3)

CO3: Reduce quadratic form to canonical form and examine the nature of quadratic form. (L4)

CO4: Interpret the meaning and evaluate gradient of a scalar valued, curl and divergence of vector valued functions. (L5)

CO5: Apply line integrals, surface integrals, volume integrals and their relations using Green's theorem, Stoke's theorem, Gauss Divergence theorems in various engineering applications. (L3)

UNIT-I: **10 Lectures**

Matrix Algebra: Rank of a matrix- Echelon form, Normal Form - Solution of Linear System of Equations - Consistency of Linear System of Equations – Gauss elimination and Gauss Jordan methods, LU Factorization method.

Applications: Finding the current in electrical circuits. [Sections: 2.7, 2.10, 28.6 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Find the rank of a matrix. (L1)
2. Test for consistency and solve a system of linear equations. (L4)
3. Apply Gauss elimination and Gauss Jordan methods, LU factorization to solve linear systems. (L3)
4. Determine unknown currents in electrical circuits. (L5)

UNIT-II: **10 Lectures**

Eigen Values and Eigen Vectors: Eigen Values and Eigen Vectors of a real Matrix – Properties - Cayley- Hamilton theorem (without proof) - Inverse and Powers of a Matrix using Cayley-Hamilton's theorem – Pseudo inverse of a matrix, Singular value decomposition. [Sections: 2.13 - 2.15 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Find eigenvalues and corresponding eigenvectors of a matrix. (L1)
2. Apply Cayley-Hamilton theorem to find powers and the inverse of a matrix. (L3)
3. Calculate the Pseudo Inverse of a matrix. (L3)
4. Calculate the singular values of a matrix. (L3)

UNIT-III: **9 Lectures**

Quadratic Forms: Inner Product – Orthogonal Vectors – Orthogonal matrix – Diagonalization of a Matrix-Quadratic Forms - Reduction of Quadratic Form to Canonical Form (Orthogonal Transformation) - Nature of a Quadratic Form. [Sections: 2.16 - 2.18 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Make use of Eigen values and eigen vectors to diagonalize the matrix. (L3)
2. Reduce the Quadratic form to canonical form examine the nature of a quadratic form. (L4)

UNIT-IV: Vector Differentiation **9 Lectures**

Introduction - Scalar and Vector point functions, General rules for vector differentiation - Vector operator ∇ applied to scalar point functions- Gradient, ∇ applied to vector point functions- divergence and curl. Physical interpretation of gradient, divergence and curl (i.e., ∇f, $\nabla . \overline{F}$, $\nabla \times \overline{F}$), Irrotational and Solenoidal fields, Vector Identities.

(Sections: 8.1, 8.4 - 8.9 of Text Book)

Learning Outcomes:

At the end of the unit, the student will be able to

1. Find the gradient of a scalar point function, divergence and curl of a vector point function. (L1)
2. Determine the directional derivative of scalar point function. (L5)

UNIT-V: Vector Integration **10 Lectures**

Integration of vectors - Line integral – Circulation - work done - surface integral-flux - Green's theorem in the plane - Stoke's theorem - Volume integral - Gauss Divergence theorem (All theoremswithout proofs).

(Sections: 8.10 - 8.16, 8.18 of Text Book)

Learning Outcomes:

At the end of the unit, the student will be able to

1. Determine the work done in a moving particle along a path. (L5)
2. Interpret surface and volume integrals. (L2)
3. Apply vector integral theorems to multiple integral. (L3)

Textbooks:

1. B. S. Grewal, Higher Engineering Mathematics, 45th Edition, Khanna Publishers, 2024.

Reference Books:

1. David Poole, Linear Algebra- A modern introduction, 4th edition, 2015.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th edition, John Wiley & Sons, 2011.
3. Peter V. O'Neil, Advanced Engineering Mathematics, 7th edition, Cengage Learning, 2011.
4. Greenberg, Advanced Engineering Mathematics, 2nd Edition, Pearson, 2017.

Web References:

1. https://nptel.ac.in/courses/111107112

ENGLISH

I Year B. Tech II Semester

[Common to ECE, EEE & CSE(AI&ML)]

L	T	P	C
3	0	0	3

Course Code: 24HE11RC01

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Develop moral values and inner peace(L3), Demonstrate the use of LSRW skills, Vocabulary and basic grammar concepts. (L3)

CO2: Identify the impact of different social backgrounds (L3), recognize the poet's insights. (L4) Demonstrate the use of LSRW skills, Vocabulary and basic grammar concepts. (L3)

CO3: Analyse socio-cultural context(L4), Establish effective interpersonal and communication skills(L3), Demonstrate the use of LSRW skills, Vocabulary and basic grammar concepts(L3)

CO4: Focus on value of education(L4), Relate to the poet's nostalgia(L4), Demonstrate the use of LSRW skills, Vocabulary and basic grammar concepts (L3)

CO5: Determine the central idea of the text(L3), Identify one's resilience(L3), Demonstrate the use of LSRW skills, Vocabulary and basic grammar concepts (L3)

UNIT-I **10 Lectures**

Prose:	Swami Vivekananda: The Secret of Work
Poetry:	Grenville Kleiser: Stay Calm
Grammar & Vocabulary:	Synonyms & Antonyms
Listening:	Listening for Context and Specific Information
Speaking:	Introducing Oneself and Others
Writing:	Basics of writing

Learning Outcomes:

At the end of the unit, the student will be able to

1. Interpret the spiritual growth and capacity building of the individual in the 21st century. (L3)
2. Use appropriate synonyms and antonyms to communicate effectively. (L3)
3. Listen and understand for specific information in the audio(L2)

4. Establish connections between oneself and others(L3)
5. Apply appropriate punctuation marks for clarity and organization of written text (L3)

UNIT-II **10 Lectures**

Prose: Katherine Mansfield: The Doll's House

Poetry: Rabindranath Tagore: Where the Mind Is Without Fear

Grammar & Vocabulary: Phrasal Verbs

Listening: Listening for Main Idea and Supporting Ideas

Speaking: Getting Someone's Attention and Interrupting

Writing: Formal Letters

Learning Outcomes:

At the end of the unit, the student will be able to

1. Relate to the world through adult & child's points of view (L3)
2. Identify the sense of self dignity & rationality in the poem (L4)
3. Utilize appropriate phrasal verbs for effective communication(L3)
4. Listen & identify main and supporting ideas in the audio(L3)
5. Practice conversational etiquette(L3)
6. Write formal letters(L3)

UNIT-III **10 Lectures**

Prose: O. Henry: The Last Leaf

Poetry: Rudyard Kipling: If

Grammar & Vocabulary: Idiomatic Expressions

Listening: Listening for Global Comprehension

Speaking: Asking for Information and Giving Information

Writing: Note-Making

Learning Outcomes:

At the end of the unit, the student will be able to:

1. Analyze strategies to face challenges in life (L4)
2. Develop one's own personality (L3)
3. Use idiomatic expressions in oral & written communication (L3)
4. Listen & Interpret the audio for Global Comprehension (L3)
5. Ask & provide information (L3)

6. Practice note making study skills(L3)

UNIT-IV **10 Lectures**

Prose:	Francis Bacon: Of Studies
Poetry:	Toru Dutt: Our Casuarina Tree
Grammar & Vocabulary:	Remedial Grammar I
Listening:	Listening to Make Inferences
Speaking:	Expressing Opinions, and Agreeing and Disagreeing with Opinions
Writing:	Essay Writing

Learning Outcomes:

At the end of the unit, the student will be able to

1. Prioritize the habits of continuous learning(L4)
2. Recognize the significance of Indian philosophy (L4)
3. Identify and correct common errors in English grammar and usage(L3)
4. Draw inferences from the audio(L3)
5. Articulate one's own opinions(L3)
6. Develop different types of essays (DEAN)(L3)

UNIT-V **8 Lectures**

Prose:	Mark Twain: Whitewashing the Fence
Poetry:	William Ernest Henley: Invictus
Grammar & Vocabulary:	Remedial Grammar II
Listening:	Listening for Key Ideas
Speaking:	Telephone Etiquette
Writing:	E-mail Etiquette

Learning Outcomes:

At the end of the unit, the student will be able to

1. Discover the humour & moral lessons in the text (L3)
2. Show resilience in adverse situations. (L3)
3. Modify sentences with appropriate grammar, vocabulary and usage (L3)
4. Identify key ideas (L3)
5. Practice telephone Etiquette (L3)
6. Apply the knowledge of E-mail Etiquette (L3)

Text Books:

1. English for Engineers: Theory to practice. Board of Editors, Orient Black Swan Publishers, India.2024.

Reference Books:

1. English Grammar in Use by Raymond Murphy
2. Oxford English Grammar Course by Michael Swan
3. Word Power Made Easy by Norman Lewis
4. Cambridge Vocabulary for IELTS by Pauline Cullen
5. The Elements of Style by William Strunk Jr. and E.B. White
6. English Vocabulary in Use by Michael McCarthy and Felicity O'Dell
7. Practical English Usage by Michael Swan
8. The Only Grammar Book You'll Ever Need by Susan Thurman
9. Advanced English Grammar: A Linguistic Approach by Ilse Depraetere and Chad Langford

PROBLEM SOLVING USING C

I Year B. Tech. II semester

[EEE]

L	T	P	C
3	0	0	3

Course Code: 24CT11RC02

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Explain the basic constructs of C through the use of simple applications. (L2)

CO2: Demonstrate the utilization of arrays and strings in the development of C programs. (L2)

CO3: Utilize functions and pointers to construct various applications in C. (L3)

CO4: Apply concepts of structures and unions to build and implement C applications. (L3)

CO5: Develop applications using sequential and random-access file processing techniques. (L3)

UNIT-I **10 Lectures**

Introduction to C: Basic structure of C program, Constants, Variables and data types, Operators and Expressions, Arithmetic Precedence and associativity, Type Conversions. Managing Input and Output Operations Formatted Input, Formatted Output. [TextBook-1: Chapter 2 (S-2.1 – S-2.12)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Outline the Basic Structure and Components of C Programs. (L2)
2. Demonstrate Variables, Data Types, Operators, and Expressions. (L2)
3. Illustrate Input and Output Operations. (L2)

UNIT-II **11 Lectures**

Decision Making, Branching, Looping: Decision making with if statement, Simple if statement, The if…else statement, Nesting of if…else statement, the else.. if ladder, switch statement, the (? :) operator, the goto statement, The while statement, the do statement, the for statement, Jumps in Loops.

Arrays & Strings: One, Two-dimensional Arrays, multi-dimensional Arrays, Character Arrays. Declaration and Initialization of Strings, reading and writing of strings, string

handling functions. [TextBook-1: Chapter 3 (S-3.1 – S-3.8), TextBook-2: Chapter 13,14,15,16 (PP:215-283)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Classify Decision Making and Branching (L2)
2. Interpretation of Looping Constructs (L2)
3. Summarize Arrays and Strings (L2)

UNIT-III **10 Lectures**

Function and Dynamic Memory Allocation: Functions: Designing structured programs, declaring a function, Signature of a function, Parameters and return type of a function, passing parameters to functions, call by value, passing arrays to functions, recursion.

Introduction to Pointers, Pointer Arithmetic, Pointers for Inter-Function Communication, passing pointers to functions, call by reference, Dynamic Memory Allocation. [TextBook-1: Chapter 4 (S-4.1 – S-4.11), Chapter 5 (S-5.1 – S-5.12)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Utilize Functions (Understand and Implement Functions, Utilize Various Function Types, Advanced Function Techniques) (L3)
2. Experiment with Pointers (Basic Pointer Operations, Pointers and Data Structures) (L3)
3. Explain Advanced Pointer Usage (Pointers in Functions, Pointers to Complex Data Types) (L2)

UNIT-IV **9 Lectures**

Structure and Unions: Defining a structure and union, declaring structure variables, accessing structure members, structure initialization, copying and comparing structure variables, arrays of structures, arrays within structures, structures within structures, definition and usage of union, structures and unions using functions, size of structures and bit-fields. The Type Definition (Type def), Enumerated Types. [TextBook-1: Chapter 6 (S-6.1 – S-6.9)]

Learning Outcomes:

1. At the end of the unit, the student will be able to
2. Define Structures and Build C programs using Structures. (L3)

3. Explain Complex Data Structures. (L2)
4. Explain Unions and Bit-Fields. (L2)

UNIT-V **8 Lectures**

File handling: Introduction to Files, Modes of File operations, Text and Binary Files, Defining and opening a file, closing a file, Input/ Output operations on files, Error handling during I/O operations, random access to files and Command Line Arguments, user defined header files. [TextBook-2: Chapter 19 (PP:325-348)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Outline File Operations. (L2)
2. Summarize Error Handling and Random Access. (L2)
3. Utilize Command Line Arguments. (L3)

Text Books:

1. Brian W. Kernighan and Dennis M. Ritchie, “The C Programming Language”, 2nd Edition, 2015, Pearson Education India, ISBN: 978-93-3254-944-9.
2. Yashavant P. Kanetkar, “Let Us C”, 16th Edition, 2019, BPB Publications, ISBN: 978-93-8728-449-4.

Reference Books:

1. N. B. Venkateswarlu, E. V. Prasad, “C and Data Structures”, 1st Edition, S. Chand Publishing, 2010, ISBN: 978-93-525-3356-5.
2. Pradip Dey, Manas Ghosh, “Programming in C”, 2nd Edition, 2018, Oxford University Press, ISBN: 978-01-9949-147-6.
3. Jacqueline A. Jones and Keith Harrow, “Problem Solving with C”, Pearson Education. ISBN: 978-93-325-3800-9.
4. E. Balagurusamy, “Programming in ANSI C”, 8th Edition, 2019, McGraw Hill Education, ISBN: 978-93-5316-513-0.

Web References:

1. https://nptel.ac.in/courses/106105171
2. https://ocw.mit.edu/courses/6-087-practical-programming-in-c-january-iap-2010/pages/lecture-notes/

3. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01384323703937433634517_shared/overview
4. https://cse02-iiith.vlabs.ac.in/List%20of%20experiments.html

ELECTRICAL CIRCUITS-1

I Year B. Tech. II semester

[EEE]

Course Code: 24EE11RC03

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, the student shall be able to:

CO1: Analyse the electrical networks using mesh and nodal analysis techniques. (L2)

CO2: Analyse Electrical circuits with AC excitation. (L2)

CO3: Summarize the applications of network theorems. (L2)

CO4: Summarize the concept of resonance and understand bandwidth, Q factor, and locus diagrams. (L2)

CO5: Analyze magnetic circuits and understand the concepts of graph theory. (L2)

UNIT-I **10 Lectures**

Introduction to Electrical Circuits: concepts of electrical circuit elements and their V-I relations; source transformation and Network Simplification Techniques (Series, Parallel, Series-Parallel, Star-delta transformations), Nodal analysis method, Mesh analysis method including super node and super mesh analysis. Concept of duality and dual networks. [TextBook-1: Chapter 1 (S-1.1 – S-1.6), Chapter 2 (S-2.1 – S-2.7), Chapter 3 (S-3.1- S-3.5)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Summarize the basic electrical elements and different fundamental laws. (L2)
2. Apply the Kirchhoff's Laws in solving series, parallel, non-series-parallel configurations in DC networks. (L2)
3. Understand the principle of duality and dual networks. (L2)

UNIT-II **10 Lectures**

Single Phase A.C Circuits: Periodic and non-periodic wave forms, R.M.S, Average Values and Form Factor for Alternating Quantities – Phase and Phase Difference – Complex and Polar Forms of Representations, j-Notation, Steady State Analysis of R, L and C (In Series, Parallel and Series Parallel Combinations) with Sinusoidal Excitation. Phasor diagrams - Concept of Reactance, Impedance, Susceptance and Admittance. Power

triangle - Apparent Power, Active and Reactive Power, Concept of Power Factor Examples. [TextBook-1: Chapter 11 (S-11.1 – S-11.7) , Chapter 9 (S-9.1 – S-9.7)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Analyse the periodic and non-periodic waveforms. (L2)
2. Perform steady-state analysis of R, L, and C circuits with sinusoidal excitation. (L2)
3. Determine the power factor, reactance, impedance, and power types. (L2)

UNIT-III **10 Lectures**

Network theorems: Superposition theorem, Thevenin's theorem, Norton's theorems, Maximum power transfer theorem, Tellegen's theorem, Compensation theorem, Milliman's theorem and Reciprocity theorem. (DC & AC with dependent and independent Excitations).

[TextBook-1: Chapter 4 (S-4.1 – S-4.8), Reference Book-2: Chapter 4 (S-4.1 – S-4.10)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Analyse the circuits using theorems for DC Excitation. (L2)
2. Analyse the circuits using theorems for AC Excitation. (L2)
3. Summarize the applications of theorems. (L2)

UNIT-IV **10 Lectures**

Resonance and locus Diagrams: Series and parallel resonance circuits, concept of band width and Q factor.

Locus diagram: RL, RC, RLC with R, L and C variables. [TextBook-2: Chapter 16 (S-16.1– S-16.4)]

https://ggsestc.digimat.in/nptel/courses/video/108105065/L06.html

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand the principles of series and parallel resonance in electrical circuits. (L1)
2. Apply the resonance concepts to analyse the electrical circuits. (L2)
3. Interpret the locus diagrams for RL, RC, and RLC circuits. (L2)

UNIT-V **8 Lectures**

Coupled circuits: Concept of self and mutual inductance, Dot convention, Coefficient of coupling, Analysis of Series and Parallel Magnetic Circuits with mutual inductance.

Network Topology: Basic concepts of Graph theory, incident matrix, tie-set matrix and cut-set matrix. [TextBook-1: Chapter 13 (S-13.1 – S-13.6), Reference Book-2: Chapter 9 (S-9.1 – S-9.6), Chapter 3 (S-3.1 – S-3.8)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand the self and mutual inductance and apply the dot convention in coupled circuits. (L1)
2. Analyse series and parallel magnetic circuits with mutual inductance. (L2)
3. Apply Graph Theory to solve the electrical circuits. (L2)

Text Books:

1. Fundamentals of Electric Circuits Charles K. Alexander and Matthew. N. O. Sadiku, Mc Graw Hill, 6th Edition, 2017.
2. Engineering circuit analysis William Hayt and Jack E. Kemmerly, Mc Graw Hill Company, 8th Edition, 2012.

Reference Books:

1. Network Analysis, M. E. Van Valkenburg, Pearson Education, 2019, Revised Third Edition.
2. Circuit Theory Analysis & Synthesis A. Chakrabarti, Dhanpat Rai & Sons, 7th Revised Edition, 2018.
3. Electric Circuits (Schaum's outline Series), Mahmood Nahvi, Joseph Edminister, and K. Rao, Mc Graw Hill Education, 2010, Fifth Edition.

Web References:

1. https://archive.nptel.ac.in/courses/108/105/108105159/
2. https://nptel.ac.in/courses/108104139

THERMAL AND HYDRO PRIME MOVERS

I Year B. Tech. II semester

[EEE]

Course Code: 24EE11RC04

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Classify internal combustion engines& boilers and assess the performance. (L2)

CO2: Analyse the various Vapour Power Cycles. (L3)

CO3: Analyze the different methods for improving the efficiency of gas turbines. (L4)

CO4: Determine the forces acting on the stationary & moving vanes and summarize the operation of pumps. (L3)

CO5: Summarize the working of various types of hydraulic turbines. (L2)

UNIT-I **10 Lectures**

I.C Engines: Classification, Basic idea of IC engine, Parts in IC engine, working principle of 2-stroke & 4-Stroke engines, Valve Timing Diagram, Port Timing Diagram, Comparison of 4 Stroke & 2 Stroke engine, Petrol Engine and Diesel Engine, Engine performance evaluation.

Boilers: Classification of Boilers, Simple Vertical Boiler, Cochran Boiler, Babcockand Wilcox Boiler, Benson Boiler. Difference between Fire Tube and Water Tube Boilers, Boiler Mountings and Accessories. [Text Book-1: Chapter 23 (S-23.1 – S-23.14, S-23.39), Chapter 11 (S-11.1 – S-11.3, S-11.6-11.8), Chapter 12 (S-12.1 – S-12.3)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand the construction and working principles of 2 stroke and 4 stroke I. C engines using petrol and diesel. (L2)
2. Evaluate the performance parameters of I. C. engines. (L3)
3. Summarize the construction and working principles of fire tube and water tube boilers. (L2)

UNIT-II **10 Lectures**

Properties of Steam and use of Steam Table: T-S and H-S Diagrams. Analysis of Various Thermodynamic Processes under gone by Steam.

Vapour Power Cycles: Carnot Cycle-Rankine Cycle- Thermodynamic Variables Effecting Efficiency and output of Rankine Cycle-. Analysis of simple Rankine Cycle.

Schematic layout of steam power plant. [Text Book-1: Chapter 2 (S-2.1 – S-2.18), Chapter 15 (S-15.1 – S-15.2)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Analyse the properties of Steam by using Steam Tables- T-S and H-S Diagrams. (L3)
2. Understand the working of various vapour power cycles, layout of steam power plant. (L2)
3. Summarize the variables effecting the efficiency and output of rankine cycle (L3)

UNIT-III **10 Lectures**

Gas Turbines: Simple gas turbine plant-ideal cycle, closed cycle, open cycle-. Efficiency, Work ratio and optimum pressure ratio for simple gas turbine cycle. Actual cycle, analysis of simple cycles & cycles with inter cooling, reheating and Regeneration. [Text Book-1: Chapter 25 (S-25.1 – S-25.6)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand the working of various gas turbine plant cycles. (L2)
2. Analyse the performance parameters for gas turbine cycle. (L3)
3. Summarize the different methods for improving the efficiency of gas turbines. (L4)

UNIT-IV **10 Lectures**

Impact of Jets on Vanes: Impulse momentum equation, Impact of Jet on stationary and moving vanes (flat and curved).

Pumps: Types of pumps, Centrifugal pumps: Main components, Working principle, Multi stage pumps, Performance and Characteristic curves. [Text Book-2: Chapter 17 (S-17.1 – S-17.4.4), Chapter 19 (S-19.1 – S-19.2, S-19.6, S-19.10)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Apply impulse momentum equations to find the forces acting on the vanes. (L3)
2. Understand the working of centrifugal pump and its types. (L2)
3. Summarize the Performance Characteristics of the pumps. (L2)

UNIT-V **8 Lectures**

Hydraulic Turbines: Classifications of turbines; Working principle of Pelton turbine, Francis turbine, Kaplan turbine, Efficiency calculation, Governing of turbines,

Performance and characteristic curves, working of hydroelectric power plant. [Text Book-2: Chapter 18 (S-18.1 – S-18.9, S-18.13 – S-18.14)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand the working of hydroelectric power plant, hydraulic turbines. (L2)
2. Evaluate the performance parameters of hydraulic turbine. (L3)
3. Summarize the performance characteristics of hydraulic turbine. (L2)

Text Books:

1. Thermal Engineering by Rajput, Lakshmi publications.
2. R.K. Bansal, Fluid Mechanics and Hydraulic Machines, 10th Edition, Laxmi Publications, 2018.

Reference Books:

1. A Textbook of Thermal Engineering By RS Khurmi | JK Gupta.
2. “Hydraulics & Fluid Mechanics”, P.N. Modi and S.M. Seth, text books House, Delhi.

Web References:

1. https://onlinecourses.nptel.ac.in/noc20_me33/
2. https://archive.nptel.ac.in/courses/112/103/112103249/

COMMUNICATION SKILLS LAB

I Year B. Tech. II Semester

[Common to ECE, EEE, CSE (AI&ML)]

Course Code: 24HE11RC02

L	T	P	C
0	0	3	1.5

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Identify and pronounce the sounds of English; choose the accurate stress in connected speech for proper intonation. (L3)

CO2: Apply the main theme and ideas of the audio/video to take notes and summarize. (L3)

CO3: Develop speaking skills by taking part in Just A Minute (JAM) – Picture Prompts-Narratives-Role Play. (L3)

CO4: Practice discussions and debates. (L3)

CO5: Demonstrate Presentation Skills. (L3)

ACTIVITY-I

Introduction to Phonetics: The Sounds of English (Speech sound – vowels and consonants) - Stress and Intonation - Accent and Rhythm.

Learning Outcomes:

At the end of the unit, the student will be able to

1. Apply the knowledge of Phonetics for better pronunciation and articulation. (L3)
2. Choose appropriate stress, intonation and rhythm of English language for clear communication. (L3)

ACTIVITY-II

Listening Skills: Listening for gist and specific information - listening for Note taking, Summarizing and for opinions - Listening to the speeches of eminent personalities.

Learning Outcomes:

At the end of the unit, the student will be able to

1. Develop effective listening skills for better comprehension of academic lectures and English spoken by native speakers. (L3).
2. Apply effective strategies for good writing. (L3)
3. Demonstrate writing skills in note taking and summarizing. (L3)

ACTIVITY-III

Speaking Skills: Just A Minute (JAM) session –Picture Prompts- Narrating stories and anecdotes-Role Play

Learning Outcomes:

At the end of the unit, the student will be able to

1. Make use of dialogues for different roles. (L3)
2. Develop communication skills in formal and informal situations. (L3)
3. Practice speaking skills through participation in activities such as narrating stories and role plays(L3)

ACTIVITY-IV

Speaking skills: Group Discussions-Arguments-Debates

Learning Outcomes:

At the end of the unit, the student will be able to

1. Organize one's own ideas for various Group-Discussion formats. (L3)
2. Develop ideas and arguments to debate. (L3)

ACTIVITY-V

Presentation skills: Verbal and non-verbal communication - Body Language - Making a Presentation

Learning Outcomes:

At the end of the unit, the student will be able to

1. Design presentations with PowerPoint slides(L3)
2. Apply appropriate body language (postures, gestures, facial expressions and eye contact) in formal presentations. (L3)

LIST OF LAB ACTIVITIES:

1. Identification and pronunciation of Vowel sounds and Consonant sounds (CO1)
2. Identification of word stress, Intonation and Rhythm (CO1)
3. Listening for specific information & Note taking (CO2)
4. Listening to the speeches of eminent personalities and summarizing (CO2)
5. Just A Minute sessions (CO3)
6. Picture Prompts (CO3)
7. Narrating Stories& anecdotes (CO3)
8. Role-Plays (CO3)

9. Group Discussions (CO4)
10. Debates (CO4)
11. Presentation Skills-I (CO5)
12. Presentation Skills-II (CO5)

Reference Books:

1. Language and Life: A Skills Approach Board of Editors, Orient Black swan Publishers, India.2018.
2. A Textbook of English Phonetics for Indian Students, T.Balasubramanian, Macmillan India Ltd.
3. Ashraf Rizvi. Effective Technical Communication. Tata McGraw Hill Education Private Limited, New Delhi.
4. Speak Well. Orient Black swan Publishers, Hyderabad.
5. Allan Pease. Body Language. Manjul Publishing House, New Delhi.

Web References:

1. https://www.englishlanguageclub.co.uk
2. https://www.ted.ed.com/
3. https://learningenglish.voanews.com/
4. https://www.bbc.co.uk/learningenglish/
5. https://www.abc.net.au/education/learn-english
6. NDTV News

PROBLEM SOLVING USING C LAB

I Year B. Tech. II semester

[EEE]

Course Code: 24CT11RC04

L	T	P	C
0	0	3	1.5

Course Outcomes: At the end of the Course, the student shall be able to:

CO1: Outline the use of basic constructs of C for simple applications. (L2)

CO2: Develop C programs for simple applications using Arrays and Strings. (L3)

CO3: Illustrate concepts such as functions, recursion, and pointers with suitable examples. (L2)

CO4: Build C programs involving Structures and Unions. (L3)

CO5: Develop applications using sequential and random-access file processing. (L3)

Module-1:

1. Write a C program to demonstrate Format Specifiers and Input/Output Statements.
2. Write a C program to demonstrate various Data Types.

Module-2:

1. Write a C program to demonstrate various Operators including Bitwise Operator.
2. Write a C program to demonstrate Arithmetic Expressions and Type Casting.

Module-3:

1. Write a C program to demonstrate decision making statements.
2. Write a C program to demonstrate iterative statements.
3. Write a C program to demonstrate break and continue Statement.

Module-4:

1. Write a C program to demonstrate arrays (one-dimensional and two-dimensional).
2. Write a C program to demonstrate string handling functions using built-in and user defined functions.

Module-5:

1. Write a C program to demonstrate user defined functions.
2. Write a C program to demonstrate nested functions.

Module-6:

1. Write a C program to demonstrate arithmetic expressions using pointers.
2. Write a C program to demonstrate Pointers to Arrays.

3. Write a C program to demonstrate manipulate strings using pointers.
4. Write a C program to demonstrate dynamic memory allocation.

Module-7:

1. Write a C program to demonstrate Call-by-value, Call-by-reference.
2. Write a C program to demonstrate recursive function.
3. Write a C program to demonstrate Functions with Storage Classes (Static).

Module-8:

1. Write a C program to demonstrate structures.
2. Write a C program to demonstrate structures within structures.
3. Write a C program to demonstrate pointer to a structure.
4. Write a C program to demonstrate unions.

Module-9:

1. Write a C program to demonstrate I/O operations on files.
2. Write a C program to demonstrate concatenating two files.
3. Write a C program to demonstrate copy content of one file to another file.

Case Study: Select any one application mentioned below.

Note: A report has to be submitted by every student at the end of the semester that includes design, coding, output, etc.

1. Develop a library management system to add, delete, and search for books efficiently.
2. Develop an ATM system to check balance, deposit money, and withdraw funds.
3. Develop a C program to calculate salary increments using a lookup table which stores the percentage of increment based on the current salary.
4. Develop a voting system where users can vote for candidates and view results.
5. Develop a basic calculator for arithmetic operations like addition, subtraction, multiplication, and division.
6. Develop a contact management system to store and manage details like name, phone number, and email.
7. Develop a banking system supporting multiple users for account management and transactions.
8. Develop a C program to calculate SGPA and CGPA based on students' marks across semesters.
9. Develop a registration page in C using file handling to securely store usernames and passwords.

10. Develop an encryption and decryption algorithm to securely transform and restore data by using the GNU C Library: crypt.

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, “The C Programming Language”, 2nd Edition, 2015, Pearson Education India, ISBN: 978-93-3254-944-9.
2. Yashavant P. Kanetkar, “Let Us C”, 16th Edition, 2019, BPB Publications, ISBN: 978- 93- 8728-449-4.
3. E. Balaguruswamy, “Programming in ANSI C”, 8th Edition, 2019, McGraw Hill Education, ISBN: 978-93-5316-513-0.
4. Pradip Dey, Manas Ghosh, “Programming in C”, 2nd Edition, 2018, Oxford University Press, ISBN: 978-01-9949-147-6.
5. N.B. Venkateswarulu, “C programming”, 1st Edition, S.Chand Publishing, 2017, ISBN: 978-93-525-3356-5.
6. Jacqueline A Jones and Keith Harrow, “Problem Solving with C”, Pearson Education. ISBN: 978-93-325-3800-9.

Web References:

1. https://nptel.ac.in/courses/106105171
2. https://ocw.mit.edu/courses/6-087-practical-programming-in-c-january-iap-2010/pages/lecture-notes/
3. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013843237039374336345 17_shared/overview
4. https://cse02-iiith.vlabs.ac.in/List%20of%20experiments.html

ELECTRICAL ENGINEERING WORKSHOP

I Year B. Tech. II semester

[EEE]

Course Code: 24EE11RC05

L	T	P	C
0	0	3	1.5

Course Outcomes: At the end of the Course, the student shall be able to:

CO1: Identity, select, and troubleshoots the house wiring components. (L3)

CO2: Troubleshoot electrical appliances such as tube light, fan and domestic pump. (L3)

CO3: Develop house wiring schemes using protective equipment like MCB and ELCBs. (L3)

CO4: Design Go-down wiring /Tunnel wiring and hospital wiring schemes. (L3)

CO5: Measure the Basic Electrical Parameters using suitable instruments. (L3)

List of experiments:

1. Demonstration of electrical safety measures
2. Identification of various electrical tools and symbols
3. Identification of various electrical cables/wires, switches, fuses, fuse carriers, MCB, ELCB, RCCB, and MCCB with their specifications and use.
4. Wiring of lighting circuit using two-way control (Stair case wiring)
5. Godown wiring / tunnel wiring.
6. Hospital wiring
7. Measurement of voltage, current, power in DC circuits.
8. Wiring of power distribution arrangement using single phase MCB distribution board with ELCB, main switch and energy meter for calculating power and power factor.
9. Wiring of backup power supply for domestic installation including inverter, battery and load.
10. Troubleshooting of domestic electrical equipment's (tube light, fan)
11. Wiring and troubleshooting of domestic pump motor with DOL starter.
12. Demonstration of moving iron, moving coil, dynamometer, and induction type measuring instruments.
13. Identification of various types of resistors, and capacitors and understand the usage of digital multi-meter.

GAYATRI VIDYA PARISHAD COLLEGE OF ENGINEERING FOR WOMEN
(Autonomous)

(Approved by AICTE, New Delhi and Permanently Affiliated to Andhra University, Visakhapatnam)

Madhurawada :: Visakhapatnam – 530 048

COURSE STRUCTURE

(Applicable for the Academic Year 2024-25 onwards)

DEPARTMENT OF INFORMATION TECHNOLOGY

B.Tech. Information Technology

SCHEME AND SYLLABI

(With effect from 2024-25 admitted batch)

I Year - I Semester

Course Code	Category	Course Title	Hours per Week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
24BM11RC01	BS	Calculus and Differential Equations	3	0	30	70	100	3
24BC11RC01	BS	Green Chemistry	3	0	30	70	100	3
24HE11RC01	HSS	English	3	0	30	70	100	3
24CT11RC01	ES	Fundamentals of Computers	3	0	30	70	100	3
24CT11RC02	ES	Problem Solving using C	3	0	30	70	100	3
24HE11RC02	HSS	Communication Skills Lab	0	3	50	50	100	1.5
24CT11RC03	ES	Computer Engineering Workshop	0	3	50	50	100	1.5
24CT11RC04	ES	Problem Solving using C Lab	0	3	50	50	100	1.5
							Total Credits	**19.5**

I Year - II Semester

Course Code	Category	Course Title	Hours per Week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
24BM11RC02	BS	Linear Algebra and Vector Calculus	3	0	30	70	100	3
24BP11RC01	BS	Engineering Physics	3	0	30	70	100	3
24EC11RC05	ES	Digital Logic Design	3	0	30	70	100	3
24EC11RC04	ES	Elements of Electronics Engineering	3	0	30	70	100	3
24CT11RC06	ES	Python Programming	3	0	30	70	100	3
24BP11RC02	BS	Engineering Physics Lab	0	3	50	50	100	1.5
24CT11RC07	ES	Python Programming Lab	0	3	50	50	100	1.5
24CT11RC08	ES	Web Technologies Fundamentals Lab	0	3	50	50	100	1.5
							Total Credits	**19.5**

CALCULUS AND DIFFERENTIAL EQUATIONS

I Year B. Tech. I Semester

[Common to EEE, ECE, CSE, IT, CSE (AI&ML)]

L	T	P	C
3	0	0	3

Course Code: 24BM11RC01

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Examine the functional dependency and utilize Taylor's theorem to expand the function of two variables. (L3)

CO2: Determine extrema of multivariable functions. (L5)

CO3: Utilize double and triple integrals to evaluate areas of plane curves and the volumes of solids. (L5)

CO4: Solve the first order differential equations and higher order differential equations with constant coefficients, apply the techniques to solve problems related to various engineering fields. (L3)

CO5: Find the Laplace Transforms of various functions and apply it to solve ordinary differential Equations with initial conditions. (L3)

UNIT-I: **8 Lectures**

Partial Differentiation: Functions of two or more variables: Introduction - Partial derivatives - Total derivative - Change of variables - Jacobians – Functional dependence - Taylor's theorem for function of two variables. [Sections: 5.1, 5.2, 5.5, 5.6, 5.7, 5.9 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Examine the functional dependencies using the Jacobian. (L3)
2. Make use of Taylor's theorem to write series expansion of function of two variables. (L3)

UNIT-II: **7 Lectures**

Applications of Partial Differentiation: Maxima and minima of function of two and three variables - Constrained maximum/minimum problems using Lagrange's method of multipliers. [Sections: 5.11, 5.12 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Determine the critical points, maxima and minima of functions several variables. (L5)

UNIT-III: **11 Lectures**

Integral Calculus: Introduction - Double integrals - Change of order of integration - Double integrals in polar Coordinates - Triple integrals - Change of variables.

Applications: Area enclosed by plane curves - Volumes of solids. [Sections: 7.1 – 7.7 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Evaluate double integrals and triple integrals in Cartesian and polar coordinates also over the given region. (L5)
2. Evaluate the double integrals by change of order of integration. (L5)
3. Evaluate double and triple integrals by change of variables. (L5)
4. Determine the areas and volumes using multiple integrals. (L5)

UNIT-IV: **11 Lectures**

Differential Equations and its Applications: Exact differential equations - Equations reducible to exact equations - Solutions of higher order linear ordinary differential equations with constant coefficients - Method of variation of parameters.

Applications: Orthogonal Trajectories - Newton's law of cooling - Law of Natural growth and decay. [Sections: 11.11, 11.12, 12.3, 12.6, 12.8, 13.1 – 13.8 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Solve the first-order differential equations and higher order Linear differential equations with constant coefficients. (L3)
2. Apply the techniques to solve problems related to various engineering fields. (L3)

UNIT-V: **11 Lectures**

Laplace Transforms: Introduction - Existence conditions - Transforms of elementary functions - Properties of Laplace transforms - Transforms of derivatives - Transforms of integrals - Multiplication by t - Division by t– Evaluation of integrals by Laplace transforms - Laplace transforms of Unit step function, Unit impulse function and Laplace transforms of periodic functions - Inverse Laplace transforms - Convolution theorem - Second shifting theorem.

Applications: Laplace Transforms to ordinary differential Equations. [Sections: 21.1 – 21.5, 21.7 – 21.15, 21.17, 21.18 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Find the Laplace transform of the function. (L1)
2. Find the Inverse Laplace transform of a function. (L1)
3. Make use of convolution theorem to find the Inverse Laplace transform of a function. (L3)
4. Apply Laplace transform to solve ordinary differential equations. (L3)

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 45th Edition, Khanna Publishers, 2024.

Reference Books:

1. R K Jain and SRK Iyengar, Advanced Engineering Mathematics, Narosa Publishers, 5th Edition, 2016.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th edition, John Wiley & Sons, 2011.
3. Peter V. O'Neil, Advanced Engineering Mathematics, 7th edition, Cengage Learning, 2011.
4. Greenberg, Advanced Engineering Mathematics, 2nd Edition, Pearson, 2017.

Web References:

1. https://nptel.ac.in/courses/111104125
2. https://nptel.ac.in/courses/111105160

GREEN CHEMISTRY

I Year B. Tech. I semester
[Common to CSE, EEE, IT]

L	T	P	C
3	0	0	3

Course Code: 24BC11RC01

Course Outcomes: At the end of the Course, the student shall be able to

CO1: To develop knowledge about water and its treatment for industrial and potable purpose. (L3)

CO2: Utilize the theory of construction and discharge reactions of various types of batteries are used in commercial society. (L3)

CO3: Explain the importance of working principle, fabrication of electrodes and other components, advantages, disadvantages and environmental aspects of fuel cells. (L4)

CO4: Classify the corrosion mechanism of metals and factors influenced by rate and extent of corrosion and categorize the reasons for corrosion control methods. (L4)

CO5: Apply green chemistry technology processes the knowledge for solving existing challenges faced in various engineering and societal areas. (L5)

UNIT-I **10 Lectures**

Water-Technology: Sources of Water – Impurities and their influence of living systems – WHO Limits – Hardness and its Determination – Boiler Troubles and their removal – Water Softening Methods – Lime-Soda, Zeolite and Ion Exchange - Municipal Water Treatment-Break Point Chlorination – Desalination of Sea Water –Reverse Osmosis Method Electro-dialysis. Chemical analysis of water. [TB1: Chapter1]

Learning Outcomes:

At the end of the unit the student will be able to

1. Explain the principles of reverse osmosis (L4)
2. Compare the quality of drinking water with BIS and WHO standards (L4)
3. Illustrate problems associated with Boiler Troubles (L2)
4. Demonstrate the estimation of hardness of water (L3)

UNIT-II **10 Lectures**

Batteries: Primary batteries: The Chemistry-Types: Zinc-carbon (Leclanche type), zinc alkaline (Duracell), zinc/air batteries; Lithium primary cells and lithium-ferrous sulphide cells.

Secondary batteries: Lead acid and VRLA (valve regulated (sealed) lead acid), nickel cadmium, nickel-

zinc, nickel- metal hydride batteries, lithium-ion batteries, ultrathin lithium polymer cells. Advanced Batteries for electric vehicles, requirements of the battery – sodium-beta and redox batteries. [TB1: Chapter6]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Deduct the working mechanism of various types of cells (L5)
2. Illustrate difference between primary and secondary cells (L2)
3. List the environmental applications of Various types of batteries (L4)
4. Utilize the manufacturing methods of advanced batteries for electric vehicles (L3)

UNIT-III **8 Lectures**

Fuel Cells: Description, working principle, anodic, cathodic and cell reactions, fabrication of electrodes and other components, applications, advantages, disadvantages and environmental aspects of the following types of fuel cells: Proton Exchange Membrane Fuel Cells, alkaline fuel cells, phosphoric acid, solid oxide, molten carbonate, direct methanol fuel cells- Membranes and Fuels, Electrochemical Sensors and Optical fibres. [TB1: Chapter 6]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Explain the fundamental theories of fuel cells (L2)
2. Classify types of fuel cells (L4)
3. Make use of the various components fabrication of fuel cells (L3)
4. Distinguish the advantages, disadvantages and environmental aspects of fuel cells(L4)

UNIT-IV **10 Lectures**

Corrosion: Origin and Theory – Types of Corrosion: Chemical and Electrochemical; Pitting, inter granular, Waterline, Stress – Galvanic Series – Factors Effecting Corrosion. Corrosion Controlling Methods, Protective Coatings, Electroplating and Electroless Plating, Paints, Varnishes, Lacquers, Enamels. [TB1: Chapter 7]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Explain the Mechanism of corrosion (L4)
2. List the various types of Corrosion (L4)
3. Describe the Factors Effecting Corrosion (L5)
4. Differentiate between Paints Lacquers Enamels (L4)

UNIT-V **10 Lectures**

Green-Chemistry and Technology: Introduction and significance of green chemistry, Goals of green chemistry, 12 principles of green chemistry, toxicity of chemicals, concept of zero pollution technologies; Aqueous phase method, Super critical fluid method, Phase transfer catalytic method, atom economy, functional toxicity vs non- functional toxicity, functional group approaches to green chemistry, Elimination of toxic functional group, optimization of frameworks for the design of greener synthetic pathways -Green synthesis of Adipic acid and Paracetamol- energy minimization-Microwave synthesis, ultra sound assisted method Bio catalyzed reaction and Only explanation with examples Processes involving solid catalysts – zeolites, ion exchange resins, applications of Green Chemistry, Green solvents, green fuels & propellants. [TB2: Chapter- 2,3,4&5]

Learning Outcomes:

At the end of the unit the student will be able to

1. Processes involving Green Chemistry and apply the knowledge for solving existing
2. Challenges faced in various engineering and societal areas (L-5)
3. Differentiate between functional toxicity vs non- functional toxicity (L-4)
4. Explain the green chemistry, 12 principles (L-2)

Textbooks:

1. Engineering Chemistry – PC Jain and M. Jain –15th Edition, Dhanpath Rai and Sons, New Delhi.
2. Anastas, P. T., Warner, J. C. Green Chemistry: Theory and Practice, Oxford UniversityPress Inc., New York, 1998.

Reference Books:

1. M. Aulice Scibioh and B. Viswanathan ‘Fuel Cells – principles and applications’, University Press India (2006).
2. A Textbook of Engineering Chemistry – S. S. Dara – S. Chand & Co. New Delhi
3. Handbook of Green Chemistry and Technology; by James Clarke and Duncan Macquarrie; Blakwell Publishing.

Web References:

1. https://archive.nptel.ac.in/course.html
2. https://nptel.ac.in/courses/engineering

ENGLISH

I Year B. Tech. I Semester

[Common to CSE, IT]

L	T	P	C
3	0	0	3

Course Code: 24HE11RC01

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Develop moral values and inner peace(L3), Demonstrate the use of LSRW skills, Vocabulary and basic grammar concepts. (L3)

CO2: Identify the impact of different social backgrounds (L3), recognize the poet's insights. (L4) Demonstrate the use of LSRW skills, Vocabulary and basic grammar concepts. (L3)

CO3: Analyse socio-cultural context(L4), Establish effective interpersonal and communication skills(L3), Demonstrate the use of LSRW skills, Vocabulary and basic grammar concepts(L3)

CO4: Focus on value of education(L4), Relate to the poet's nostalgia(L4), Demonstrate the use of LSRW skills, Vocabulary and basic grammar concepts (L3)

CO5: Determine the central idea of the text(L3), Identify one's resilience(L3), Demonstrate the use of LSRW skills, Vocabulary and basic grammar concepts (L3)

UNIT-I **10 Lectures**

Prose:	Swami Vivekananda: The Secret of Work
Poetry:	Grenville Kleiser: Stay Calm
Grammar & Vocabulary:	Synonyms & Antonyms
Listening:	Listening for Context and Specific Information
Speaking:	Introducing Oneself and Others
Writing:	Basics of writing

Learning Outcomes:

At the end of the unit, the student will be able to

1. Interpret the spiritual growth and capacity building of the individual in the 21st century. (L3)
2. Use appropriate synonyms and antonyms to communicate effectively. (L3)
3. Listen and understand for specific information in the audio(L2)
4. Establish connections between oneself and others(L3)
5. Apply appropriate punctuation marks for clarity and organization of written text (L3)

UNIT-II **10 Lectures**

Prose:	Katherine Mansfield: The Doll's House
Poetry: Rabindranath Tagore:	Where the Mind Is Without Fear
Grammar & Vocabulary:	Phrasal Verbs
Listening:	Listening for Main Idea and Supporting Ideas
Speaking:	Getting Someone's Attention and Interrupting
Writing:	Formal Letters

Learning Outcomes:

At the end of the unit, the student will be able to

1. Relate to the world through adult & child's points of view (L3)
2. Identify the sense of self dignity & rationality in the poem (L4)
3. Utilize appropriate phrasal verbs for effective communication(L3)
4. Listen & identify main and supporting ideas in the audio(L3)
5. Practice conversational etiquette(L3)
6. Write formal letters(L3)

UNIT-III **10 Lectures**

Prose:	O. Henry: The Last Leaf
Poetry:	Rudyard Kipling: If
Grammar & Vocabulary:	Idiomatic Expressions
Listening:	Listening for Global Comprehension
Speaking:	Asking for Information and Giving Information
Writing:	Note-Making

Learning Outcomes:

At the end of the unit, the student will be able to:

1. Analyze strategies to face challenges in life (L4)
2. Develop one's own personality (L3)
3. Use idiomatic expressions in oral & written communication (L3)
4. Listen & Interpret the audio for Global Comprehension (L3)
5. Ask & provide information (L3)
6. Practice note making study skills(L3)

UNIT-IV **10 Lectures**

Prose:	Francis Bacon: Of Studies
Poetry:	Toru Dutt: Our Casuarina Tree
Grammar & Vocabulary:	Remedial Grammar I
Listening:	Listening to Make Inferences
Speaking:	Expressing Opinions, and Agreeing and Disagreeing with Opinions
Writing:	Essay Writing

Learning Outcomes:

At the end of the unit, the student will be able to

1. Prioritize the habits of continuous learning(L4)
2. Recognize the significance of Indian philosophy (L4)
3. Identify and correct common errors in English grammar and usage(L3)
4. Draw inferences from the audio(L3)
5. Articulate one's own opinions(L3)
6. Develop different types of essays (DEAN)(L3)

UNIT-V **8 Lectures**

Prose:	Mark Twain: Whitewashing the Fence
Poetry:	William Ernest Henley: Invictus
Grammar & Vocabulary:	Remedial Grammar II
Listening:	Listening for Key Ideas
Speaking:	Telephone Etiquette
Writing:	E-mail Etiquette

Learning Outcomes:

At the end of the unit, the student will be able to

1. Discover the humour & moral lessons in the text (L3)
2. Show resilience in adverse situations. (L3)
3. Modify sentences with appropriate grammar, vocabulary and usage (L3)
4. Identify key ideas (L3)
5. Practice telephone Etiquette (L3)
6. Apply the knowledge of E-mail Etiquette (L3)

Text Books:

1. English for Engineers: Theory to practice. Board of Editors, Orient Black Swan Publishers, India.2024.

Reference Books:

1. English Grammar in Use by Raymond Murphy
2. Oxford English Grammar Course by Michael Swan
3. Word Power Made Easy by Norman Lewis
4. Cambridge Vocabulary for IELTS by Pauline Cullen
5. The Elements of Style by William Strunk Jr. and E.B. White
6. English Vocabulary in Use by Michael McCarthy and Felicity O'Dell
7. Practical English Usage by Michael Swan
8. The Only Grammar Book You'll Ever Need by Susan Thurman
9. Advanced English Grammar: A Linguistic Approach by Ilse Depraetere and Chad Langford

FUNDAMENTALS OF COMPUTERS

I Year B. Tech. I semester
[Common to CSE, CSE (AI&ML), IT]

L	T	P	C
3	0	0	3

Course Code: 24CT11RC01

Course Outcomes: At the end of the Course, the student shall be able to:

CO1: Identify different I/O devices and their usage. (L3)

CO2: Compare different computer memory with their efficiency. (L3)

CO3: Relate different computer software's and programming languages for solving problems. (L2)

CO4: Summarize the use of operating system, database system, and computer network in the field of computing in engineering. (L2)

CO5: Infer the methods and applications of artificial intelligence (AI), machine learning (ML) and data science. (L3)

UNIT-I **10 Lectures**

Introduction to Computers: Computers, Stored Program Concept, Classification of Computers, Evolution and Development of Computers, Application Areas of Computers, Features/Characteristics of Computers, Basic Organization of a Computer.

Input and Output Devices: Input Devices, Output Devices, Soft Copy Devices, Hard Copy Devices, Voice Response Systems, Biometric Devices [TextBook-1: Chapter 1 (S-1.1 – S-1.7)]

https://oer-studentresources.gesci.org/wp-content/courses/Computer/CS-F1-Introduction-to-computers/evolution_and_development_of_computers.html (Development of Computers) [TextBook-1: Chapter 2 (S-2.1 – S-2.6)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Outline characteristics and classification of computers (L2)
2. Demonstrate different configurations of software and hardware used in computer (L2)
3. Model the computer by organizing different computer peripherals such as I/O, CPU, etc. (L3)

UNIT-II **10 Lectures**

Computer Memory: Introduction, Memory Organization, Memory Hierarchy, Sequential and Random Access, Processor Registers, Cache Memory, Primary Memory, Secondary Storage Devices, Magnetic Tapes, Floppy Disks, Hard Disks, External Hard Disks, Optical Disks, USB Flash Drives, Memory Cards, Mass Storage Devices. [TextBook-1: Chapter 3 (S-3.1 – S-3.16)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Summarize computer memory hierarchy. (L2)
2. Classify different memory with respect to speed and cost. (L2)
3. Illustrate different external storage devices and its applications. (L2)

UNIT-III **10 Lectures**

Computer Software: Introduction to Computer Software, Classification of Computer Software, System Software, Application software, Graphics Software, Multimedia Software, Database Management Software, Firmware, Middleware, Procuring Computer Software.

Problem Solving using Computers: Introduction, Program Development Life Cycle, Program Design Tools, Programming Languages, Generations of Programming Languages, Categorization of High-level Languages, Some Popular High-level Languages, Apps. [TextBook-1: Chapter 6 (S-6.1 – S-6.7), TextBook-1: Chapter 7 (S-7.1 – S-7.7)]

https://www.builder.ai/glossary/app#:~:text=An%20app%20is%20a%20type,enhance%20productivity%20and%20streamline%20communication (Apps)

Learning Outcomes:

At the end of the unit, the student will be able to

1. Compare different computer software's (L2)
2. Summarize different programming languages for solving problems. (L2)
3. Contrast Structured Programming Language, Logic-oriented Programming Language, and Object-oriented Programming. (L2)

UNIT-IV **10 Lectures**

Fundamental Operating Systems: Introduction, History of Operating Systems, Functions of Operating Systems, Types of Operating Systems, Providing User Interface, Popular Operating Systems

Database Systems: File-Oriented Approach, Database-oriented Approach, Database Views, Three-schema Architecture, Database Models, Components of Database Management, Retrieving Data Through Queries.

Computer Networks: Introduction to Computer Networks, Types of Networks, Physical Components of a Network, Wired Media, Wireless Media, Networking Devices, Network Topologies, Wireless Networks. [TextBook-2: Chapter 11 (S-11.1 / P-238 – S-11.11 / P-258), TextBook-1: Chapter 9 (S-9.1 – S-9.7), Chapter 10 (S-10.1 – S-10.8)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Explain fundamentals of operating systems. (L2)
2. Illustrate database system applications and its design concepts. (L2)

3. Outline fundamentals of computer networks and its applications. (L2)

UNIT-V **8 Lectures**

Introduction to Artificial Intelligence & Machine Learning (AI&ML) and Data Science: Introduction to AI & ML, and Data Science, Use Cases in Business and Scope, Modelling Concepts, CRISP-DM Method.

1. https://community.aws/content/2drbbXokwrIXivItJ8ZeCk3gT5F/introduction-to-artificial-intelligence-and-machine-learning?lang=en (Artificial Intelligence)
2. https://www.javatpoint.com/machine-learning-models (Machine Learning)
3. https://www.techtarget.com/searchenterpriseai/feature/Top-12-machine-learning-use-cases-and-business-applications (Machine Learning)
4. https://www.heavy.ai/learn/data-science (Data Science)
5. https://www.sv-europe.com/crisp-dm-methodology/ (CRISP-DM Method)

Learning Outcomes:

At the end of the unit, the student will be able to

1. Outline the main methods and applications of artificial intelligence (AI) concepts. (L2)
2. Outline the main methods and applications of machine learning (ML) concepts. (L2)
3. Outline the main methods and applications of data science concepts. (L2)

Textbooks:

1. Reema Thareja, Fundamentals of Computers, Second Edition, Oxford University Press, 2019.
2. E Balagurusamy, Fundamentals of Computers, Tata McGraw Hill Education Private Limited, 2009

Reference Books:

1. Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems, 4th Edition, McGraw-Hill, 2002.
2. Andrew S. Tanenbaum, Modern Operating Systems, 2nd edition, PHI, 1995.

Web References:

1. https://oer-studentresources.gesci.org/wp-content/courses/Computer/CS-F1-Introduction-to-computers/evolution_and_development_of_computers.html (Development of Computers)
2. https://www.builder.ai/glossary/app#:~:text=An%20app%20is%20a%20type,enhance%20productivity%20and%20streamline%20communication (Apps)
3. https://www.geeksforgeeks.org/what-is-an-operating-system/ (Operating System)
4. https://www.javatpoint.com/computer-network-tutorial (Computer Network)
5. https://community.aws/content/2drbbXokwrIXivItJ8ZeCk3gT5F/introduction-to-artificial-intelligence-and-machine-learning?lang=en (Artificial Intelligence)
6. https://www.javatpoint.com/machine-learning-models (Machine Learning)

7. https://www.techtarget.com/searchenterpriseai/feature/Top-12-machine-learning-use-cases-and-business-applications (Machine Learning)
8. https://www.heavy.ai/learn/data-science (Data Science)
9. https://www.sv-europe.com/crisp-dm-methodology/ (CRISP-DM Method)

PROBLEM SOLVING USING C

I Year B. Tech. I semester

[Common to CSE, CSE (AI&ML), IT, ECE]

L	T	P	C
3	0	0	3

Course Code: 24CT11RC02

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Explain the basic constructs of C through the use of simple applications. (L2)

CO2: Demonstrate the utilization of arrays and strings in the development of C programs. (L2)

CO3: Utilize functions and pointers to construct various applications in C. (L3)

CO4: Apply concepts of structures and unions to build and implement C applications. (L3)

CO5: Develop applications using sequential and random-access file processing techniques. (L3)

UNIT-I **10 Lectures**

Introduction to C: Basic structure of C program, Constants, Variables and data types, Operators and Expressions, Arithmetic Precedence and associativity, Type Conversions. Managing Input and Output Operations Formatted Input, Formatted Output. [TextBook-1: Chapter 2 (S-2.1 – S-2.12)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Outline the Basic Structure and Components of C Programs. (L2)
2. Demonstrate Variables, Data Types, Operators, and Expressions. (L2)
3. Illustrate Input and Output Operations. (L2)

UNIT-II **11 Lectures**

Decision Making, Branching, Looping: Decision making with if statement, Simple if statement, The if…else statement, Nesting of if…else statement, the else.. if ladder, switch statement, the (? :) operator, the goto statement, The while statement, the do statement, the for statement, Jumps in Loops.

Arrays & Strings: One, Two-dimensional Arrays, multi-dimensional Arrays, Character Arrays. Declaration and Initialization of Strings, reading and writing of strings, string handling functions. [TextBook-1: Chapter 3 (S-3.1 – S-3.8), TextBook-2: Chapter 13,14,15,16 (PP:215-283)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Classify Decision Making and Branching (L2)
2. Interpretation of Looping Constructs (L2)
3. Summarize Arrays and Strings (L2)

UNIT-III **10 Lectures**

Function and Dynamic Memory Allocation: Functions: Designing structured programs, declaring a function, Signature of a function, Parameters and return type of a function, passing parameters to functions, call by value, passing arrays to functions, recursion.

Introduction to Pointers, Pointer Arithmetic, Pointers for Inter-Function Communication, passing pointers to functions, call by reference, Dynamic Memory Allocation. [TextBook-1: Chapter 4 (S-4.1 – S-4.11), Chapter 5 (S-5.1 – S-5.12)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Utilize Functions (Understand and Implement Functions, Utilize Various Function Types, Advanced Function Techniques) (L3)
2. Experiment with Pointers (Basic Pointer Operations, Pointers and Data Structures) (L3)
3. Explain Advanced Pointer Usage (Pointers in Functions, Pointers to Complex Data Types) (L2)

UNIT-IV **9 Lectures**

Structure and Unions: Defining a structure and union, declaring structure variables, accessing structure members, structure initialization, copying and comparing structure variables, arrays of structures, arrays within structures, structures within structures, definition and usage of union, structures and unions using functions, size of structures and bit-fields. The Type Definition (Type def), Enumerated Types. [TextBook-1: Chapter 6 (S-6.1 – S-6.9)]

Learning Outcomes:

1. At the end of the unit, the student will be able to
2. Define Structures and Build C programs using Structures. (L3)
3. Explain Complex Data Structures. (L2)
4. Explain Unions and Bit-Fields. (L2)

UNIT-V **8 Lectures**

File handling: Introduction to Files, Modes of File operations, Text and Binary Files, Defining and opening a file, closing a file, Input/ Output operations on files, Error handling during I/O operations, random access to files and Command Line Arguments, user defined header files. [TextBook-2: Chapter 19 (PP:325-348)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Outline File Operations. (L2)
2. Summarize Error Handling and Random Access. (L2)
3. Utilize Command Line Arguments. (L3)

Text Books:

1. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, 2015, Pearson Education India, ISBN: 978-93-3254-944-9.
2. Yashavant P. Kanetkar, "Let Us C", 16th Edition, 2019, BPB Publications, ISBN: 978-93-8728-449-4.

Reference Books:

1. N. B. Venkateswarlu, E. V. Prasad, "C and Data Structures", 1st Edition, S. Chand Publishing, 2010, ISBN: 978-93-525-3356-5.
2. Pradip Dey, Manas Ghosh, "Programming in C", 2nd Edition, 2018, Oxford University Press, ISBN: 978-01-9949-147-6.
3. Jacqueline A. Jones and Keith Harrow, "Problem Solving with C", Pearson Education. ISBN: 978-93-325-3800-9.
4. E. Balagurusamy, "Programming in ANSI C", 8th Edition, 2019, McGraw Hill Education, ISBN: 978-93-5316-513-0.

Web References:

1. https://nptel.ac.in/courses/106105171
2. https://ocw.mit.edu/courses/6-087-practical-programming-in-c-january-iap-2010/pages/lecture-notes/
3. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013843237039374336345 17_shared/overview
4. https://cse02-iiith.vlabs.ac.in/List%20of%20experiments.html

COMMUNICATION SKILLS LAB

I Year B. Tech. I semester

[Common to CSE, IT]

Course Code: 24HE11RC02

L	T	P	C
0	0	3	1.5

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Identify and pronounce the sounds of English; choose the accurate stress in connected speech for proper intonation. (L3)

CO2: Apply the main theme and ideas of the audio/video to take notes and summarize. (L3)

CO3: Develop speaking skills by taking part in Just A Minute (JAM) – Picture Prompts-Narratives-Role Play. (L3)

CO4: Practice discussions and debates. (L3)

CO5: Demonstrate Presentation Skills. (L3)

ACTIVITY-I

Introduction to Phonetics: The Sounds of English (Speech sound – vowels and consonants) - Stress and Intonation - Accent and Rhythm.

Learning Outcomes:

At the end of the unit, the student will be able to

1. Apply the knowledge of Phonetics for better pronunciation and articulation. (L3)
2. Choose appropriate stress, intonation and rhythm of English language for clear communication. (L3)

ACTIVITY-II

Listening Skills: Listening for gist and specific information - listening for Note taking, Summarizing and for opinions - Listening to the speeches of eminent personalities.

Learning Outcomes:

At the end of the unit, the student will be able to

1. Develop effective listening skills for better comprehension of academic lectures and English spoken by native speakers. (L3).
2. Apply effective strategies for good writing. (L3)
3. Demonstrate writing skills in note taking and summarizing. (L3)

ACTIVITY-III

Speaking Skills: Just A Minute (JAM) session –Picture Prompts- Narrating stories and anecdotes-Role Play

Learning Outcomes:

At the end of the unit, the student will be able to

1. Make use of dialogues for different roles. (L3)
2. Develop communication skills in formal and informal situations. (L3)
3. Practice speaking skills through participation in activities such as narrating stories and role plays(L3)

ACTIVITY-IV

Speaking skills: Group Discussions-Arguments-Debates

Learning Outcomes:

At the end of the unit, the student will be able to

1. Organize one's own ideas for various Group-Discussion formats. (L3)
2. Develop ideas and arguments to debate. (L3)

ACTIVITY-V

Presentation skills: Verbal and non-verbal communication - Body Language - Making a Presentation

Learning Outcomes:

At the end of the unit, the student will be able to

1. Design presentations with PowerPoint slides(L3)
2. Apply appropriate body language (postures, gestures, facial expressions and eye contact) in formal presentations. (L3)

LIST OF LAB ACTIVITIES:

1. Identification and pronunciation of Vowel sounds and Consonant sounds (CO1)
2. Identification of word stress, Intonation and Rhythm (CO1)
3. Listening for specific information & Note taking (CO2)
4. Listening to the speeches of eminent personalities and summarizing (CO2)
5. Just A Minute sessions (CO3)
6. Picture Prompts (CO3)
7. Narrating Stories& anecdotes (CO3)
8. Role-Plays (CO3)
9. Group Discussions (CO4)

10. Debates (CO4)
11. Presentation Skills-I (CO5)
12. Presentation Skills-II (CO5)

Reference Books:

1. Language and Life: A Skills Approach Board of Editors, Orient Black swan Publishers, India.2018.
2. A Textbook of English Phonetics for Indian Students, T.Balasubramanian, Macmillan India Ltd.
3. Ashraf Rizvi. Effective Technical Communication. Tata McGraw Hill Education Private Limited, New Delhi.
4. Speak Well. Orient Black swan Publishers, Hyderabad.
5. Allan Pease. Body Language. Manjul Publishing House, New Delhi.

Web References:

1. https://www.englishlanguageclub.co.uk
2. https://www.ted.ed.com/
3. https://learningenglish.voanews.com/
4. https://www.bbc.co.uk/learningenglish/
5. https://www.abc.net.au/education/learn-english
6. NDTV News

COMPUTER ENGINEERING WORKSHOP

I Year B. Tech. I semester
[Common to CSE, CSE (AI&ML), IT]

Course Code: 24CT11RC03

L	T	P	C
0	0	3	1.5

Course Outcomes: At the end of the Course, the student shall be able to:

CO1: Identify the peripherals of a computer. (L3)

CO2: Demonstrate the installation process of operating systems like MS Windows, LINUX. (L3)

CO3: Make use of MS-Office suite that comprises of various applications to create documents, organizes & analyses data and captivating presentations. (L3)

CO4: Categorize various UNIX/LINUX Commands to work on a modern operating system. (L3)

CO5: Experiment with GIT Commands and make use of LaTeX to prepare research articles. (L3)

Module-1: Hardware Concepts

1. Identify the peripherals of a computer, components in a CPU and its functions.
2. Draw the block diagram of the CPU along with the configuration of each peripheral.
3. Disassemble and assemble the PC back to working condition.

Module-2: Software Installations

1. Install operating systems like LINUX and MS windows on a personal computer.
2. The system should be configured as dual boot with both MS windows and LINUX.

Module-3: Office Suite

1. Creating Documents: Formatting Fonts/Texts, page layout, Applying Text effects, Character Spacing, Borders and Colours, Inserting Header and Footer, equation editor.
2. Spreadsheet Orientation: Accessing, overview of toolbars, saving spreadsheet files, Using help and resources. Creating a Scheduler, Gridlines, Format Cells, Summation, auto fill, Formatting Text, Renaming and Inserting worksheets, Hyper linking.
3. Excel Calculation: Calculating Average, Cell Referencing, Excel Formula, std. deviation, Charts, Count Function, Sorting, Conditional formatting, Excel Advanced-sumif, VLOOKUP, and Pivot Table.
4. Creating Power Point: Student should work on basic power point utilities and tools to create basic power point presentation. PPT Orientation, Slide Layouts, Inserting Text, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows, Hyperlinks, Inserting Images, Tables and charts.
5. Software as a service (SaaS): Usage of online office suite.

Module-4: Unix / Linux Commands

1. Study and practice on file system, handling files with commands, syntax, usage, application.
2. Practice on vi editor.
3. Study and practice on shells/shell programming with relevant programming constructs, syntax, usage, application.

Module-5: GIT Commands and LaTeX

1. Installation of GIT, Branch in Git Basic GIT Commands.
2. Installation of LaTeX and preparing research articles by creating overleaf account.
3. Introduction to Scratch Programming - Introduction, Stage, Sprite, Script, Block Palette.

Reference Books:

1. IT Essentials: PC Hardware and Software Companion Guide, Third Edition, David Anfinson, Ken Quamme.
2. UNIX concepts and applications by Sumitabha Das, TMH Publications.
3. Shell programming by Yashwanth Kanetkar.

Web References:

1. https://www.javatpoint.com/

PROBLEM SOLVING USING C LAB

I Year B. Tech. I semester

[Common to CSE, CSE (AI&ML), IT, ECE]

Course Code: 24CT11RC04

L	T	P	C
0	0	3	1.5

Course Outcomes: At the end of the Course, the student shall be able to:

CO1: Outline the use of basic constructs of C for simple applications. (L2)

CO2: Develop C programs for simple applications using Arrays and Strings. (L3)

CO3: Illustrate concepts such as functions, recursion, and pointers with suitable examples. (L2)

CO4: Build C programs involving Structures and Unions. (L3)

CO5: Develop applications using sequential and random-access file processing. (L3)

Module-1:

1. Write a C program to demonstrate Format Specifiers and Input/Output Statements.
2. Write a C program to demonstrate various Data Types.

Module-2:

1. Write a C program to demonstrate various Operators including Bitwise Operator.
2. Write a C program to demonstrate Arithmetic Expressions and Type Casting.

Module-3:

1. Write a C program to demonstrate decision making statements.
2. Write a C program to demonstrate iterative statements.
3. Write a C program to demonstrate break and continue Statement.

Module-4:

1. Write a C program to demonstrate arrays (one-dimensional and two-dimensional).
2. Write a C program to demonstrate string handling functions using built-in and user defined functions.

Module-5:

1. Write a C program to demonstrate user defined functions.
2. Write a C program to demonstrate nested functions.

Module-6:

1. Write a C program to demonstrate arithmetic expressions using pointers.
2. Write a C program to demonstrate Pointers to Arrays.
3. Write a C program to demonstrate manipulate strings using pointers.
4. Write a C program to demonstrate dynamic memory allocation.

Module-7:

1. Write a C program to demonstrate Call-by-value, Call-by-reference.
2. Write a C program to demonstrate recursive function.
3. Write a C program to demonstrate Functions with Storage Classes (Static).

Module-8:

1. Write a C program to demonstrate structures.
2. Write a C program to demonstrate structures within structures.
3. Write a C program to demonstrate pointer to a structure.
4. Write a C program to demonstrate unions.

Module-9:

1. Write a C program to demonstrate I/O operations on files.
2. Write a C program to demonstrate concatenating two files.
3. Write a C program to demonstrate copy content of one file to another file.

Case Study: Select any one application mentioned below.

Note: A report has to be submitted by every student at the end of the semester that includes design, coding, output, etc.

1. Develop a library management system to add, delete, and search for books efficiently.
2. Develop an ATM system to check balance, deposit money, and withdraw funds.
3. Develop a C program to calculate salary increments using a lookup table which stores the percentage of increment based on the current salary.
4. Develop a voting system where users can vote for candidates and view results.
5. Develop a basic calculator for arithmetic operations like addition, subtraction, multiplication, and division.
6. Develop a contact management system to store and manage details like name, phone number, and email.
7. Develop a banking system supporting multiple users for account management and transactions.
8. Develop a C program to calculate SGPA and CGPA based on students' marks across semesters.
9. Develop a registration page in C using file handling to securely store usernames and passwords.
10. Develop an encryption and decryption algorithm to securely transform and restore data by using the GNU C Library: crypt.

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, 2015, Pearson Education India, ISBN: 978-93-3254-944-9.
2. Yashavant P. Kanetkar, "Let Us C", 16th Edition, 2019, BPB Publications, ISBN: 978- 93- 8728-449-4.
3. E. Balaguruswamy, "Programming in ANSI C", 8th Edition, 2019, McGraw Hill Education, ISBN: 978-93-5316-513-0.
4. Pradip Dey, Manas Ghosh, "Programming in C", 2nd Edition, 2018, Oxford University Press, ISBN: 978-01-9949-147-6.
5. N.B. Venkateswarulu, "C programming", 1st Edition, S.Chand Publishing, 2017, ISBN: 978-93-525-3356-5.
6. Jacqueline A Jones and Keith Harrow, "Problem Solving with C", Pearson Education. ISBN: 978-93-325-3800-9.

Web References:

1. https://nptel.ac.in/courses/106105171
2. https://ocw.mit.edu/courses/6-087-practical-programming-in-c-january-iap-2010/pages/lecture-notes/
3. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013843237039374336345 17_shared/overview
4. https://cse02-iiith.vlabs.ac.in/List%20of%20experiments.html

LINEAR ALGEBRA AND VECTOR CALCULUS

I Year B. Tech. II Semester

[Common to EEE, ECE, CSE, IT, CSE (AI&ML)]

Course Code: 24BM11RC02

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Test for consistency and solve linear system of equations, also determine unknown currents in the electrical circuits. (L5)

CO2: Find the Eigen values and Eigen vectors of a matrix and apply Cayley- Hamilton theorem to find the inverse of a matrix. (L3)

CO3: Reduce quadratic form to canonical form and examine the nature of quadratic form. (L4)

CO4: Interpret the meaning and evaluate gradient of a scalar valued, curl and divergence of vector valued functions. (L5)

CO5: Apply line integrals, surface integrals, volume integrals and their relations using Green's theorem, Stoke's theorem, Gauss Divergence theorems in various engineering applications. (L3)

UNIT-I: **10 Lectures**

Matrix Algebra: Rank of a matrix- Echelon form, Normal Form - Solution of Linear System of Equations - Consistency of Linear System of Equations – Gauss elimination and Gauss Jordan methods, LU Factorization method.

Applications: Finding the current in electrical circuits. [Sections: 2.7, 2.10, 28.6 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Find the rank of a matrix. (L1)
2. Test for consistency and solve a system of linear equations. (L4)
3. Apply Gauss elimination and Gauss Jordan methods, LU factorization to solve linear systems. (L3)
4. Determine unknown currents in electrical circuits. (L5)

UNIT-II: **10 Lectures**

Eigen Values and Eigen Vectors: Eigen Values and Eigen Vectors of a real Matrix – Properties - Cayley- Hamilton theorem (without proof) - Inverse and Powers of a Matrix using Cayley-Hamilton's theorem – Pseudo inverse of a matrix, Singular value decomposition. [Sections: 2.13 - 2.15 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Find eigenvalues and corresponding eigenvectors of a matrix. (L1)
2. Apply Cayley-Hamilton theorem to find powers and the inverse of a matrix. (L3)
3. Calculate the Pseudo Inverse of a matrix. (L3)
4. Calculate the singular values of a matrix. (L3)

UNIT-III: **9 Lectures**

Quadratic Forms: Inner Product – Orthogonal Vectors – Orthogonal matrix – Diagonalization of a Matrix-Quadratic Forms - Reduction of Quadratic Form to Canonical Form (Orthogonal Transformation) - Nature of a Quadratic Form. [Sections: 2.16 - 2.18 of Textbook]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Make use of Eigen values and eigen vectors to diagonalize the matrix. (L3)
2. Reduce the Quadratic form to canonical form examine the nature of a quadratic form. (L4)

UNIT-IV: Vector Differentiation **9 Lectures**

Introduction - Scalar and Vector point functions, General rules for vector differentiation - Vector operator ∇ applied to scalar point functions- Gradient, ∇ applied to vector point functions- divergence and curl. Physical interpretation of gradient, divergence and curl(i.e., ∇f, $\nabla . \overline{F}$, $\nabla \times \overline{F}$), Irrotational and Solenoidal fields, Vector Identities. [Sections: 8.1, 8.4 - 8.9 of Text Book]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Find the gradient of a scalar point function, divergence and curl of a vector point function. (L1)
2. Determine the directional derivative of scalar point function. (L5)

UNIT-V: Vector Integration **10 Lectures**

Integration of vectors - Line integral – Circulation - work done - surface integral-flux - Green's theorem in the plane - Stoke's theorem - Volume integral - Gauss Divergence theorem (All theoremswithout proofs). [Sections: 8.10 - 8.16, 8.18 of Text Book]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Determine the work done in a moving particle along a path. (L5)
2. Interpret surface and volume integrals. (L2)

3. Apply vector integral theorems to multiple integral. (L3)

Textbooks:

1. B. S. Grewal, Higher Engineering Mathematics, 45th Edition, Khanna Publishers, 2024.

Reference Books:

1. David Poole, Linear Algebra- A modern introduction, 4th edition, 2015.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th edition, John Wiley & Sons, 2011.
3. Peter V. O'Neil, Advanced Engineering Mathematics, 7th edition, Cengage Learning, 2011.
4. Greenberg, Advanced Engineering Mathematics, 2nd Edition, Pearson, 2017.

Web References:

1. https://nptel.ac.in/courses/111107112

ENGINEERING PHYSICS

I Year B. Tech. II Semester

[Common to CSE, IT]

L	T	P	C
3	0	0	3

Course Code: 24BP11RC01

Course Outcomes: At the end of the Course, the student shall be able to:

CO1: Apply the principles of interference, diffraction, and polarization in wave optics, and utilize optical instruments for practical applications. (L3)

CO2: Familiarize the basic concepts of Thermodynamics relevant to engineering applications. (L2)

CO3: Outline the knowledge of basic principles of Electromagnetism and EM Waves. (L2)

CO4: Describe the basic principles of lasers, optical fibres and their use in technological applications. (L2)

CO5: Understand the basic principles of Quantum mechanics, Quantum computing. (L2)

UNIT-I **10 Lectures**

Interference: Principle of superposition, Young's Experiment (qualitative treatment), Coherence, Interference in thin films (reflected light), Newton's Rings, Michelson's Interferometer and its applications (thickness of thin sheet, determination of wavelength).

Diffraction: Introduction, Differences between Interference and Diffraction, Differences between Fresnel and Fraunhoffer diffraction, Fraunhoffer diffraction at a single slit (Qualitative and Quantitative treatment)

Polarization: Introduction - types of Polarization. Polarization by reflection, Brewster's law, refraction and double refraction in uniaxial crystals, Nicol Prism, Quarter wave plate and Half wave plate, Applications of Polarization.

Text Book 1: 5.16,5.17,5.18, 5.20, 6.1, 6.2, 6.8.(1-3), 6.11, 6.13, 6.14.1, 6.14.3, 7.1, 7.2, 7.3, 7.4, 7.5, 8.1, 8.2,8.5, 8.6,8.11,8.12, 8.16,8.20.

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand the principles of interference patterns and apply Michelson's Interferometer to measure physical quantities such as thickness and wavelength. (L2)
2. Distinguish between interference and diffraction and perform qualitative and quantitative analysis of Fraunhoffer diffraction at a single slit. (L2)
3. Apply polarization concepts through various optical devices to explore and solve problems related to polarized light. (L3)

UNIT-II **7 Lectures**

Thermodynamics: Heat and Work, First law of thermodynamics and its applications, Reversible and Irreversible process, Carnot cycle and Efficiency, Second law of thermodynamics, Carnot's Theorem, Entropy, Second law in terms of Entropy, Entropy and disorder, Third law of thermodynamics (statement only). [TextBook-1: 16.3,16.5.1,16.6,16.8,16.11,16.12,16.14,16.16,16.17, 16.17.1, 16.18]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Apply the first and second laws of thermodynamics to analyse energy transformations and process efficiencies. (L3)
2. Understand the Carnot cycle and its efficiency and calculate entropy changes to explain thermodynamic processes. (L2)
3. Differentiate between reversible and irreversible processes and relate entropy to disorder. (L2)
4. State the third law of thermodynamics and understand its implications for materials at absolute zero. (L2)

UNIT-III **11 Lectures**

Electromagnetism: Concept of electric flux, Gauss' law, applications of Gauss' law (wire, sheet, sphere), Magnetic Field, Gauss' law in magnetostatics, Faraday's law of induction, Lenz's law, Induced magnetic fields, Displacement current, Maxwell's equations (no derivation, qualitative treatment), Electromagnetic wave equations, Introduction to EM waves, The Biot-Savart's law, magnetic field near a long wire, magnetic field for a circular Current loop, Ampere's law. [TextBook-1: 2.12,2.14,2.18, 3.5, 3.8, 3.9,3.12, 3.13,3.14, 3.10, 3.12, 3.3,3.4]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Apply Gauss's law and Faraday's law of induction to solve problems involving electric and magnetic fields. (L3)
2. Use Maxwell's equations to understand electromagnetic wave phenomena. (L2)
3. Analyse magnetic fields using Biot-Savart's law, Ampere's law, and apply e magnetostatic field distributions. (L3)

UNIT-IV **10 Lectures**

Lasers: Characteristics of laser beam, Spontaneous and stimulated emission of radiation, population inversion, Ruby laser, He-Ne laser, Semiconductor laser (homojunction), Applications of lasers.

Optical fibres: principle of propagation of light in optical fibres, Acceptance Angle and cone of a fibre, Numerical aperture, Modes of propagation, Classification of fibres based on refractive index profile and modes, Losses in optical fibres- scattering and bending losses, Fibre optics in communication- Block diagram, Applications of optical fibres. [TextBook-1: 24.12, 24.2, 24.5,24.6, 24.7, 24.11.1, 24.11.3, 24.11.5.1, 24.13, 10.2, 10.3, 10.4, 10.5, 10.6, 10.10, 10.11, 10.19,10.20 (only for list of applications]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand the principles of laser operation, including spontaneous and stimulated emission, and analyse various types of lasers such as Ruby, He-Ne, and Semiconductor lasers. (L2)
2. Describe the fundamentals of optical fibre technology, including light propagation, acceptance angle, numerical aperture, and classification of fibres. (L2)
3. Apply these concepts to fibre optics communication systems and explore their practical applications. (L2)

UNIT-V **10 Lectures**

Quantum Physics: de Broglie concept of matter waves, Heisenberg's uncertainty principle, Schrödinger time independent wave equation, Physical significance of wave function, particle in a one-dimensional box.

Quantum Computing Quantum bits, Introduction to Pauli spin matrices, Bloch sphere, Entanglement, Qubit Vs classical bit, Single Qubit gates, Quantum Teleportation – Basic Idea. [Textbook-1 20.5, 20.11, 20.17, 20.18, 20.22; Textbook -3 Sec 1.8, 1.9, 1.10.1]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand the concepts quantum mechanics such as the de Broglie wavelength and Heisenberg's uncertainty principle and use the Schrödinger equation (L2).
2. Describe the fundamentals of quantum computing (L2)

Textbooks:

1. M. N. Avadhanulu, P. G. Kshirsagar, and T. V. S. Arun Murthy, A textbook of Engineering Physics, 11th edition, S. Chand and Company Ltd., 2019.
2. H. K. Malik and A. K. Singh, Engineering Physics, 2nd Edition, McGraw Hill Education Pvt Ltd. ,2018.
3. P.K. Palanisamy, Engineering Physics, SCITECH Publications, 2011.

Reference Books:

1. Modern Engineering Physics by A.S. Vasudeva S. Chand and Company Ltd., 2010
2. University Physics by Young and Freedman Pearson Education, 2010.
3. Michael A. Nielsen, Isaac L. Chuang, Quantum Computation and Quantum Information Cambridge University Press, 10 th Ed., 2010

Web References:

1. https://nptel.ac.in/courses/115105537 (Wave optics)
2. https://nptel.ac.in/courses/115106122 (Electromagnetism)
3. https://nptel.ac.in/courses/112102255 (Thermodynamics)
4. https://nptel.ac.in/courses/115107095 (Fiber Optics)
5. https://nptel.ac.in/courses/104104085 (Lasers)
6. https://nptel.ac.in/courses/104104082 (Quantum Computing)
7. https://www.intechopen.com/online-first/73811 (Quantum Computing)
8. https://lewisla.gitbook.io/learning-quantum/quantum-circuits/single-qubit-gates(Quantum Computing)
9. https://profmcruz.wordpress.com/wp-content/uploads/2017/08/quantum-computation-and-quantum-information-nielsen-chuang.pdf (Quantum Computing)

DIGITAL LOGIC DESIGN

I Year B. Tech. II semester

[Common to ECE, CSE, CSE(AI&ML), IT]

Course Code: 24EC11RC05

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Represent different number systems & binary codes and perform conversions & binary arithmetic. (L2)

CO2: Apply different simplification methods for minimizing Boolean functions. (L3)

CO3: Model various combinational circuits using gates and PLD's. (L3)

CO4: Outline the concept of latches and flip-flops. Construct sequential logic circuits like counters and registers using flip-flops. (L3)

CO5: Categorize Mealy & Moore models and Design Synchronous Sequential machines. (L3)

UNIT-I **9 Lectures**

Number systems: Number systems, Base conversion methods, Representation of signed numbers and Binary Arithmetic.

Codes: Binary, Non binary, Decimal, Alphanumeric, XS-3, Gray. Error detecting and error correcting codes.

Logic Gates: AND, OR, NOT, NAND, NOR, XOR, EX-NOR. [Textbook1: Chapter1, Chapter 2: section 2.1 to 2.8]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand the advantages of using different number systems. (L2)
2. Describe the usefulness of different binary codes. (L2)
3. Summarize the error detection and correction concepts. (L2).

UNIT-II **10 Lectures**

Minimization of Boolean Functions: Fundamental postulates of Boolean algebra, Basic theorems, Simplification of Boolean equations, Min terms, Max terms, Standard form of Boolean functions. Simplification of functions using Karnaugh map method (2,3,4,5 variables) Don't care conditions, AOI implementation, NAND and NOR Realizations. [Textbook1: Chapter 2: Sections 2.11 to 2.19,2.21,2.22,2.23, Chapter 3: sections 3.2 to 3.6,3.7]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Apply basic laws and theorems to simplify Boolean expressions and construct logic circuits. (L3)
2. Understand concepts of sum-of-products and product-of-sums representations. (L2)
3. Apply K- Map for minimizing logic functions and build logic circuits. (L3)

UNIT-III **12 Lectures**

Combinational Logic-Circuit Design-I: Logic design of combinational circuits: Adders and Subtractors: Binary, BCD, Excess-3 and Look–ahead-carry adder, Code converters, Multiplexers, De multiplexers, Encoders, Decoders and priority encoders, Realization of Boolean functions using multiplexers and Decoders.

Combinational Logic-Circuit Design-II: Design of 4-bit comparator, Parity checker/Generator. Basics of PLDs: Basic structure of PROM, PAL, PLA, Realization of Boolean functions with PLDs and their merits and demerits. [Textbook1: Chapter 4: section 4.1 to 4.27, Chapter 5 Sections 5.1 to 5.11]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Apply Boolean algebra for describing combinational digital circuits (L3)
2. Describe standard combinational circuits such as adders, subtractors, comparators etc. (L2)
3. Develop the digital circuits using PLDs (L3)

UNIT-IV **10 Lectures**

Sequential Circuits: Classification of sequential circuits, SR-latch, Gated latches, Flip flops: RS, JK, D, T and Master slave flip flops, Excitation tables, flip flop conversion from one type to another. Design of counters: Ripple counters, Synchronous counters, asynchronous counters, up-down counters, Johnson counter, ring counter. Design of registers: Buffer registers, Shift registers, Bi directional shift registers, Universal shift register. [Textbook1: Chapter 6]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand the principle of Flip-Flops and Latches. (L2)
2. Summarize the concepts of Shift Registers and Counters. (L2)
3. Construct different sequential logic circuits using Flipflops. (L3)

UNIT-V **7 Lectures**

Analysis and Design of Synchronous Sequential Machines: Moore and Mealy machine models, State Equations, State Table, State diagram, State reduction & assignment, Synthesis of synchronous sequential circuits- sequence detector and generator. [Textbook1: Chapter 7 Sections 7.1 to 7.5]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand Moore and Mealy machine models (L2)
2. Discuss the concepts of State assignment & Reduction (L2)
3. Analyse the design and synthesis of synchronous sequential circuits (L3)

Textbooks:

1. Anand Kumar, Switching Theory and Logic Design. PHI, 2014.
2. M. Morris Mano and Michael D. Ciletti, Digital Design, 4th Edition, Pearson Education, 2013.

Reference Books:

1. Foundation of Switching theory and Logic Design, A k Singh, New age International Publishers,2008
2. Modern Digital Electronics, R P Jain, 4th Edition, Tata McGraw Hill Education Pvt. Ltd, New Delhi,2010
3. Fundamentals of Logic Design, Charles. R. Roth, Thomson Publications,5th edition,2004.

Web References:

1. https://nptel.ac.in/courses/108105132 (Digital Electronic Circuits)
2. https://onlinecourses.nptel.ac.in/noc24_ee147/preview (Digital Circuits)
3. https://nptel.ac.in/courses/117105080 (Digital Systems Design)
4. https://onlinecourses.swayam2.ac.in/nou24_ec07/preview (Digital electronic and System design)

ELEMENTS OF ELECTRONICS ENGINEERING

I Year B. Tech. II Semester

[Common to CSE, IT]

Course Code: 24EC11RC04

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Outline the concepts of semiconductor devices. (L2)

CO2: Understand the characteristics of different semiconductor diodes and their applications. (L2)

CO3: Apply various biasing techniques for design of BJT circuits. (L3)

CO4: Apply hybrid models to understand the operation of BJT amplifier. (L3)

CO5: Understand the characteristics of FET. (L2)

UNIT-I 8 Lectures

Introduction to Electronics and Semiconductors: Energy band theory, Conduction in Insulators, Semiconductors and metals, Classification of semiconductors, Properties of intrinsic and extrinsic semiconductor, Carrier concentration in an intrinsic semiconductor, Drift, and diffusion currents. [Textbook 1: Chapter -1 Section 1.6, 1.7, 1.8; Chapter -2 Section 2.2, 2.3, 2.9; Chapter -19 Section 19.5]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Explain the energy band theory of solids (insulators, semiconductors, and metals) based on their band structures (L2)
2. Describe the transport phenomena in semiconductors (L2)

UNIT-II 11 Lectures

Semi-Conductor Diode: Theory of PN junction, Open circuited PN junction, V-I characteristics of a PN diode, Diode current equation, basics on junction capacitance, Break down in PN diode, Applications of PN diodes. Zener diode, Zener regulator, Tunnel diode, Schottky diode.

Rectifying circuits: Half wave and full wave rectifiers, Bridge rectifiers, Efficiency, Ripple and regulation of each rectifier, Capacitor filters. [Textbook 2: Chapter 4 Section 4.1 – 4.5, 4.8; Chapter 5 Section 5.3, 5.4, 5.7; Chapter 8 Section 8.2 – 8.4, 8.6]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Explain the formation of PN junction and represent the band structure, interpret the Volt-ampere characteristics (L2)

2. Describe the operation of rectifiers, and evaluate their performance metrics like ripple factor and regulation characteristics (L2)
3. Explain the working principles of special diodes such as Zener diode, tunnel diodes and Schottky barrier diodes. (L2)

UNIT-III **11 Lectures**

Bi-Polar Junction Transistor: Introduction, construction, Operation of PNP and NPN Transistors, transistor configurations, Input and Output Characteristics of CE configuration, Comparison of CE, CB, and CC Configurations.

Transistor Biasing and thermal stabilization: Junction Biasing for Saturation, Cutoff and Active Region, Biasing circuits analysis, fixed bias, collector to base bias, emitter bias, voltage divider bias, thermal runaway. [Textbook 2: Chapter 6 Section 6.1 - 6.3, 6.6-6.9, 6.11, Chapter 10 Section 10.4 - 10.8]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Describe the characteristics of transistor in CE, CB, and CC configurations. (L2)
2. Understand the principals of transistor biasing and compensation methods (L2)
3. Identify the characteristics of different transistor biasing techniques (L3)

UNIT-IV **8 Lectures**

Transistor Amplifiers: CE, CB, CC amplifier configurations –Multistage amplifier – A Two Stage RC coupled amplifier – frequency response curve and bandwidth. [Textbook 2: Chapter -11 Section 11.9, 11.11, 11.12, 11.16, 11.17, 11.20]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Represent transistor with its equivalent h parameter model (L2)
2. Apply hybrid models to obtain the performance of transistor amplifiers (L3)

UNIT-V **10 Lectures**

Field Effect Transistors: Construction of JFET and its drain, transfer characteristics, pinch off Voltage, Drain Saturation Current, parameters of JFET, Construction of MOSFET – Enhancement and Depletion Modes, drain and transfer characteristics. [Textbook 2: Chapter -7 Section 7.1 – 7.5, 7.11, 7.12]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Comprehend the characteristics of BJT and FET(L2)
2. Explain the construction of JFET and MoSFETs (L2)
3. Describe the characteristics of JFET and MoSFET (L2)

Textbooks:

1. Jacob Millman, Christos C. Halkias, Integrated Electronics: Analog and Digital Circuits and Systems, McGRAW-HILL. 1972
2. Sanjeev Gupta, Electronic Devices and Circuits, 2nd Edition, Dhanpat Rai Publications,2005.

Reference Books:

1. Thomas L.Floyd, Electronic Devices, 9th Edition , Prentice Hall, 2012.
2. B. V. Rao and K. Raja Rajeswari, Electronic Devices and Circuits 2nd Edition, Pearson Education.,2010.
3. David A. Bell, Electronic Devices and Circuits, 5th Edition, Oxford University Press, 2008
4. Robert Boylestad, Louis Nashelsky, Electronic Devices and Circuit Theory, 7th Edition, Prentice Hall,1998

Web References:

1. https://onlinecourses.nptel.ac.in/noc21_ee80/preview
2. https://be-iitkgp.vlabs.ac.in/

PYTHON PROGRAMMING

I Year B. Tech. II Semester

[Common to CSE, IT, CSE (AI&ML)]

Course Code: 24CT11RC06

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, the student shall be able to:

CO1: Understand the historical development, necessity, applications, and basic concepts of python programming. (L2)

CO2: Identify and implement appropriate control structures to solve a particular programming problem. (L3)

CO3: Examine various data structures and apply to solve real world problems. (L3)

CO4: Build simple functions and packages used in python for solving real world problems. (L3)

CO5: Outline Object Oriented concepts in python and illustrate Exception handling. (L2)

UNIT-I **8 Lectures**

Introduction: History of Python, Need of Python Programming, Applications of Python, Variables, Assignment, Comments, Keywords, Data types, Input-Output, Indentation. [TextBook-1: Chapter 3 (S-3.1 – S-3.12)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand the Evolution of Python [L2]
2. Recall the Need and Applications of Python [L1]
3. Outline python's Input and Output Functions[L2]

UNIT-II **10 Lectures**

Operators and Expressions: Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations, Control Flow- if, if-elif-else, for, while, break, continue, pass [TextBook-1: Chapter 3 (S-3.12), Chapter 4 (S-4.1 – S-4.7)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Illustrate python operators: arithmetic, comparison, assignment, logical, bitwise, membership, identity [L2]
2. Make use of control flow statements: if, if-elif-else, for, while, break, continue, pass. [L3]

UNIT-III **10 Lectures**

Data Structures: Strings, Lists, Tuples, Sets, Dictionaries. Data Structures manipulations - create, Index, Negative indexing, Slicing, update, add elements, delete or remove elements, operations, Comprehension, Membership Test, Iteration. [TextBook-1: Chapter 6 (S-6.1 – S-6.9), Chapter 8 (S-8.1 – S-8.6)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understanding basic operations on lists, including indexing and slicing [L2]
2. Utilize methods of lists, tuples, sets, and dictionaries to solve problems [L3]
3. Compare and apply appropriate use cases for lists, tuples, sets, and dictionaries. [L2]

UNIT-IV **10 Lectures**

Functions - Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Lambda Functions, Function Returning Values, Built-in functions, Scope of the Variables in a Function - Global and Local Variables.

Modules: Creating modules, import statement, from…import statement, namespaces. Python packages: Introduction to PIP, Installing Packages via PIP [TextBook-1: Chapter 5 (S-5.1 – S-5.8,5.12)]

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understanding and implementing various types of function arguments and scopes in Python. [L2]
2. Utilize Python modules to understanding the import mechanisms [L3]

UNIT-V **10 Lectures**

Object Oriented Programming (OOP) in Python: Classes and Objects, Class Method and self-Argument, The __init() Method (The Class Constructor), Class Variables and Object Variables, Public and Private Data Members, Inheritance, Overriding Methods.

Error and Exceptions: Introduction to Errors and Exceptions, Handling Exception, try except block, finally block, Raising Exceptions.

File Handling: Type of files, Opening and Closing files, Reading and Writing files.

TextBook-1: Chapter 9 (S-9.1 – S-9.8), Chapter 10 (S-10.1 – S-10.3)

TextBook-1: Chapter 7 (S-7.1 – S-7.5), Chapter 12 (S-12.1 – S-12.10)

Learning Outcomes:

At the end of the unit, the student will be able to

1. Understand and implement classes, methods, and the 'self' variable in Python [L2]
2. Demonstrate concepts of inheritance, method overriding, and data hiding in OOP [L2]

3. List the differences between errors and exceptions, and handle exceptions using try-except blocks [L1]
4. Illustrate file operations including reading, writing, and manipulating file pointers in Python. [L2]

Textbooks:

1. Reema Thareja, “Python Programming: Using Problems Solving Approach”, Oxford University Press, 2017
2. Fundamentals of Python First Programs, Kenneth. A. Lambert, Cengage.

Reference Books:

1. Fundamentals of Data Structures using Python, P Lalitha Surya Kumari, P. S. Avadhani, Lambert Academic Publishing
2. Introduction to Python Programming, Gowrishankar.S, Veena A, CRC Press.
3. Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

Web References:

1. https://www.tutorialspoint.com/python3/python_tutorial.pdf
2. https://www.python.org/doc/

ENGINEERING PHYSICS LAB

I Year B. Tech. II semester

[Common to CSE, IT]

Course Code: 24BP11RC02

L	T	P	C
0	0	3	1.5

Course Outcomes: At the end of the course the student will be able to

CO1: Interpret the physical parameters based on optical phenomena. (L2)

CO2: Verify the behaviour of double refraction in birefringent material like quartz. (L2)

CO3: Demonstrate the concepts of diffraction through experiments. (L3)

CO4: Calibrate instruments like low range voltmeters and ammeters. (L3)

CO5: Design temperature sensors based on diodes and thermistors. (L3)

List of Experiments: (Any TEN of the following experiments shall be conducted)

1. Determination of Radius of Curvature of a given Convex Lens By forming Newton's Rings.
2. Determination of Thickness Given Paper Strip or hairline by Wedge Method.
3. Determination of Wavelength of Spectral Lines in the Mercury Spectrum by Normal Incidence method
4. Determination of Cauchy's Constants of a Given Material of the Prism using Spectrometer in minimum deviation position
5. Determination of Refractive Index of Ordinary ray and Extra-ordinary ray in quartz prism
6. Laser- Diffraction – determination of wavelength of laser source using diffraction grating
7. Determination of wavelength of laser source using Fraunhofer single slit diffraction
8. Melde's Apparatus – Frequency of electrically maintained Tuning Fork.
9. Study of Intensity Variation of the Magnetic Field along the axis of circular Current Carrying conductor using Stewart and Gee apparatus
10. Calibration of Low Range Voltmeter using Potentiometer Bridge
11. Calibration of Low Range Ammeter using Potentiometer Bridge
12. Determination of dielectric constant of material using charging discharging method with a parallel plate capacitor
13. Determination of energy band gap of semiconductor using PN junction diode in reverse bias
14. Determination of thermo electric coefficients for thermistor
15. Determination of Planck's constant using LED.

Textbooks:

1. Practical physics by CL Arora, S.chand publishing company, 1995.
2. Advanced Practical Physics For Students by B.l.worsnop And H.t.flint, 1923

Web References:

1. http://lo-au.vlabs.ac.in/laser-optics/Newtons_Rings_Wavelength_of_light/
2. http://ov-au.vlabs.ac.in/optics/Spectrometer_Refractive_Index/
3. http://ov-au.vlabs.ac.in/optics/Diffraction_Grating/
4. http://htv-au.vlabs.ac.in/heat-thermodynamics/Characteristics_of_Thermistor/
5. https://bop-iitk.vlabs.ac.in/exp/energy-band-gap/simulation.html

PYTHON PROGRAMMING LAB

I Year B. Tech. II semester

[Common to CSE, CSE (AI&ML), IT]

Course Code: 24CT11RC07

L	T	P	C
0	0	3	1.5

Course Outcomes: At the end of the Course, the student shall be able to:

CO1: Understand core programming basics and various Operators of Python. (L2)

CO2: Implement programs using conditional statements and loops and strings. (L3)

CO3: Develop functions and strings to perform simple tasks. (L3)

CO4: Make use of various data structures like lists, tuples, sets and dictionaries. (L3)

CO5: Implement Python programs with files, Classes and objects. (L3)

Module-1: Basics of Python

1. Write a program to display the statements.
2. Demonstrate about fundamental Data types in Python Programming. (i.e., int, float, complex, bool and string types)
3. Write a Python program to demonstrate various type conversion functions.
4. Write a program to demonstrate the inbuilt Math function

Module-2: Operators in Python

1. Demonstrate the following Operators in Python with suitable examples.

   i) Arithmetic Operators ii) Relational Operators

   iii) Assignment Operators iv) Logical Operators

   v) Bit wise Operators vi) Ternary Operator

   vii) Membership Operators viii) Identity Operators

Module-3: Conditional Branching Statements

1. Write a program to check whether the given number is even or odd
2. Write a program to read marks of a student and display the corresponding grade
3. Write a program to find the largest element among the given numbers (multi-way if-elif-else statements.)

Module-4: Looping/Iterative Statements

1. Implement the following programs using while loop and for loop

   i. Display all prime numbers up to n. ii. Print the nth multiplication table.

   iii. Print different patterns using loops:

2. Demonstrate the following control transfer statements in Python with suitable examples.
   i. break ii. continue iii. Pass

Module-5: Functions

1. Write a function to find the multiplication of two numbers and demonstrate the usage of parameters and arguments of a function.
2. Write a program to define a function using default arguments.
3. Demonstrate lambda functions in Python with suitable example programs.

Module-6: Strings

1. Write a program to manage and analyse customer feedback using string operations include:

   i. Create feedback with name, email, comment ii. Collecting feedback.
   iii. Normalizing feedback (e.g., removing extra spaces, converting to lowercase).
   iv. Extracting key in formation (e.g., names, email addresses, and comments).
   v. Searching for keywords. vi. Replacing certain words.
   vii. Formatting feedback for display. viii. Summarizing feedback.

Module-7: Lists:

1. Write a program to create a list and perform the following operations:
   i. + ii. * iii. slicing iv. del
2. Inventory Management: You have a list of items in your warehouse along with their quantities. Write a program to find out which items are low in stock (quantity less than 10). (use only comprehensions)
3. Employee Performance: You have a list of employee names and their corresponding performance scores. Write a program to sort the list based on the performance scores in descending order.
4. Sales Analysis: you have a list of sales figures for the past week. Write a program to find the total sales, the highest sale, the lowest sale, and the average sale.
5. Write a program to calculate the length of each element in a list using map function in python.

Module-8: Tuples

1. Write a program to return the top n's most frequently occurring chars and their respective counts. e.g. string=aaaaaabbbbcccc, n=2 should return [(a 6) (b 4)].
2. Write a program to create n iterables of varied sizes and group the values using zip function in python.
3. Student Information: Write a program to create a list of tuples where each tuple contains the student ID, name, and grade and find the student with the highest grade.

4. Course Enrolment: Write a program to create list of tuples where each tuple contains the course ID and the number of students enrolled and find the total number of students enrolled across all courses
5. Faculty Information: Write a program to create a list of tuples where each tuple contains the faculty ID, name, and department and find all faculty members in a given department.
6. Library Book Tracking: You have a list of tuples where each tuple contains the book ID, title, and number of copies available. Write a program to find all books with fewer than 5 copies available.

Module-9: Sets & Dictionaries

1. Write a program to create two sets and perform the following operations:

i. Union ii. Intersection iii. Difference iv. Asymmetric Difference

2. Write a program to generate a dictionary that contains numbers (between 1 and n) in the form of (x,x*x).
3. Write a program to implement a shopping cart where you can add items with their prices and quantities, and then calculate the total cost.
4. Banking System: Write a program to create dictionary with customer name and balance and retrieve the balance for a given customer, deposit a specified amount into a customer's account, Withdraw a specified amount from a customer's account if sufficient balance is available, Transfer a specified amount from one customer's account to another's and Remove a customer from the bank's system.

Module-10: Classes and objects

1. Create a class to represent menu items in a restaurant with attributes like name, price, and category. Implement methods to display menu details and calculate the total cost of a selected list of items.
2. Write a program to read 3 subject marks and display pass or failed using class and object.

Module-11: Files

1. Write a program to copy the contents of a file to another file.
2. Write a program to compute the number of characters, words and lines in a file.

Case Study:

Select any one application mentioned below

Note: A report has to be submitted by every student at the end of the semester that includes design, coding, output, etc.

1. Design a Python program to manage inventory, process orders, and handle customer information for an online store.
2. Create a library system to track books, manage member accounts, and handle book loans and returns.
3. Implement a personal finance management tool to track income, expenses, and generate monthly reports.
4. Create a system to manage student grades, calculate GPAs, and generate academic reports.

5. Develop a Python-based movie recommendation system using collaborative filtering.
6. Build a to-do list application that allows users to add, update, delete, and prioritize tasks..
7. Build a patient management system to handle appointments, medical records, and billing.
8. Design a digital menu for a restaurant with options for ordering, bill generation, and inventory management.
9. Implement a fitness tracking application to log workouts, track progress, and suggest exercise plans.
10. Build a secure online voting platform with user authentication and vote tallying.
11. Create a program to manage recipes, including ingredients, instructions, and nutritional information.
12. Build a travel planning application to manage itineraries, bookings, and budget tracking.
13. Develop an e-learning application with course creation, student enrolment, and progress tracking.
14. Build a car rental management system to handle bookings, returns, and vehicle maintenance.
15. Build a budget planning application to track expenses, income, and financial goals.
16. Develop a cryptocurrency tracking application to monitor prices, market trends, and portfolio performance.

Reference Books:

1. Python Programming: Using Problem Solving Approach by Reema Theraja , Oxford publications
2. Ashok N Kamthane, Amit Ashok Kamthane, Programming and Problem Solving with Python, 1st Edition, McGraw Hill Education (India), 2018.

Web References:

1. https://www.python.org/doc/
2. https://www.w3schools.com/python/python_reference.asp
3. https://thepythonguru.com/
4. https://www.programiz.com/python-programming

WEB TECHNOLOGIES LAB

I Year B. Tech. II semester

[Common to CSE, CSE (AI&ML), IT]

Course Code: 24CT11RC08

L	T	P	C
0	0	3	1.5

Course Outcomes: At the end of the Course, the student shall be able to

CO1: Develop professional web pages for an application using HTML elements like lists, navigations, tables, various form elements, and embedded media, including images, audio, and video. (L3)

CO2: Build inline, internal, and external CSS to enhance the visual presentation of web pages, including layout, fonts, colors, and backgrounds. (L3)

CO3: Utilize JavaScript to develop interactive HTML web pages and validate form data. (L3)

CO4: Apply JavaScript functions and events to enhance user interaction and provide a dynamic user experience. (L3)

CO5: Experiment with XML files to store and display structured data and write a DTD to perform well-formed and validated XML documents. (L3)

Module-1:

Design a web page using Basic HTML Elements – Structure of HTML, Headings, Paragraph, Division and Span, List, Link, Image, Table, Form, Input, Iframe, and Media Elements.

Module-2:

Design the following static web pages required for an online book store website.

1. **HOME PAGE:**
   i. The static home page must contain three frames.

   Top frame: Logo and the college name and links to the Home page, Login page, Registration page, Catalogue page, and Cart page (the description of these pages will be given below).

   Left frame: At least four links for navigation, which will display the catalogue of respective links.For e.g.: When you click the link "CSE" the catalogue for CSE Books should be displayed in the Right frame.

   Right frame: The pages to the links in the left frame must be loaded here. Initially, this page contains a description of the website.

   ii. Add media content in a frame using audio, video, and iframe elements to the Home page of an online bookstore website. The page should include:

   iii. Audio Element: An audio player to play background music or a podcast.

   iv. Video Element: A video player to display a promotional video about the bookstore.

v. Iframe Element: An iframe to embed a Google Maps location of the bookstore.

2. **LOGIN PAGE**
3. **CATALOGUE PAGE:** The catalogue page should contain the details of all the books available on the website in a table: The details should contain the following:

   i) Snapshot of Cover Page. ii)Author Name. iii)Publisher.

   iv) Price. v)Add to cart button.
4. **REGISTRATION PAGE:** Create a "registration form "with the following fields

   i) **Username:** Text input field ii) **Password:** Password input field

   iii) **Email:** Email input field iv) **Phone number:** Text input field

   v) **Birthday:** Date picker vi) **Favorite Color:** Color picker

   vii) **Gender:** Select an element with options (Male, Female, Other).

Module-3:

Develop and demonstrate the usage of inline, internal, and external style sheets using CSS.

Module-4:

Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next to the list. Add CSS to customize the properties of the font of the capital (colour, bold, and font size).

Module-5:

Develop and demonstrate JavaScript with POP-UP boxes and functions for the following problems:

1. Input: Click on the Display Date button using onclick( ) function

   Output: Display the date in the textbox.
2. Input: A number n obtained using prompt

   Output: Factorial of n number using alert.
3. Input: A number n obtained using prompt

   Output: A multiplication table of numbers from 1 to 10 of n using alert.
4. Input: A number n obtained using prompt and add another number using confirm

   Output: Sum of the entire n numbers using alert.

Module-6:

Write JavaScript to validate the following fields of the Registration page.

1. First Name (Name should contain alphabets and the length should not be less than 6 characters).
2. Password (Password should not be less than 6 characters in length).
3. E-mail ID (should not contain any invalid and must follow the standard pattern name@domain.com)
4. Mobile Number (The phone number should contain 10 digits only).

5. Last Name and Address (should not be Empty).

Module-7:

Write an HTML page including any required JavaScript that takes a number from the text field in the range of 0 to 999 and shows it in words. It should not accept four and above digits, alphabets, and special characters.

Module-8:

Create an 'Employee' class extending from a base class 'Person'. The task should include:

1. Create a class 'Person' with attributes 'name' and 'age' and add a constructor to initialize these values.
2. Create a class 'Employee' that extends 'Person' and includes an additional attribute 'role,' with a constructor to initialize 'name,' 'age,' and 'role.'

Module-9:

Create an array of objects representing book details in an online bookstore. Each object should include the book title, author, genre, and price. Render the details of the books on the page using this array, demonstrating array creation, accessing array elements, and applying array methods.

Module-10:

Write an XML file which will display the Book information which includes the following:

a) Title of the Book b) Author Name c) ISBN Name
d) Publisher Name e) Edition f) Price

Write a Document Type Definition (DTD) to validate the above XML file.

Case Study:

Select any one practical application mentioned below.

Note: A report has to be submitted by every student at the end of the semester, including design, coding, output, etc.

1. Portfolio Website: Create a personal portfolio website showcasing projects, skills, and experience using HTML, CSS, and JavaScript for interactive features.
2. Responsive Blog: Design a responsive blog template with multiple pages, utilizing HTML for structure, CSS for styling, and JavaScript for dynamic content.
3. E-commerce Site: Develop a basic e-commerce website with product listings, shopping cart functionality, and user authentication using HTML, CSS, and JavaScript.
4. Quiz Game: Create an interactive quiz game with multiple-choice questions, scoring, and feedback using HTML, CSS, and JavaScript for functionality.

5. To-Do List: Develop a to-do list application allowing users to add, edit, and delete tasks, with data persistence using JavaScript local storage.
6. Interactive Resume: Design a dynamic resume with sections for education, experience, and skills, including interactive elements powered by JavaScript.
7. Photo Gallery: Create an interactive photo gallery with image lightbox effects, using CSS for styling and JavaScript for functionality.
8. Recipe Finder: Build a recipe search application that fetches and displays recipes from an API, using JavaScript for dynamic content updates.
9. Expense Tracker: Develop an expense tracker app to log and categorize expenses, with data visualization using charts and graphs created with JavaScript.
10. Event Countdown: Create a countdown timer for upcoming events with HTML structure, CSS styling, and JavaScript for the timer logic.
11. Contact Form: Create a contact form with validation and submission handling using JavaScript, styled with CSS to match the site's theme.
12. Memory Game: Develop a memory matching game with cards that flip and match, using CSS for design and JavaScript for game logic.
13. Interactive Story: Design an interactive storytelling website where users make choices that affect the narrative, using JavaScript for decision logic.
14. Fitness Tracker: Build a fitness tracker to log workouts and track progress, with dynamic charts and data visualization using JavaScript.
15. Task Manager: Create a task manager application with features for adding, editing, and prioritizing tasks, using JavaScript for interactivity.
16. Interactive Timelines: Design interactive timelines to visualize historical events or project milestones, using HTML, CSS, and JavaScript.
17. Product Landing Page: Develop a product landing page with animations and interactive elements, using CSS for styling and JavaScript for effects.
18. Calculator: Build a fully functional calculator with basic arithmetic operations, using JavaScript for logic and CSS for design.
19. Job Board: Develop a job board where users can post and search for jobs, with dynamic content updates using JavaScript.
20. Interactive Form: Create a multi-step interactive form with validation and progress indicators, using JavaScript for form handling and CSS for styling.

References:

1. Internet and Web Technologies by Raj Kamal, Tata McGraw-Hill.
2. Programming the World Wide Web by Robert W. Sebesta, Pearson Education.

3. An Introduction to Web Design and Programming by Paul S Wang, Sanda S Katila, 1st Edition, Cengage Learning.

Web Links:

1. https://onlinecourses.swayam2.ac.in/nou24_cs18/preview
2. https://infyspringboard.onwingspan.com/en/app/toc/lex_17739732834840810000_shared /overview (HTML5)
3. https://infyspringboard.onwingspan.com/en/app/toc/lex_18109698366332810000_shared /overview (JavaScript)

SCHEME AND SYLLABUS FOR FIRST & SECOND YEARS OF FOUR YEAR UNDER GRADUATE DEGREE COURSE B. TECH (COMPUTER SCIENCE & ENGINEERING) [W.E.F. 2022 - 2023 ADMITTED BATCH]

DEPARTMENT OF COMPUTER SCIENCE & SYSTEMS ENGINEERING
ANDHRA UNIVERSITY COLLEGE OF ENGINEERING
ANDHRA UNIVERSITY
VISAKHAPATNAM-530 003

ANDHRA UNIVERSITY
DEPARTMENT OF COMPUTER SCIENCE AND SYSTEM ENGINEERING
SCHEME AND SYLLABI
(With effect from 2022-23 admitted batch)
Common for CSE & IT

B.Tech & B.Tech + M.Tech
(Computer Science & Engineering)

I Year – I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
CS1101	BS	Engineering Mathematics –I	4	0	30	70	100	3
CS1102	BS	Green Chemistry	4	0	30	70	100	3
CS1103	HSS	English	4	0	30	70	100	3
CS1104	ES	Computer Programming Using C	4	0	30	70	100	3
CS1105	ES	IT Essentials	4	0	30	70	100	3
CS1106	HSS	Communication skills Lab	0	3	50	50	100	1.5
CS1107	ES	Computer Engineering Workshop Lab	0	3	50	50	100	1.5
CS1108	ES	Computer Programming using C lab	0	3	50	50	100	1.5
Total Credits								**19.5**

B.Tech & B.Tech + M.Tech

I Year-II Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
CS1201	BS	Engineering Mathematics–II	4	0	30	70	100	3
CS1202	BS	Engineering Physics	4	0	30	70	100	3
CS1203	ES	Elements of Electronics Engineering	4	0	30	70	100	3
CS1204	ES	Data Structures Using C	4	0	30	70	100	3
CS1205	ES	Digital Logic Design	4	0	30	70	100	3
CS1206	ES	Linux Administration Lab	0	3	50	50	100	1.5
CS1207	BS	Engineering Physics Lab	0	3	50	50	100	1.5
CS1208	ES	Data Structures Lab	0	3	50	50	100	1.5
Total Credits								**19.5**

B.Tech & B.Tech + M.Tech
(Computer Science & Engineering)
II Year - I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
CS2101	ES	Discrete Mathematical Structures	4	0	30	70	100	3
CS2102	PC	Computer Organization and Architecture	4	0	30	70	100	3
CS2103	BS	Probability, Statistics and Queuing theory	4	0	30	70	100	3
CS2104	PC	Operating Systems	4	0	30	70	100	3
CS2105	PC	Object Oriented Programming Through Java	4	0	30	70	100	3
CS2106	PC	Computer Organization & Architecture Lab	0	3	30	70	100	1.5
CS2107	PC	Object Oriented Programming Through Java Lab	0	3	50	50	100	1.5
CS2108	PC	Operating Systems Lab	0	3	50	50	100	1.5
CS2109	SC	Intellectual Property Rights (Internal)	1	2	100	0	100	2
CS2110	MC	Environmental Science	0	0	-	100	100	0
Total credits								**21.5**

B.Tech & B.Tech + M.Tech
II Year - II Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
CS2201	ES	Microprocessors	4	0	30	70	100	3
CS2202	PC	Design and Analysis of Algorithms	4	0	30	70	100	3
CS2203	PC	Database Management Systems	4	0	30	70	100	3
CS2204	PC	Formal Languages & Automata Theory	4	0	30	70	100	3
CS2205	HSS	Managerial Economics	4	0	30	70	100	3
CS2206	PC	Algorithms Lab through C++.	0	3	50	50	100	1.5
CS2207	PC	Database Management Systems Lab	0	3	50	50	100	1.5
CS2208	SC	Web Technologies	1	2	50	50	100	2
CS2209	MC	Professional Ethics & Universal Human Values	0	0	0	100	100	0
CS2210	MC	NCC/NSS	0	2	-	-	-	0
Total credits								**20**
Internship-I								

B.Tech & B.Tech + M.Tech
(Computer Science & Engineering)

I Year – I Semester

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CS1101	BS	Engineering Mathematics –I	4	0	30	70	100	3
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CS1107	ES	Computer Engineering Workshop Lab	0	3	50	50	100	1.5
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Total Credits								**19.5**

CS1101 ENGINEERING MATHEMATICS-I

Course Objectives

- To transmit the knowledge of Partial differentiation.
- To know of getting maxima and minima of function of two variables and finding errors and approximations.
- To evaluate double and triple integrals, volumes of solids and area of curved surfaces.
- To expand a periodical function as Fourier series and half-range Fourier series

Course Outcomes

- Find the partial derivatives of functions of two or more variables.
- Evaluate maxima and minima, errors and approximations.
- Evaluate double and triple integrals, volumes of solids and area of curved surfaces.
- To expand a periodical function as Fourier series and half-range Fourier series.
- Have a fundamental understanding of Fourier series and be able to give Fourier expansions of a given function.

SYLLABUS

Partial Differentiation: Introduction - Functions of two or more variables - Partial derivatives - Homogeneous functions – Euler's theorem - Total derivative - Change of variables – Jacobins. Mean value Theorems (without proofs)

Applications of Partial Differentiation: Geometrical interpretation -Tangent plane and Normal to a surface -Taylor's theorem for functions of two variables - Errors and approximations -Total differential. Maxima and Minima of functions of two variables - Lagrange's method of undetermined multipliers - Differentiation under the integral Sign - Leibnitz's rule.

Multiple Integrals: Introduction - Double Integrals - Change of Order of Integration - Double Integrals in Polar Coordinates - Triple Integrals - Change of Variables.

Multiple Integrals-Applications: Area enclosed by plane curves - Volumes of solids - Area of a curved surface - Calculation of Mass - Centre of gravity - Moment of inertia - product of

inertia – principal axes- Beta Function - Gamma Function - Relation between Beta and Gamma Functions. Error Function or Probability Integral.

Fourier Series: Introduction - Euler's Formulae - Conditions for a Fourier Expansion - Functions having points of discontinuity - Change of Interval - Odd and Even Functions - Expansions of Odd or Even Periodic Functions, Half-Range Series - Parseval's Formula. Practical Harmonic analysis

Text Book

1. Scope and Treatment as in "Higher Engineering Mathematics", by Dr. B.S. Grewal, 43rd Edition, Khanna publishers.

Reference Books

1. Graduate Engineering Mathematics by V B Kumar Vatti., I.K.International publishing house Pvt. Ltd.
2. Advanced Engineering Mathematics by Erwin Kreyszig.
3. A text book of Engineering Mathematics, by N.P. Bali and Dr. Manish Goyal, Lakshmi Publications.
4. Advanced Engineering Mathematics by H.K. Dass. S. Chand Company
5. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Graw Hill Company. 6.
6. Higher Engineering Mathematics by Dr. M.K.Venkataraman.

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CS1102 GREEN CHEMISTRY

Course Objectives:

- To apply the basic knowledge of Chemistry to the Engineering Discipline.
- To develop knowledge about water and its treatment for industrial and potable purposes.
- To develop understanding in the areas of Batteries, Fuels Mechanism of Corrosion of Metals and Corrosion Control Methods, Green Chemistry and Technology and Processes involving Green Chemistry and apply the knowledge for solving existing challenges faced in various engineering and societal areas.

Learning outcome:

- The students are able to apply the basic concepts and principles studied in Chemistry to the field of Engineering.
- The students are able to apply chemistry to different branches of engineering
- The students are able to acquire the knowledge in the areas of Water Chemistry, Mechanism of Corrosion of Metals and Corrosion Control Methods, Batteries, Fuel Cells, Green Chemistry and Technology and Processes involving Green Chemistry and suggest innovative solutions for existing challenges in these areas.

SYLLABUS

Water Technology
Sources of Water – Impurities and their influence of living systems – WHO Limits – Hardness and its Determination – Boiler Troubles and their removal – Water Softening Methods – Lime-Soda, Zeolite and Ion Exchange - Municipal Water Treatment-Break Point Chlorination – Desalination of Sea Water – Reverse Osmosis Method, Electro-dialysis.

Batteries
Primary batteries: The chemistry - Types: Zinc-carbon (Leclanche type), zinc alkaline (Duracell), zinc/air batteries; Lithium primary cells – liquid cathode, solid cathode and lithium-ferrous sulphide cells. Secondary batteries: Lead acid and VRLA (valve regulated (sealed) lead acid), nickel-cadmium, nickel-zinc, nickel-metal hydride batteries, lithium ion batteries, ultrathin lithium polymer cells. Advanced Batteries for electric vehicles, requirements of the battery – sodium-beta and redox batteries.

Fuel Cells
Fuel Cells: Description, working principle, anodic, cathodic and cell reactions, fabrication of electrodes and other components, applications, advantages, disadvantages and environmental aspects of the following types of fuel cells: Proton Exchange Membrane Fuel Cells, alkaline fuel cells, phosphoric acid, solid oxide, molten carbonate, direct methanol fuel cells-Membranes and Fuels

Corrosion
Corrosion: Origin and Theory – Types of Corrosion: Chemical and Electrochemical; Pitting, Inter granular, Waterline, Stress – Galvanic Series – Factors Effecting Corrosion. Corrosion

Controlling Methods, Protective Coatings, Metallic Coatings, Electroplating and Electroless Plating.

Green Chemistry and Technology

Introduction and significance of green chemistry, Goals of green chemistry, 12 principles of green chemistry, toxicity of chemicals, material safety data sheet (MSDS), concept of zero pollution technologies, atom economy, functional toxicity vs non-functional toxicity, functional group approaches to green chemistry, Elimination of toxic functional group, optimization of frameworks for the design of greener synthetic pathways, Applications of green chemistry - Green solvents, green fuels and propellants, biocatalysis.

Text Books

1. Engineering Chemistry – PC Jain and M. Jain – Dhanpath Rai and Sons, New Delhi.
2. A Text book of Engineering Chemistry – S. S. Dara – S. Chand & Co. New Delhi.
3. Hand Book of Green Chemistry and Technology; by James Clarke and Duncan Macquarrie; Blakwell Publishing.

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CS1103 ENGLISH

Course Objectives

- To make students understand the explicit and implicit meanings of a text/topic;
- To give exposure to new words and phrases, and aid to use them in different contexts;
- To apply relevant writing formats to draft essays, letters, emails and presentations; and
- To adapt oneself to a given situation and develop a functional approach to finding solutions: adaptability and problem solving.

Course Outcomes

- Students will be able to analyse a given text and discover the various aspects related to language and literature;
- Learn the various language structures, parts of speech and figures of speech;
- Develop one's reading and writing abilities for enhanced communication; and
- Learn to apply the topics in real-life situations for creative and critical use.

SYLLABUS

On the conduct of life: William Hazlitt

Life skills: Values and Ethics

If: Rudyard Kipling

The Brook: Alfred Tennyson

Life skills: Self-Improvement

How I Became a Public Speaker: George Bernard Shaw

The Death Trap: Saki

Life skills: Time Management

On saving Time: Seneca

Chindu Yellama

Life skills: Innovation

Muhammad Yunus

Politics and the English Language: George Orwell

Life skills: Motivation

Dancer with a White Parasol: Ranjana Dave

Grammar: Prepositions – Articles – Noun-Pronoun Agreement, Subject-Verb Agreement – Misplaced Modifiers–Clichés, Redundancies.

Vocabulary: Introduction to Word Formation – Root Words from other Languages –Prefixes and Suffixes–Synonyms, Antonyms– Common Abbreviations

Writing: Clauses and Sentences – Punctuation – Principals of Good Writing – Essay Writing – Writing a Summary

Writing: Essay Writing

Life skills: Innovation

Muhammad Yunus

Textbook

1. Language and Life: A Skills Approach Board of Editors, Orient Blackswan Publishers, India.2018.

References

1. Practical English Usage, Michael Swan. OUP. 1995.
2. Remedial English Grammar, F.T. Wood. Macmillan.2007
3. On Writing Well, William Zinsser. Harper Resource Book. 2001
4. Study Writing, Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
5. Communication Skills, Sanjay Kumar and Pushp Lata. Oxford University Press. 2011.
6. Exercises in Spoken English, Parts. I-III. CIEFL, Hyderabad. Oxford University Press.

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CS1104 COMPUTER PROGRAMMING USING C

Course Objectives

- The course is designed to provide complete knowledge of C language.
- To provide students with understanding of code organization and functional hierarchical decomposition with using complex data types.
- To provide knowledge to the students to develop logics which will help them to create programs, applications in C.
- This course aims to identify tasks in which the numerical techniques learned are applicable and apply them to write programs, and hence use computers effectively to solve the task.
- This course provides the fundamental knowledge which is useful in understanding the other programming languages.

Course Outcomes

- Identify basic elements of C programming structures like data types, expressions, control statements, various simple functions and apply them in problem solving.
- Apply various operations on derived data types like arrays and strings in problem solving.
- Design and implement of modular Programming and memory management using Functions, pointers.
- Apply Structure, Unions and File handling techniques to Design and Solve different engineering programs with minimal complexity.
- Apply Numerical methods to Solve the complex Engineering problems.

SYLLABUS

Introduction to C: Basic structure of C program, Constants, Variables and data types, Operators and Expressions, Arithmetic Precedence and associativity, Type Conversions. Managing Input and Output Operations Formatted Input, Formatted Output.

Decision Making, Branching, Looping: Decision making with if statement, Simple if statement, The if…else statement, Nesting of if…else statement, the else.. if ladder, switch statement, the (?:) operator, the GOTO statement., The while statement, the do statement, The for statement, Jumps in Loops.

Arrays & Strings: One, Two-dimensional Arrays, Character Arrays. Declaration and initialization of Strings, reading and writing of strings, String handling functions, Table of strings.

Functions: Definition of Functions, Return Values and their Types, Function Calls, Function Declaration, Category of Functions: No Arguments and no Return Values, Arguments but no Return Values, Arguments with Return Values, No Argument but Returns a Value, Functions that Return Multiple Values. Nesting of functions, recursion, passing arrays to functions, passing strings to functions, the scope, visibility and lifetime of variables.

Pointers: Accessing the address of a variable, declaring pointer variables, initializing of pointer variables, accessing variables using pointers, chain of pointers, pointer expressions, pointers and arrays, pointers and character strings, array of pointes, pointers as function arguments, functions returning pointers, pointers to functions, pointers to structures-Program Applications.

Structure and Unions: Defining a structure, declaring structure variables, accessing structure members, structure initialization, copying and comparing structure variables, arrays of structures, arrays within structures, structures within structures, structures and functions and unions, size of structures and bit-fields- Program applications.

File handling: Defining and opening a file, closing a file, Input/ Output operations on files, Error handling during I/O operations, random access to files and Command Line Arguments-Program Applications.

Text Books

1. Programming in ANSI C, E Balagurusamy, 6th Edition. McGraw Hill Education (India) Private Limited.

Reference Books

1. Let Us C ,Yashwant Kanetkar, BPB Publications, 5th Edition.
2. Computer Science, A structured programming approach using C", B.A.Forouzan and R.F.Gilberg, " 3rd Edition, Thomson, 2007.
3. The C –Programming Language' B.W. Kernighan, Dennis M. Ritchie, PHI.
4. Scientific Programming: C-Language, Algorithms and Models in Science, Luciano M. Barone (Author), EnzoMarinari (Author), Giovanni Organtini, World Scientific.

CS1105 IT ESSENTIALS

Course Objectives

- Select the appropriate computer components to build, repair, or upgrade personal computers.
- Explain how to correctly use tools and safely work in a lab.
- Install components to build, repair, or upgrade personal computers.
- Configure computers to communicate on a network
- Configure devices to connect to the Internet and Cloud services
- Explain how to use, configure, and manage laptops and mobile devices

Course Outcomes

- Understands the roles and responsibilities of the IT professional
- Able to Troubleshoot advanced hardware and software problems
- Provides an experience-oriented course that employs industry-relevant instructional approaches to prepare students for entry-level jobs in the industry.

Syllabus

Introduction to the Personal Computer Describe a Computer System, Identify the Names, Purposes, and Characteristics of Cases and Power Supplies, Identify the Names, Purposes, and Characteristics of Internal Components, Identify the Names, Purposes, and Characteristics of Ports and Cables, Identify the Names, Purposes, and Characteristics of Input Devices, Identify the Names, Purposes, and Characteristics of Output Devices, Explain System Resources and Their Purposes.

Safe Lab Procedures and Tool Use Explain the Purpose of Safe Working Conditions and Procedures, Identify Tools and Software Used with Personal Computer Components and Their Purposes, Implement Proper Tool Use.

Computer Assembly Attach the Components to the Motherboard and Install the Motherboard, Install Internal Drives, Install Drives in External Bays, Install Adapter Cards, Connect the Power Cables Reattach the Side Panels to the Case, Boot the Computer for the First Time. **Basics of Preventive Maintenance and Troubleshooting** Explain the Purpose of Preventive Maintenance, Identify the Steps of the Troubleshooting Process.

Fundamental Laptops and Portable Devices Identify Common Preventive Maintenance Techniques for Laptops and Portable Devices, Describe How to Troubleshoot Laptops and Portable Devices.

Fundamental Operating Systems Explain the Purpose of an Operating System, Describe and Compare Operating Systems to Include Purpose, Limitations, and Compatibilities, Determine Operating System Based on Customer Needs, Install an Operating System, Identify and Apply Common Preventive Maintenance Techniques for Operating Systems, Troubleshoot Operating Systems.

Fundamental Networks Explain the Principles of Networking, Describe Types of Networks, Describe Basic Networking Concepts and Technologies, Describe the Physical Components of a Network, Describe LAN Topologies and Architectures.

Fundamental Security: Explain Why Security Is Important, Describe Security Threats, Identify Security Procedures, Identify Common Preventive Maintenance Techniques for Security, Troubleshoot Security.

Text books:

1. IT Essentials: PC Hardware and Software Companion Guide Fourth Edition, Cisco Networking Academy.

References:

1. Network security essentials application and standrads, by William stallings, 4th edition, prentice hall.
2. Mike Meyers' CompTIA A+ Guide to Managing and Troubleshooting PCs, Sixth Edition 6th Edition

CS1106 COMMUNICATION SKILLS LAB

Course Objectives

- To make students recognize the sounds of English through Audio-Visual aids;
- To help students build their confidence and help them to overcome their inhibitions and self- consciousness while speaking in English;
- To familiarize the students with stress and intonation and enable them to speak English effectively; and
- To give learners exposure to and practice in speaking in both formal and informal contexts.

Course Outcomes

- Students will be sensitized towards recognition of English sound patterns and the fluency in their speech will be enhanced;
- A study of the communicative items in the laboratory will help students become successful in the competitive world;
- Students will be able to participate in group activities like roleplays, group discussions and debates; and
- Students will be able to express themselves fluently and accurately in social as well professional context.

SYLLABUS

Introduction to Phonetics: The Sounds of English (Speech sound – vowels and consonants) - Stress and Intonation - Accent and Rhythm.

Listening Skills: Listening for gist and specific information - listening for Note taking, summarizing and for opinions - Listening to the speeches of eminent personalities.

Speaking Skills: Self-introduction - Conversation Skills (Introducing and taking leave) - Giving and asking for information - Role Play - Just A Minute (JAM) session - Telephone etiquette.

Reading and Writing skills: Reading Comprehension – Précis Writing - E-Mail writing - Punctuation.

Presentation skills: Verbal and non-verbal communication - Body Language - Making a Presentation

Reference Books

1. Ashraf Rizvi. Effective Technical Communication. Tata McGraw Hill Education Private Limited, New Delhi.
2. Speak Well. Orient Blackswan Publishers, Hyderabad.
3. Allan Pease. Body Language. Manjul Publishing House, New Delhi.

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CS1107 COMPUTER ENGINEERING WORKSHOP LAB

Course Objectives

- Explain the internal parts of a computer, peripherals, I/O ports, connecting cables
- Demonstrate basic command line interface commands on LINUX
- Teach the usage of Internet for productivity and self-paced lifelong learning
- Describe about Compression, Multimedia and Antivirus tools
- Demonstrate Office Tools such as Word processors, Spreadsheets and Presentation tools

Course Outcomes

- Assemble and disassemble components of a PC
- Construct a fully functional virtual machine, Summarize various LINUX operating system commands.
- Able to Troubleshoot hardware and software problems.

Syllabus

Module I – Hardware Concepts

1. Every student should identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor. Every student should disassemble and assemble the PC back to working condition.

Module II – Software Installations

1. Every student should individually install operating system like LINUX or MS windows on the personal computer. The system should be configured as dual boot with both windows and LINUX.
2. Hardware Troubleshooting: Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition.
3. Software Troubleshooting: Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition.
4. Cyber Hygiene: Students should learn about viruses on the internet and install antivirus software. Student should learn to customize the browsers to block pop ups, block active x downloads to avoid viruses and/or worms.
5. Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and popup blockers.

Module III – MS-Office

1. MS Word - Features to be covered: Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colours, Inserting Header and Footer, Using Date.
2. Creating project abstract Features to be covered: Formatting Styles, inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.
3. Creating a Newsletter: Features to be covered: Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs in word.
4. Spreadsheet Orientation: Accessing, overview of toolbars, saving spreadsheet files, Using help and resources. Creating a Scheduler: Gridlines, Format Cells, Summation, auto fill, Formatting Text.
5. Calculating GPA - Features to be covered: Cell Referencing, Formulae in spreadsheet – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, Sorting, Conditional formatting.
6. Creating Power Point: Student should work on basic power point utilities and tools in Latex and Ms Office/equivalent (FOSS) which help them create basic power point presentation. PPT Orientation, Slide Layouts, Inserting Text, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows, Hyperlinks, Inserting Images, Tables and charts.

CS1108 Computer Programming Using C Lab

Course Objectives

- To impart writing skill of C programming to the students and solving problems.
- To write and execute programs in C to solve problems such as Modularize the problems into small modules and then convert them into programs.,
- To write and execute programs in C to solve problems such as arrays, files, strings, structures and different numerical methods.
- This reference has been prepared for the beginners to help them understand the basic to advanced concepts related to Objective-C Programming languages.

Course Outcomes

- Understand various computer components, Installation of software. C programming development environment, compiling, debugging, and linking and executing a program using the development environment.
- Analysing the complexity of problems, Modularize the problems into small modules and then convert them into programs.
- Construct programs that demonstrate effective use of C features including arrays, strings, structures, pointers and files.
- Apply and practice logical ability to solve the real-world problems.
- Apply Numerical methods to Solve the complex Engineering problems.

Syllabus

Practice the following concepts with algorithm, flow chart and implementation.

1. C – Tokens, Data Types - Format Specifiers, I/O Statements.
2. Operators in C, their Precedence and Associativity, Arithmetic Expressions/Instructions, Type casting, Math.h functions.
3. Control Statements (Conditional): If and its Variants, Switch (Break).
4. Goto Statement, Control Statements (Looping): While, Do-While, For Loop, Continue & Break (Unconditional), Nested Loops
5. Arrays, One Dimensional Array: Declaration and Initialization, Accessing Array Elements.
6. Two Dimensional Array: Declaration and Initialization, Accessing Array Elements.
7. Strings: Read & Write, “String.h” Predefined Functions, without predefined functions.

8. Pointers: Declarations, Types, Pointers to Arrays, Pointers to Character Strings, Pointers to Pointers, Array of Pointers
9. Structures: Nested Structures, Pointers to Structures, Unions.
10. Functions: Function Declaration, Classification (Arguments and Return Type), Storage Classes.
11. Parameter Passing Techniques, Passing Parameters Types, Recursion
12. Files: Opening, Closing of Files, Reading and Writing of Files.
13. Binary Files, Random Accessing of Files, Enum, Typedef, Pre-processor Commands.
14. Numerical methods: Bisection method, Newton Raphson method, Lagrange's interpolation, Simpson's rule for numerical integration.

References:

1. Programming in ANSI C, E Balagurusamy, 6th Edition. McGraw Hill Education (India) Private Limited.
2. Introduction to Numerical Methods, SS Sastry, Prentice Hall

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CS1205	ES	Digital Logic Design	4	0	30	70	100	3
CS1206	ES	LINUX Administration Lab	0	3	50	50	100	1.5
CS1207	BS	Engineering Physics Lab	0	3	50	50	100	1.5
CS1208	ES	Data Structures Lab	0	3	50	50	100	1.5
Total Credits								**19.5**

CS1201 ENGINEERING MATHEMATICS – II

Course Objectives

- The way of obtaining rank, eigen values and eigen vectors of a matrix.
- To know the importance of Cayley-Hamilton theorem and getting canonical form from a given quadratic form.
- To solve the system of equations by using direct and indirect methods.
- To solve first order and higher order differential equations by various methods.
- To obtain the Laplace transforms and inverse Laplace transforms for a given functions and their applications.

Course Outcomes

- Find rank, eigen values and eigen vectors of a matrix and understand the importance of Cayley- Hamilton theorem.
- Reduce quadratic form to canonical forms and solving linear systems by direct and indirect methods.
- Demonstrate solutions to first order differential equations by various methods and solve basic applications problems related to electrical circuits, orthogonal trajectories and Newton's law of cooling
- Discriminate among the structure and procedure of solving higher order differential equations with constant and variable coefficients.
- Understand Laplace transforms and its properties and finding the solution of ordinary differential equations.

SYLLABUS

Linear Algebra: Rank of a matrix- Echelon form, Normal Form - Solution of Linear System of Equations - Consistency of Linear System of Equations - Direct & Indirect Methods: Gauss elimination method, LU Factorization method, Gauss Seidal Method. Complex Matrices: Hermitian, Skew-Hermitian and Unitary Matrices and their Properties.

Eigen Values and Eigen Vectors: Eigen Values and Eigen Vectors of a Matrix - Cayley-Hamilton theorem - Inverse and Powers of a Matrix using Cayley-Hamilton's theorem and its applications. Diagonalization of a Matrix - Quadratic Forms - Reduction of Quadratic Form to Canonical Form - Nature of a Quadratic Form.

Ordinary Differential Equations of First Order and its Applications: Formation of ordinary differential equations (ODEs) - Solution of an ordinary differential equation - Equations of the first order and first degree - Linear differential equation - Bernoulli's equation - Exact differential equations - Equations reducible to exact equations - Orthogonal Trajectories - Simple Electric (LR & CR) Circuits - Newton's Law of Cooling - Law of Natural growth and decay.

Differential Equations of Higher Order: Solutions of Linear Ordinary Differential Equations with Constant Coefficients - Rules for finding the complimentary function - Rules for finding the particular integral - Method of variation of parameters - Cauchy's linear equation - Legendre's linear equation - Simultaneous linear differential equations.

Laplace Transforms: Introduction - Existence Conditions - Transforms of Elementary Functions - Properties of Laplace Transforms - Transforms of Derivatives - Transforms of Integrals - Multiplication by tn - Division by t – Evaluation of integrals by Laplace Transforms - Inverse Laplace Transform - Applications of Laplace Transforms to Ordinary Differential Equations - Simultaneous Linear Differential Equations with Constant Coefficients - Second Shifting Theorem - Laplace Transforms of Unit Step Function, Unit Impulse Function and Laplace Transforms of Periodic Functions.

Text Book

1. Scope and Treatment as in "Higher Engineering Mathematics", by Dr. B.S. Grewal, 43rd edition, Khanna publishers.

Reference Books

1. Graduate Engineering Mathematics by V B Kumar Vatti., I.K. International publishing house Pvt. Ltd.
2. Advanced Engineering Mathematics by Erwin Kreyszig.
3. A text book of Engineering Mathematics, by N.P. Bali and Dr. Manish Goyal. Lakshmi Publications.
4. Advanced Engineering Mathematics by H.K. Dass. S. Chand Company.
5. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Graw Hill Company.

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CS1202 ENGINERING PHYSICS

Course Objectives

- To impart knowledge in basic concept of physics of Thermodynamics relevant to engineering applications.
- To grasp the concepts of physics for electromagnetism and its application to engineering. Learn production of Ultrasonics and their applications in engineering.
- To Develop understanding of interference, diffraction and polarization: connect it to a few engineering applications.
- To Learn basics of lasers and optical fibres and their use in some applications.
- To Understand concepts and principles in quantum mechanics and Nanophase Materials. Relate them to some applications.

Course Outcomes

- Understand the fundamentals of Thermodynamics and Laws of thermodynamics. Understand the working of Carnot cycle and concept of entropy.
- Gain Knowledge on the basic concepts of electric and magnetic fields. Understand the concept of the nature of magnetic materials. Gain knowledge on electromagnetic induction and its applications.
- Understand the Theory of Superposition of waves. Understand the formation of Newton's rings and the working of Michelson's interferometer. Remember the basics of diffraction, Evaluate the path difference. Analysis of Fraunhofer Diffraction due to a single slit
- Understand the interaction of matter with radiation, Characteristics of Lasers, Principle, working schemes of Laser and Principle of Optical Fibre. Realize their role in optical fibre communication.
- Understand the intuitive ideas of the Quantum physics and understand dual nature of matter. Compute Eigen values, Eigen functions, momentum of Atomic and subatomic particles using Time independent one-Dimensional Schrodinger's wave equation. Understand the fundamentals and synthesis processes of Nanophase materials.

SYLLABUS

Thermodynamics: Introduction, Heat and Work, First law of thermodynamics and applications, Reversible and Irreversible process, Carnot cycle and Efficiency, Second law of

thermodynamics, Carnot's Theorem, Entropy, Second law in terms of entropy, Entropy and disorder, Third law of thermodynamics (statement only).

Electromagnetism: Concept of electric flux, Gauss's law - some applications, Magnetic field - Magnetic force on current, torque on current loop, The Biot-Savart's Law, B near a long wire, B for a circular Current loop, Ampere's law, B for a solenoid, Hall effect, Faraday's law of induction, Lenz's law, Induced magnetic fields, Displacement current, Maxwell's equations (no derivation), Magnetic materials: Classification of magnetic materials and properties.

Ultrasonics: Introduction, Production of Ultrasonics – Piezoelectric and Magnetostriction methods, acoustic grating, applications of ultrasonics.

Optics-

Interference: Principles of superposition – Young's Experiment – Coherence - Interference in thin films (reflected light), Newton's Rings, Michelson Interferometer and its applications.

Diffraction: Introduction, Differences between interference and diffraction, Fresnel and Fraunhofer diffraction, Fraunhofer diffraction at a single slit (Qualitative and quantitative treatment).

Polarisation: Polarisation by reflection, refraction and double refraction in uniaxial crystals, Nicol prism, Quarter and Half wave plate, circular and elliptical polarization.

Lasers And Fibre Optics: Introduction, characteristics of a laser beam, spontaneous and stimulated emission of radiation, population inversion, Ruby laser, He-Ne laser, Semiconductor laser, applications of lasers Introduction to optical fibres, principle of propagation of light in optical fibres, Acceptance Angle and cone of a fibre, Numerical aperture, Modes of propagations, classification of fibres, Fibre optics in communications, Application of optical fibres.

Modern Physics-

Introduction, De Broglie concept of matter waves, Heisenberg uncertainty principle, Schrodinger time independent wave equation, application to a particle in a box. Free electron theory of metals, Kronig - Penney model (qualitative treatment), Origin of energy band formation in solids, Classification of materials into conductors, semi-conductors and insulators.

Nanophase Materials: Introduction, properties, Top-down and bottom-up approaches, Synthesis - Ball milling, Chemical vapour deposition method, sol-gel methods, Applications of nano materials.

Text Books

1. Physics by David Halliday and Robert Resnick – Part I and Part II - Wiley.
2. A textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar - S. Chand
3. Engineering Physics by R.K. Gaurand S.L. Gupta–Dhanpat Rai

Reference Books

1. Modern Engineering Physics by A.S. Vadudeva
2. University Physics by Young and Freedman

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CS1203 ELEMENTS OF ELECTRONICS ENGINEERING

Course Objectives

- Introduce students to basics of semiconductors, their classification and properties
- To provide theory of PN junction diode, its characteristics and applications
- To introduce basics of rectifying circuits and bipolar junction transistor
- To provide basics of transistor biasing, transistor amplifiers and field effect transistors

Course Outcomes

By the end of the course, the student should be able to:

- Explain the basics of semiconductors and their classification
- Understand the theory of PN junction diode, rectifying circuits and bipolar junction transistor
- Explain the concepts of transistor biasing, transistor amplifiers and field effect transistors

SYLLABUS

Introduction to Electronics and Semiconductors: Energy band theory, Conduction in Insulators, Semiconductors and metals, Electron emission from metals, Classification of semiconductors, Carrier concentration in an intrinsic semiconductor, Properties of intrinsic semiconductor, Drift and diffusion currents.

Semi-Conductor Diode: Theory of PN junction diode, Open circuited PN junction, V-I characteristics of a PN diode, Diode current equation, Transition and diffusion capacitances, Break down in PN diode, Applications of PN diodes. Zener diode, Zener regulator, Tunnel diode, Schottky diode.

Rectifying circuits: Half wave and full wave rectifiers, Bridge rectifiers, Efficiency, Ripple and regulation of each rectifier, Capacitor filters.

Bipolar Junction Transistor: Introduction, construction, Operation of PNP and NPN Transistors – Transistor Circuit configurations- Characteristics of a CE configurations – h parameters, low frequency small signal equivalent circuit of a Transistor.

Transistor Biasing and thermal stabilization: Transistor Biasing, Stabilization, Different methods of transistor biasing – Fixed bias, Collector feedback bias – self bias – Bias compensation.

Transistor Amplifiers: CE, CB, CC amplifier configurations –Multistage amplifier – A Two Stage RC coupled amplifier – frequency response curve and bandwidth.

Field Effect Transistors: Junction Field Effect Transistors (JFET) – JFET characteristics, JFET Parameters, Small signal equivalent circuit – MOSFETS – Depletion and Enhancement MOSFETS.

Text Books:

1. Electronic Device and Circuits by Sanjeev Guptha.

Reference Books:

1. Electronic Device and Circuits Theory by Robert L. Boylested Electronic Device and Circuits by David. A. Bell

CS1204 DATA STRUCTURES USING C

Course objectives

- Assess how the choice of data structures and algorithm design methods impacts the performance of programs.
- Choose the appropriate data structure and algorithm design method for a specified application.
- Solve problems using data structures such as linear lists, stacks, queues, binary trees, heaps binary search trees, and graphs and writing programs for these solutions.

Course outcomes

- Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithm.
- Demonstrate different methods for traversing trees.
- Compare alternative implementations of data structures with respect to performance.
- Discuss the computational efficiency of the principal algorithms for sorting and searching

SYLLABUS

Introduction to Data Structures: Review of C Programming, Recursive Definition and Processes, Recursion in C, Simulation of Recursion, Efficiency of Recursion, Abstract Data Types, Meaning and Definition of Data Structures, Arrays.

Stacks: Stack as an Abstract Data Type, Primitive Operations, Implementing Stack Operations using Arrays, Infix, Postfix and Prefix: Definitions, Evaluation and Conversions.

Queues: Queue as an Abstract Data Type, Sequential Representation, Types of Queues, Operations, Implementation using Arrays.

Linked List: Operations, Implementation of Stacks, Queues and priority Queues using Linked Lists+, Circular Lists: Insertion, Deletion and Concatenation Operations, Stacks and Queues as Circular Lists, Doubly Linked Lists.

Trees: Binary Trees - Definitions and Operations, Binary Tree Representation: Node Representation, Implicit array Representation, Binary Tree Traversal, Threaded Binary Trees and their Traversal, Trees and their Applications; Tree Searching: Insertion and Deletion of a node from a Binary Search Tree, Efficiency of Binary Search Tree operations.

Searching: Basic Searching Techniques: Dictionary as an Abstract Data Type, Algorithmic Notation, Sequential Searching and its Efficiency, Binary Search, Interpolation Search.

Sorting: General Background: Efficiency, Asymptotic Notations, Efficiency of Sorting, Bubble Sort and Quick Sort and their Efficiency, Selection Sorting, Binary Tree Sort, Heap Sort, Insertion Sorts, Shell Sort, Address calculation Sort, Merge and Radix Sorts.

Graphs and Their Application: Definition of Graphs, Representation of Graphs, Transitive closure, Linked Representation of Graphs, Topological Ordering of nodes, Graph Traversal and Spanning Forests, Undirected Graphs and their Traversals, Applications of Graphs, Minimal Spanning Trees.

Textbooks

1. Data Structures Using C and C++ Yddish Langsam, Moshe J. Augenstein and Aaron M.Tanenbaum, Prentice Hall Of India (2nd Edition)
2. Data Structures, Algorithms and Applications with C++, Sahani Mc-Graw Hill.

CS1205 DIGITAL LOGIC DESIGN

Course objectives

- To introduce the basic principles for design of combinational circuit and sequential circuits.
- To learn simple digital circuits in preparation for computer engineering.

Course Outcomes

A student who successfully fulfils the course requirements will have demonstrated:

- An ability to define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.
- An ability to understand the different Boolean algebra theorems and apply them for logic functions.
- An ability to define the Karnaugh map for a few variables and perform an algorithmic reduction of logic functions.
- An ability to define the following combinational circuits: multiplexer, de-multiplexers encoders/decoders, comparators, arithmetic-logic units; and to be able to build simple circuits.
- An ability to understand asynchronous and synchronous sequential circuits, like counters and shift registers.
- An ability to understand memories like RAM and ROM, Programmable Logic Array and Programmable Array Logic.

SYLLABUS

Binary Systems: Digital Systems. Binary Numbers. Number Base Conversions. Octal and Hexadecimal Numbers. Complements. Signed Binary Numbers. Binary Codes. Binary Storage and Registers. Binary Logic

Boolean Algebra and Logic Gates: Basic Definitions. Axiomatic Definition of Boolean Algebra. Basic Theorems and Properties of Boolean Algebra. Boolean Functions. Canonical and Standard Forms. Other Logic Operations. Digital Logic Gates. Integrated Circuits.

Combinational Logic Design, Gate-Level Minimization: The Map Method. Four Variable Map. Five-Variable Map. Product of Sums Simplification. Don't-Care Conditions. NAND and

NOR Implementation. Other Two- Level Implementations. Exclusive-OR Function. Hardware Description Language (HDL).

Combinational Logic: Combinational Circuits. Analysis Procedure. Design Procedure. Binary Adder Subtractor. Decimal Adder. Binary Multiplier. Magnitude Comparator. Decoders. Encoders. Multiplexers. HDL For Combinational Circuits.

Sequential Logic Design, Synchronous Sequential Logic: Sequential Circuits. Latches Flipflops. Analysis of Clocked Sequential Circuits. HDL For Sequential Circuits. State Reduction and Assignment. Design Procedure.

Registers ad Counters: Registers. Shift Registers. Ripple Counters. Synchronous Counters. Other Counters. HDL for Registers and Counters.

Memory and Programmable Logic: Introduction. Random-Access Memory. Memory Decoding, Error Detection and Correction. Read-Only Memory. Programmable Logic Array. Programmable Array Logic. Sequential Programmable Devices.

Text Book

1. DigitalDesign,3rdEdition, M. Morris Mano, Pearson Education.

Reference Books

1. Digital Logic Design Principles, Norman Balabanian & Bradley Carlson, John Wiley &Sons (Asia) Pvt.Ltd.,2002
2. Fundamentals of Digital Logic with VHDL Design, Stephen Brown and ZvonkoVranesic, TataMcGraw-HillEdition,2002.

CS1206 LINUX ADMINISTRATION LAB

Course Objectives

- To understand LINUX operating system and its internals.
- To understand LINUX file system structure and its operations.
- To understand LINUX shell environment and its programming.
- To understand communication in LINUX and the corresponding primitives.

Course Outcomes

- The student learns about LINUX features for multiuser, multitasking capabilities.
- The student learns about file system organization, file and directory manipulation, setting file permissions, and disk free space administration.
- The student learns about writing shell scripts for different applications.
- The student learns about how users communicate with each other in LINUX environment.

SYLLABUS

1) Study and practice on file system / handling files with commands, syntax, usage, application.
2) Practice on vi editor.
3) Study and practice on redirection operators with relevant commands, syntax, usage, application.
4) Study and practice on filters with relevant commands, syntax, usage, application.
5) Study and practice on Backup with relevant commands, syntax, usage, application.
6) Study and practice on internet related commands, syntax, usage, application.
7) Study and practice on shells/shell programming with relevant programming constructs, syntax, usage, application.
8) Study and practice on awk with relevant commands, syntax, usage, application.
9) Study and practice on regular expressions and the grep family with relevant commands, syntax, usage, application.
10) Study and practice on compilation process of C programs under UNIX.

References:

1. Unix concepts and applications by Sumitabha Das, TMH Publications.
2. Shell programming by Yashwanth Kanetkar.

CS1207 ENGINNERING PHYSICS LAB

Course Objectives

- To enable the students to acquire skill, technique and utilization of the Instruments
- Draw the relevance between the theoretical knowledge and to imply it in a practical manner with respect to analyse various electronic circuits and its components.
- To impart the practical knowledge in basic concepts of Wave optics, Lasers and fibre optics.
- To familiarize the handling of basic physical apparatus like Vernier callipers, screw gauge, spectrometers, travelling microscope, laser device, optical fibre, etc.

Course Outcomes

- Ability to design and conduct experiments as well as to analyse and interpret
- Ability to apply experimental skills to determine the physical quantities related to Heat, Electromagnetism and Optics
- The student will learn to draw the relevance between theoretical knowledge and the means to imply it in a practical manner by performing various relative experiments.

SYLLABUS

1. Determination of Radius of Curvature of a given Convex Lens By forming Newton's Rings.
2. Determination of Wavelength of Spectral Lines in the Mercury Spectrum by Normal Incidence method.
3. Study the Intensity Variation of the Magnetic Field along axis of Current Carrying Circular Coil.
4. Determination of Cauchy's Constants of a Given Material of the Prism using Spectrometer.
5. Determination of Refractive Index of Ordinary ray □o and Extraordinary □e ray.
6. Determination of Thickness Given Paper Strip by Wedge Method.
7. Calibration of Low Range Voltmeter.
8. Calibration of Low Range Ammeter.
9. Determination of Magnetic Moment and Horizontal Component of Earth's Magnetic Field.

10. Lees Method - Coefficient of thermal Conductivity of a Bad Conductor.

11. Carey Foster's Bridge – Verification of laws of Resistance and Determination of Specific Resistance.

12. Melde's Apparatus – Frequency of electrically maintained Tuning Fork.

13. Photoelectric cell-Characteristics.

14. Planks Constants.

15. Laser- Diffraction.

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CS1208 DATA STRUCTURES LAB

Course Objectives

- To implement stacks and queues using arrays and linked lists.
- To develop programs for searching and sorting algorithms.
- To write programs using concepts of various trees.
- To implement programs using graphs.

Course Outcomes

- Student will be able to write programs to implement stacks and queues.
- Ability to implement various searching and sorting techniques.
- Ability to implement programs using trees and graphs.

SYLLABUS

List of Programs:

1. Write a C program for sorting a list using Bubble sort and then apply binary search.
2. Write a C program for implementing the operations of a queue.
3. Write a C program to implement the operations on priority queues.
4. Write a C to implement the operations on circular queues.
5. Write a C program to implement the operations on stacks.
6. Write a C program for evaluating a given postfix expression using stack.
7. Write a C program for converting a given infix expression to postfix form using stack.
8. Write a C program to implement the operations on single linked list.
9. Write a C program for demonstrate operations on double linked list.
10. Write a C program for the representation of polynomials using circular linked list and for the addition of two such polynomials
11. Write a C program to create a binary search tree and for implementing the in order, Pre order, post order traversal using recursion
12. a) Write a C program for finding the transitive closure of a digraph
    b) Write a C program for finding the shortest path from a given source to any vertex in a digraph using Dijkstra's algorithm.
13. a) Write a C program for finding the Depth First Search of a graph.
    b) Write a C program for finding the Breadth First Search of a graph

References:

1. Data Structures Using C and C++ Yddish Langsam, Moshe J. Augenstein and Aaron M.Tanenbaum, Prentice Hall Of India (2nd Edition)

2. Data Structures, Algorithms and Applications with C++, Sahani Mc-Graw Hill.

B.Tech & B.Tech + M.Tech
(Computer Science & Engineering)
II Year - I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
CS2101	ES	Discrete Mathematical Structures	4	0	30	70	100	3
CS2102	PC	Computer Organization and Architecture	4	0	30	70	100	3
CS2103	BS	Probability, Statistics and Queuing theory	4	0	30	70	100	3
CS2104	PC	Operating Systems	4	0	30	70	100	3
CS2105	PC	Object Oriented Programming Through Java	4	0	30	70	100	3
CS2106	PC	Computer Organization & Architecture Lab	0	3	30	70	100	1.5
CS2107	PC	Object Oriented Programming Through Java Lab	0	3	50	50	100	1.5
CS2108	PC	Operating Systems Lab	0	3	50	50	100	1.5
CS2109	SC	Intellectual Property Rights (Internal)	1	2	100	0	100	2
CS2110	MC	Environmental Science	0	0	-	100	100	0
Total credits								**21.5**

CS2101 DISCRETE MATHEMATICAL STRUCTURES

Course Objectives

- To understand mathematical arguments using logical connectives and quantifiers and verify the validity of logical flow of arguments using propositional, predicate logic and truth tables.
- To understand about permutations and combinations.
- To understand various types of relations and discuss various properties of the relations.
- To study the graphs, graph isomorphism and spanning trees.
- To study about Boolean algebra and Finite State Machines.

Course Outcomes

At the end of the course student will be able to

- Rewrite mathematical arguments using logical connectives and quantifiers and verify the validity of logical flow of arguments using propositional, predicate logic.
- Identify and give examples of various types of relations and describe various properties of the relations.
- Ability to solve problems using permutations and combinations.
- Determine isomorphism of graphs and spanning tree of a given graph using BFS/DFS algorithms. Also determine minimal spanning tree of a given graph.

SYLLABUS

The Foundations-Logic and Proofs: Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers Rules of Inference, Introduction to Proofs, Proof Methods and Strategy, Basic Structures-Sets, Functions, Sequences and Sums: Sets, Set Operations, Functions, Sequences and Summations.

The Fundamentals-Algorithms, the Integers and Matrices: Algorithms, The Growth of Functions, Complexity of Algorithms, The Integers and Division, Primes and Greatest Common Devisors, Integers and Algorithms, Applications of Number Theory, Matrices.

Induction and Recursion: Mathematical Induction, Strong Induction and Well-Ordering, Recursive Definitions and Structural Induction, Recursive Algorithms, Program Correctness.

Counting: The Basics of Counting, The Pigeonhole Principle, Permutations and Combinations, Binomial Coefficients, Generalized Permutations and Combinations, Generating Permutations and Combinations.

Advanced Counting Techniques: Recurrence Relations, Solving Linear Recurrence Relations, Divide-and-Conquer Algorithms and Recursion Relations, Generating Functions, Inclusion-Exclusion, and Applications of Inclusion-Exclusion.

Relations: Relations and their properties, n-ary relations, applications, Representation, closure, equivalence relations, Partial orderings.

Graphs: Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Colouring.

Trees: Introduction to Trees, Applications of Trees, Tree Traversal, Spanning Trees, Minimum Spanning Trees,

Boolean Algebra: Boolean Functions, Representing Boolean Functions, Logic Gates, Minimization of Circuits

Modelling Computation: Languages and Grammars, Finite-State Machines with Output, Finite-State Machines with No Output, Language Recognition, Turing Machines.

Text Book

1. Discrete Mathematics & Its Applications with Combinatorics and Graph Theory by Kenneth H Rosen, Tata McGraw-Hill Publishing Company Ltd., New Delhi.

Reference Books

1. Discrete Mathematics for Computer Scientists & Mathematicians by Joe L. Mott, Abraham Kandel, Theodore P. Baker, Prentice-Hall, India.
2. Discrete Mathematics by Richard Johnson Baug, Pearson Education, New Delhi.
3. Discrete and Combinatorial Mathematics by Ralph. G. Grimaldi, Pearson Education, New Delhi.

CS2102 COMPUTER ORGANIZATION AND ARCHITECTURE

Course Objectives

- To study about structure and functional components of a computer.
- Understanding the hierarchical organization of a computer system which consists of instruction set of commands.
- Learn about the architecture of a computer from a programming view.
- To design a balance system that minimizes performance and utilization of all elements.

Course Outcomes

By the end of the course, the student should be able to:

- Demonstrate knowledge about major components of a computer such as processor, memory and I/O modules along with their interconnections internally with outside world.
- have detailed idea about architecture of central processing unit, functions of control unit, memory, I/O devices and their issues.
- Understand simple and multiple processor organization and their issues.

SYLLABUS

Register Transfer and Micro operations: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations, Arithmetic Logic Shift Unit.

Basic Computer Organization and Design: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input- Output and Interrupt, Complete Computer Description, Design of Basic Computer, Design of Accumulator Logic.

Micro programmed Control: Control Memory, Address Sequencing, Micro program Example, Design of Control Unit.

Central Processing Unit: Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control,

Reduced Instruction Set Computer (RISC), Architecture and Programming of 8085 Microprocessor

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISK Pipeline, Vector Processing, Array Processors.

Input/output Organization: Peripheral Devices, I/O interface, Asynchronous data transfer, Modes of transfer, priority Interrupt, Direct memory access, Input-Output Processor (IOP), Serial Communication.

Memory Organization: Memory Hierarchy, Main memory, Auxiliary memory, Associate Memory, Cache Memory, and Virtual memory, Memory Management Hardware.

Text Books

1. Computer System Architecture, M. Morris Mano, Prentice Hall of India Pvt. Ltd., Third Edition, Sept.2008.
2. Computer Architecture and Organization, P.Chakraborty.
3. Microprocessor Architecture, Programming and Applications with the 8085by Ramesh S Gaonkar

Reference Books

1. Computer Architecture and Organization, William Stallings, PHI Pvt. Ltd., Eastern Economy Edition, Sixth Edition, 2003.
2. Computer Organization and Architecture, Linda Null, Julia Lobur, Narosa Publications ISBN81- 7319-609-5
3. Computer System Architecture", John. P.Hayes.

CS2103 PROBABILITY, STATISTICS AND QUEUING THEORY

Course objectives

- To provide foundations of probabilistic and statistical analysis
- To provide an understanding on concepts of probability, random variables, probability distributions, sampling, estimation, hypothesis testing, regression, correlation, multiple regression, hypothesis testing, sample test, queuing methods
- To explore applications of probabilistic and statistical tools to solve real world problems.

Course outcomes

After completion of the course the student should be able to:

- Define and explain basic concepts in probability theory and how to translate real-world problems into probability models
- Solve standard problems that include random variables, discrete and continuous probability distributions
- Perform Test of Hypothesis and construct a confidence interval to estimate population parameters
- Compute and interpret the results of Correlation Analysis, Multivariate Regression, Chi-Square test for Independence and Goodness of Fit
- Explain basic concepts in Markov processes, M/M/1 and M/M/C queueing systems.

SYLLABUS

Probability: Definitions of probability, Addition theorem, Conditional probability, Multiplication theorem, Bayes Theorem of Probability and Geometric Probability.

Random variables and their properties: Discrete Random Variable, Continuous Random Variable, Probability Distribution, Joint Probability Distributions their Properties, Transformation Variables, Mathematical Expectations, Probability Generating Functions.

Probability Distributions: Discrete Distributions: Binomial, Poisson Negative Binominal Distributions and Their Properties; **Continuous Distributions:** Uniform, Normal, Exponential Distributions And Their Properties.

Multivariate Analysis: Correlation, Correlation Coefficient, Rank Correlation, Regression Analysis, Multiple Regression, Attributes, Coefficient Of Association, Chi Square Test For Goodness Of Fit, Test For Independence.

Estimation: Sample, Populations, Statistic, Parameter, Sampling Distribution, Standard Error, Un- biasedness, Efficiency, Maximum Likelihood Estimator, Notion & Interval Estimation.

Testing of Hypothesis: Formulation of Null hypothesis, critic al region, level of significance, power of the test;

Sample Tests: Small Sample Tests: Testing equality of means, testing equality of variances, test of correlation coefficient, test for Regression Coefficient; Large Sample tests: Tests based on normal distribution

Queuing Theory: Queue description, characteristics of a queuing model, study state solutions of M/M/1: Model, M/M/1; N Model, M/M/C: Model, M/M/C: N Model, Case studies.

Text Books

1. Probability & Statistics for Engineers and Scientists, Walpole, Myers, Myers, Ye. Pearson Education.
2. Probability, Statistics and Random Processes T.Veerarajan Tata McGraw – Hill

Reference Book

1. Probability & Statistics with Reliability, Queuing and Computer Applications, Kishor S. Trivedi, Prentice Hall of India ,1999

CS2104 OPERATING SYSTEMS

Course objectives:

- To understand evolution of Operating System.
- To understand operating system as a layer of abstraction above physical hardware that facilitates usage convenience and efficient resource management of computer system resources.
- To learn design and implementation of policies and mechanisms for OS subsystem.
- To investigate case studies to understand the design philosophies / paradigm for popular multiuser or single user operating system.

Course Outcomes:

- The student understands OS evolution, its structure and services provided by it.
- Learn process life cycle, process scheduling objectives, policies and mechanisms, process synchronization, inter process communication, deadlocks and other process subsystem related concepts.
- Learn memory hierarchy, allocation and deallocation policies and mechanism for main and auxiliary memory, file system design and implementation issues.
- investigate UNIX/ LINUX and Windows OS platforms w.r.t similarities and differences in design philosophies.

SYLLABUS

Introduction to Operating Systems: Over View of Operating Systems, Types of Operating Systems, Operating System Structures, Operating System Services, System Calls, Virtual Machines, Operating System Design and Implementation.

Process Management: Process Concepts, Operations on Processes, Cooperating Processes, Threads, Inter Process Communication, Process Scheduling, Scheduling Algorithms, Multiple-Processor Scheduling, Thread Scheduling.

Process Synchronization: The Critical Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classical Problems of Synchronization, Critical Regions, Monitors.

Deadlocks: System Model, Deadlock Characterization, Methods For Handling Deadlocks, Deadlock Prevention, Avoidance, Deadlock Detection, Recovery from Deadlocks.

Memory Management: Logical versus Physical Address, Swapping, contiguous memory allocation, paging, structure of the page table, segmentation, Virtual Memory, Demand Paging, Page Replacement, Allocation of Frames, Thrashing, Memory-Mapped files.

File Systems, Implementation, and Secondary-storage Structure: Concept of a file, Access Methods, Directory Structure, Protection, File System Structure, Allocation Methods, Free Space Management, Directory Management, Device Drivers, overview of Mass-storage structure, Disk structure, disk attachment, disk scheduling, swap-space management.

Case study: Overview of LINUX, Windows Operating systems.

Text Book:

1. Operating Systems, Abraham Silberschatz, Peter Baer Galvin, and Greg Gagne, John Wiley Publ., Seventh Edition.
2. Operating Systems; A Practical Approach. Rajiv Chopra.

Reference Books:

1. Modern Operating Systems, Andrew S. Tanenbaum, ,2nd edition, 1995, PHI.
2. Operating Systems, William Stallings 5th Edition -PHI
3. Operating Systems: A Design-Oriented Approach', Charles Crowley, 'Tata Hill Co.,1998 edition.

CS2105 OBJECT ORIENTED PROGRAMMING THROUGH JAVA

Course Objectives:

- This subject will help to improve the analytical skills of object-oriented programming
- Overall development of problem solving and critical analysis
- Formal introduction to Java programming language

Course Outcome:

On successful completion of this course, the student should be able to:

- Show competence in the use of the Java programming language in the development of small to medium-sized application programs that demonstrate professionally acceptable coding and performance standard
- Understand the basic principles of the object-oriented programming
- Demonstrate an introductory understanding of graphical user interfaces, multi- threaded programming, and event-driven programming.

SYLLABUS

Introduction to Java: Basics of Java programming, Data types, Variables, Operators, Control structures including selection, Looping, Java methods, Overloading, Math class, Arrays in java.

Objects and Classes: Basics of objects and classes in java, Constructors, Finalizer, Visibility modifiers, Methods and objects, Inbuilt classes like String, Character, StringBuffer, File, this reference

Inheritance and Polymorphism: Inheritance in java, Super and sub class, Overriding, Object class, Polymorphism, Dynamic binding, Generic programming, Casting objects, Instance of operator, Abstract class, Interface in java, Package in java, UTIL package.

Event and GUI programming: Event handling in java, Event types, Mouse and key events, GUI Basics, Panels, Frames, Layout Managers: Flow Layout, Border Layout, Grid Layout, GUI components like Buttons, Check Boxes, Radio Buttons, Labels, Text Fields, Text Areas, Combo Boxes, Lists, Scroll Bars, Sliders, Windows, Menus, Dialog Box, Applet and its life cycle, Introduction to swing

I/O programming: Text and Binary I/O, Binary I/O classes, Object I/O, Random Access Files.

Multithreading in java: Thread life cycle and methods, Runnable interface, Thread synchronization, Exception handling with try-catch-finally, Collections in java, Introduction to JavaBeans and Network Programming.

Java Database Connectivity (JDBC): JDBC Product, Types of Drivers, Two-Tier Client/Server Model, Three-Tier Client/Server Model, Basic Steps of JDBC, Creating and Executing SQL Statement, The Result Set Object, Working with Database MetaData Interface

Reference Books:

1 Introduction to Java Programming (Comprehensive Version), Daniel Liang, Seventh Edition, Pearson.

2 Programming in Java, Sachin Malhotra & Saurabh Chaudhary, Oxford University Press.

3 Murach's Beginning Java 2, Doug Lowe, Joel Murach and Andrea Steelman, SPD.

4 Core Java Volume-I Fundamentals, Eight Edition, Horstmann & Cornell, Pearson Education.

5 The Complete Reference, Java 2 (Fourth Edition), Herbert Schild, TMH.

6 Java Programming, D. S. Malik, Cengage Learning.

CS2106 COMPUTER ORGANIZATION & ARCHITECTURE LAB

SCourse Objectives

- to design and analyse the operational behaviour of IC gates, multiplexers, decoders, flip-flops, counters, shift registers, binary adders and subtractors and ALU.
- to implement assembly language programming using various trainers.
- to make students familiar with Pentium class PC architecture.

Course Outcomes

After completion of the course the student should be able to:

- analyse the operational behaviour of various digital logic units such as multiplexers, decoders, flip-flops, counters, shift registers, binary adders and subtractors and ALU.
- write assembly language code using various trainers.
- understand Pentium class PC architecture.

SYLLABUS

I - Cycle: Digital Logic Design Experiments

TTL Characteristics and TTL IC Gates

Multiplexers & Decoders

Flip-Flops

Counters

Shift Registers

Binary Adders & Subtractors

A L U

II - CYCLE: 8085 Assembly Language Programming

8085 Assembly Language Programming according to theory course microprocessors-I using the following trainers:

Keyboard Monitor of 8085µP Trainer

Serial Monitor of 8085µP Trainer with Terminal

8085 Line Assembler of 8085μP Trainer with PC as Terminal

8085 Cross Assembler using In-Circuit Emulator (ICE) with 8085μP Trainer and PC as Terminal

Graded Problems are to be used according to the syllabus of computer organization Pentium class pc architecture familiarization hardware & software parts demonstration

Reference Books

1. Computer System Architecture, M. Morris Mano, Prentice Hall of India Pvt. Ltd., Third Edition, Sept.2008
2. Microprocessor Architecture, Programming and Applications with the 8085 by Ramesh S
   Gaonkar.

CS2107 OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB

Course Objectives:

- To develop programs using basic OOPS concepts such as classes and objects.
- To implement programs using Inheritance concepts.
- To implement programs using Exception handling.
- To develop programs using operator overloading concepts.

Course Outcomes:

- Student will be able to use OOPs concepts.
- Ability to apply Inheritance concepts to several problems.
- Ability to use Exception Handling concepts.

List of Programs:

1. Program to define a structure of a basic JAVA program
2. Program to define the data types, variable, operators, arrays and control structures.
3. Program to define class and constructors. Demonstrate constructors.
4. Program to define class, methods and objects. Demonstrate method overloading.
5. Program to define inheritance and show method overriding.
6. Program to demonstrate Packages.
7. Program to demonstrate Exception Handling.
8. Program to demonstrate Multithreading.
9. Program to demonstrate I/O operations.
10. Program to demonstrate Network Programming.
11. Program to demonstrate Applet structure and event handling.
12. Program to demonstrate Layout managers.

CS2108 OPERATING SYSTEMS LAB

Course Objectives:

- To learn about UNIX/LINUX operating system environment.
- To learn about system calls for UNIX/LINUX Operating System.
- To understand resource management policies and mechanisms and their performance evaluation.

Course Outcomes:

- The student learns about multiprogramming, and multitasking capabilities of UNIX/LINUX.
- The student develops skill in writing C programs using system calls for process management, inter process communication and other aspects.
- The student learns to simulate OS resource management aspects like process scheduling, page replacement, disk scheduling, free space management and others to evaluate performance.

Syllabus

Module I

1. OS lab familiarization, Home Assignment on Unix commands, Vi editor
2. Simple shell programming exercises
3. Shell programming using decision making constructs, loop constructs, file and directory manipulation
4. Simple C programs using command line arguments, system calls, library function calls, make utility
5. C programs using system call to create processes and study parent, child process mechanism
6. C programs to create process chaining, spawning
7. C programs to error handling using errno(), perror() function
8. C programs to use pipe system call for inter process communication

Module II

1. C programs to study process scheduling implementing FCFS, Shortest Job First, and Round Robin algorithms
2. C programs to study page replacement implementing FIFO, Optimal, and LRU page replacement algorithms
3. C programs to study deadlock avoidance and detection
4. C Programs to simulate free space management (first fit, best fit, worst fit).
5. C programs to study disk scheduling algorithms (i.e., SCAN, SSTF, LOOK, etc.,)

References:

1. Unix concepts and applications by Sumitabha Das, TMH Publications.
2. Unix programming by Stevens, Pearson Education.
3. Shell programming by Yashwanth Kanetkar.
4. Operating System Concepts by Silberschatz, and Peter Galvin.

CS2109 INTELLECTUAL PROPERTY RIGHTS

Course Objective:

- To introduce the students to Intellectual Property Rights (IPR) which is a key component in modern knowledge management processes
- To create consciousness on IPR in students at an early stage of their education so that they develop an appreciation for ethical and rightful use of existing knowledge
- To make them understand how to take ownership of knowledge they may develop as a result of their creative innovations, take ownership and either drive themselves in becoming entrepreneurs or become responsible knowledge users in society
- To expose students some of the recent debates on the societal implications of IPR and its role in national/international trade and socio-economic development.

Course outcome:

Learners will be able to

- identify the types of intellectual property protection available for their research outcome
- conduct patent search and analyse patentability of the invention
- understand the basic structure of Patent document
- understand the registration and prosecution of different IPs
- understand the basics of IP commercialization and techno/commercial/legal issues in IPR commercialization

SYLLABUS

Introduction: Concept of property, Intellectual Property (IP) and Intellectual Property Rights (IPR), Importance of IP, Value creation through IP, Advantages of IP protection, Competitive advantage, Promotion of social good, Prevention of duplicates, counterfeit products and IP.

Evolution of IP system: Historical view of IP system in India and abroad, Legal basis and rationale behind development of IP system, WTO and TRIPS agreement, Role of WIPO.

Types of IPR: Major forms of IP in India and globally, Acts enacted in India related to IP.

Patent: Concept, Life of patent, Rights of Patentee, Criteria of patentability- novelty, non-obviousness, and utility, Non-patentable inventions.

Patent filing and prosecution: Prior art search, Process of obtaining a patent in India, Provisional and complete specification, Convention application, Patent Cooperation Treaty (PCT), Patent Infringement and Enforcement.

Trademark: Types of trademarks, Trademark and Brand, Trademark Registration, Trademark Infringement.

Copyright: Copyrights and related rights, Copyright registration, Copyright infringement, Section 52 of Indian Copyright Act.

Industrial Design: What is Industrial design, Design registration, Design infringement.

Trade Secret: What are Trade Secrets, How trade secrets are maintained in trade and business.

Other forms of IP: Semiconductor Integrated Circuits Layout Design, Geographical Indications, Protection of Plant Varieties & Farmers' right, Traditional knowledge.

IP commercialization: Licensing & Royalty; Technology Transfer; IP assignment, Compulsory License.

Emerging areas: Pat informatics, IP and bank loan, IP insurance, IP audit, IP valuation, IP management, Use of artificial intelligence in IP enforcement, Open innovation.

Text Books

1. Ganguli Prabuddha, Gearing up for Patents The Indian Scenario", Universities Press (1998)
2. Ganguli Prahuddha "Intellectual Property Rights-Unleashing the Knowledge Economy". Tata McGraw Hill (2001)
3. Geographical Indications of Goods Act 1990 Ganguli Piabaddha "Geographical Indications-its evolving contours accessible in http ips. nminsoda/files/2012/05/main book pdf (2009)

Reference Books

1. Ganguli Prabuddha and Jahade Siddharth, "Nanotechnology Intellectual Property Rights Research, Design, and Commercialisation", CRC Press, Taylor and Francis Group, USA (2012)
2. Beyond Intellectual Property: Toward Traditional Resource Rights for Indigenous Peoples and Local Communities [Paperback J,Darrell A. Posey and Graham Dotfield, IDRC Books; annotated edition (June (1996)
3. Netancl Neil Weinstock, Copyright's Paradox, Oxford University Press (2010)
4. The Indian Patents Act 1970 (as amended in 2005)
5. The Indian Copyright Act 1950 as amended in 2017)
6. Indian Trademarks Act 1999
7. The Indian Industrial Designs Act 2000
8. The Protection of Plant Varieties and Farmers' Right Act 2001
9. Inventing the Future: An Introduction to Patents for small and medium sized enterprises, WIPO publication No 917 www.wipo.int/ebookshop
10. Looking Good: An Introduction to Industrial Designs for Small and Medium sized Enterprises; WIPO publication No.498 www.wipo.int/ebookshop

CS2110 ENVIRONMENTAL SCIENCE

Course Objectives

The objectives of the Environmental Science course are to

- Familiarize the fundamental aspects of environment and the environmental management'
- Provide information of some of the important international conventions which will be useful during the future endeavours after graduation.
- Make realize the importance of natural resources management for the sustenance of the life and the society.
- Apprise the impact of pollution getting generated through the anthropogenic activities on the environment
- Provide the concept of Sustainable Development, energy and environmental management
- Impart knowledge on the new generation waste like e-waste and plastic waste.

Course Outcomes

After completion of the course the students will have

- Knowledge on the fundamental aspects of environment and the environmental management
- The knowledge on the salient features of the important international conventions
- Understanding of the importance of natural resources management for the sustenance of the life and the society.
- Familiarity on various forms of pollution and its impact on the environment.
- Understand the elements of Sustainable Development, energy and environmental management
- Knowledge on the new generation waste like e-waste and plastic waste.

SYLLABUS

Introduction: Structure and functions of Ecosystems-Ecosystems and its Dynamics-Value of Biodiversity-impact of loss of biodiversity, Conservation of bio-diversity. Environmental indicators - Global environmental issues and their impact on the ecosystems. Salient features of international conventions on Environment: Montreal Protocol, Kyoto protocol, Ramsar

Convention on Wetlands, Stockholm Convention on Persistent Organic Pollutants, United Nations Framework Convention on Climate Change (UNFCCC),

Natural Resources Management: Importance of natural resources management-Land as resource, Land degradation, Soil erosion and desertification, Effects of usage of fertilizer, herbicides and pesticide- watershed management.

Forest resources: Use and over-exploitation, Mining and dams – their effects on forest ecosystems and the living beings.

Water resources: Exploitation of surface and groundwater, Floods, droughts, Dams: benefits and costs.

Mineral Resources: Impact of mining on the environment and possible environmental management options in mining and processing of the minerals.

Sustainable resource management (land, water, and energy), and resilient design under the changing environment.

Environmental Pollution: Local and Global Issues. Causes, effects and control measures. Engineering aspects of environmental pollution control systems.

Air pollution: impacts of ambient and indoor air pollution on human health. Water pollution: impacts water pollution on human health and loss of fresh water resources. Soil pollution and its impact on environment. Marine pollution and its impact on blue economy. Noise pollution.

Solid waste management: Important elements in solid waste management- Waste to energy concepts. Air (prevention and control of pollution) Act, Water (prevention and control of pollution) Act and their amendments. Salient features of Environmental protection Act, 1986.

Sustainable Development: Fundamentals of Sustainable Development– Sustainability Strategies and Barriers – Industrialization and sustainable development. Circular economy concepts in waste (solid and fluid) management.

Energy and Environment: Environmental Benefits and challenges, Availability and need of conventional energy resources, major environmental problems related to the conventional energy resources, future possibilities of energy need and availability. Solar Energy: process of photovoltaic energy conversion, solar energy conversion technologies and devices, their principles, working and applications, disposal of solar panel after their usage. Biomass energy:

Concept of biomass energy utilization, types of biomass energy, conversion processes, Wind Energy, energy conversion technologies, their principles, equipment and suitability in context of India.

Management of plastic waste and E-waste: Sources, generation and characteristics of various e- and plastic wastes generated from various industrial and commercial activities; Waste management practices including onsite handling, storage, collection and transfer. E-waste and plastic waste processing alternatives. E-Waste management rules and Plastic waste management rules, 2016 and their subsequent amendments.

Text Books:

1. Bharucha,Erach (2004). Textbook for Environmental Studies for Undergraduate Courses of all Branches of Higher Education, University Grants Commission, New Delhi.
2. Basu, M., Xavier, S. (2016). Fundamentals of Environmental Studies, Cambridge University Press, India
3. Masters, G. M., &Ela, W. P. (1991). Introduction to environmental engineering and science. Englewood Cliffs, NJ: Prentice Hall.
4. Enger, E. and Smith, B., Environmental Science: A Study of Interrelationships, Publisher: McGraw-Hill Higher Education; 12th edition, 2010.

Reference Books:

1. Sharma, P. D., & Sharma, P. D. (2005). Ecology and environment. Rastogi Publications
2. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
3. Clark R.S. (2001). Marine Pollution, Clanderson Press Oxford (TB)
4. Jadhav, H & Bhosale, V.M. (1995). Environmental Protection and Laws. Himalaya Pub. House, Delhi 284 p.
5. MoEF&CC, Govt. of India, CPCB: E-waste management rules, 2016 and its amendments 2018.
6. MoEF&CC, Govt. of India, CPCB: Plastic waste management rules, 2016.

B.Tech & B.Tech + M.Tech
(Computer Science & Engineering)
II Year - II Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
CS2201	ES	Microprocessors	4	0	30	70	100	3
CS2202	PC	Design and Analysis of Algorithms	4	0	30	70	100	3
CS2203	PC	Database Management Systems	4	0	30	70	100	3
CS2204	PC	Formal Languages & Automata Theory	4	0	30	70	100	3
CS2205	HSS	Managerial Economics	4	0	30	70	100	3
CS2206	PC	Algorithms Lab through CPP.	0	3	50	50	100	1.5
CS2207	PC	Database Management Systems Lab	0	3	50	50	100	1.5
CS2208	SC	Web Technologies	1	2	50	50	100	2
CS2209	MC	Professional Ethics& Universal Human Values	0	0	0	100	100	0
CS2210	MC	NCC/NSS	0	2	-	-	-	0
							Total credits	**20**
Internship-I								

CS2201 MICROPROCESSORS

Course Objectives:

- To discuss the architectures of 8085, 8086 microprocessors, their instruction sets and related ALP programs.
- To discuss interfacing semiconductor memories, interfacing peripheral to Intel 8086.
- To study interfacing data converters to 8086 and discuss about micro controller 8051 architecture.

Course Outcomes:

- Understand the basic architectures of 8085 and 8086 microprocessors.
- Ability to write ALP programs using instruction sets.
- Understand the various interfacing concepts and micro controllers.

SYLLABUS

Introduction to Microprocessors and Microcomputers: A Brief Architecture and Programming of 8085Microprocessor.

Architecture: Instruction Set and Programming of 8086Microprocessor

Interfacing Semiconductor Memories and I/O Devices: Semiconductor Memories: Classification Internal Organization& Functional Description, Interfacing SRAMs and EPROMs to8086, Interfacing Characteristics of I/Devices, I/O Device addressing methods, I/O Device Programming Methods.

Interfacing Peripherals to Intel8086 -1: Parallel I/O Interface- 8255, Serial I/O Interface – 8251, Timer Interface -8253/8254

Interfacing Peripheral to Intel 8086 - 2: Keyboard / Display Interface – 8279, Interrupt Controller Interface – 8259

Interfacing Data Converters to 8086: D/A Conversion Methods, A/D Conversion methods, Interfacing DAC, Interfacing ADC.

Introduction to Micro controllers: Intel 8051Architecture and Programming

Text Books:

1. Microprocessor Architecture, Programming, and Applications with the 8085 Ramesh S.Gaonkar, 4thEdition, PenramInternational,1999
2. The 80x86 Family, Design, Programming and Interfacing, John E.Uffenbeck, 3rdEdition,Pearson Education Inc.,2002
3. KennethJ.Ayala, 8051 Microcontroller Architecture, Programming And Applications, 2ndEdition, Penram InternationalPublications,1999

Reference Books:

1. BARRYB.BREY, The Intel Microprocessors 8086 / 8088, 80186 / 80188, 80286, 80386 and 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium4, Architecture, Programming and Interfacing, 8th Edition, Pearson Education Inc.,2009
2. Walter A. Tribeland, Avtar Singh, The 8088 and 8086 Microprocessors, Programming, interfacing, Software, Hardware, and Applications, 4thEdition, Pearson Education Inc.,20033. Microprocessors and Interfacing, Programming and Hardware, 2ndEdition, Douglass V. Hall, TMH Edition,1999
3. Sanjay K Bose, Hardware and Software of Personal Computers, New Age International (P)Ltd.,1991 Myke Predko, Programming and Customizing the 8051 Microcontroller, TMH,1999

CS2202 DESIGN AND ANALYSIS OF ALGORITHMS

Course Objectives:

Upon completion of this course, students will be able to do the following:

- Analyse the asymptotic performance of algorithms.
- Write rigorous correctness proofs for algorithms.
- Demonstrate a familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations

Course Outcomes:

Students who complete the course will have demonstrated the ability to do the following:

- Argue the correctness of algorithms using inductive proofs and invariants.
- Analysis worst-case running times of algorithms using asymptotic analysis.
- Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and conquer algorithms. Derive and solve recurrences describing the performance of divide and-conquer algorithms.
- Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic programming algorithms, and analysis them.
- Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms, and analysis them.

SYLLABUS

Introduction: What is an Algorithm, Algorithm Specification, Pseudocode Conventions Recursive Algorithm, Performance Analysis, Space Complexity, Time Complexity, Amortized Complexity, Amortized Complexity, Asymptotic Notation, Practical Complexities, Performance Measurement.

Divide and Conquer: General Method, Defective Chessboard, Binary Search, Finding the Maximum and Minimum, Merge Sort, Quick Sort, Performance Measurement, Randomized Sorting Algorithms.

The Greedy Method: The General Method, Knapsack Problem, Job Sequencing with Deadlines, Minimum-cost Spanning Trees, Prim's Algorithm, Kruskal's Algorithms, An Optimal Randomized Algorithm, Optimal Merge Patterns, Single Source Shortest Paths.

Dynamic Programming: All - Pairs Shortest Paths, Multistage graphs, optimal binary search tree, String editing, 0/1 Knapsack, Reliability Design.

Backtracking: The General Method, The 8-Queens Problem, Sum of Subsets, Graph Colouring, Hamiltonian Cycles, Knapsack problem

Branch and Bound: Least cost (LC) Search, The 15-Puzzle, Control Abstraction for LC-Search, Bounding, FIFO Branch-and-Bound, LC Branch and Bound, 0/1 Knapsack Problem, LC Branch-and Bound Solution, FIFO Branch-and-Bound Solution, Traveling Salesperson problem.

Limitations of Algorithm Power: Lower-Bound Arguments, Decision Trees, P, NP and NP – complete problems – Challenges of Numerical Algorithms. Limitations of Algorithms Power: Backtracking – Branch-and Bound– Approximation Algorithms for NP-hard Problems – Algorithms for solving Nonlinear Equations.

Text Books:

1. Fundamentals of computer algorithms E. Horowitz S. Sahni, Sanguthevar Rajasekaran, University Press.
2. Introduction to Algorithms by Thomas H. Corman, Charles E. Leiserson, Ronald R. Rivest & Clifford Stein, Prentice Hall of India, New Delhi, New Delhi.

Reference Books:

1. Data structures and algorithm analysis in C++ / Mark Allen Weiss, Florida International University. — Fourth edition.
2. Introduction to Design & Analysis of Algorithms by Anany Levitin, Pearson Education, New Delhi, 2003
3. Introduction to Algorithms by Thomas H. Corman, Charles E. Leiserson, Ronald R. Rivest & Clifford Stein, Prentice Hall of India, New Delhi, New Delhi.
4. The Design and Analysis of Computer Algorithms, Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman

CS2203 DATABASE MANAGEMENT SYSTEMS

Course Objectives:

- To learn the evolution of DBMS Versus File systems, data models, and layers of abstraction.
- To understand conceptual and physical aspects of database design.
- To learn formal and commercial query language specifications.
- To understand concurrency control, recovery management, and other related issues.

Course Outcomes:

- The student will understand ER-modelling for conceptual database design and relational model.
- The student is introduced to formal and commercial query languages: Relational Algebra, calculus and SQL.
- The student will learn schema refinement and normalization.
- The student understands locking protocols concurrency control, and crash recovery methods.

SYLLABUS

Introduction: File system versus a DBMS, Advantages of a DBMS, Describing and Storing Data in a DBMS, The Relational model, Levels of abstraction, Data Independence, Transaction management, Structure of a DBMS.

Introduction to Database Design and The Relational Model: Database Design and ER Diagrams, Entities, Attributes and Entity Sets, Relationships & Relationship Sets, Additional Features of the ER Model, Conceptual Design with ER Model, Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity Constraints, Querying Relational Data, Logical Database Design: ER to Relational, Introduction to Views, Destroying/ Altering Tables and Views.

Relational Algebra and SQL: Preliminaries, Relational Algebra, The form of a Basic SQL Query, UNION, INTERSECT and EXCEPT, Nested Queries, Aggregate Operators, Null Values, Complex Integrity Constraints in SQL, Triggers and Active Databases, Embedded SQL, Dynamic SQL, JDBC.

Database Design: Schema Refinement and Normal Forms, Introduction to Schema Refinement, Functional Dependencies, Reasoning about FD's, Normal Forms, Properties of Decomposition, Normalization, Other kinds of Dependencies.

Transaction Management: The ACID Properties, Transactions & Schedules, Concurrent Execution of Transactions, Lock-Based Concurrency Control.

Concurrency Control: 2PL, Serializability and Recoverability, Introduction to Lock Management, Lock Conversions, Dealing with Deadlocks, Specialized Locking Techniques, Concurrency Control without Locking.

Crash Recovery: Introduction to ARIES, The Log, Other Recovery-Related Structures, The Write-Ahead Log Protocol, Check pointing, Recovering from a System Crash, Media Recovery.

Text Books:

1. Database Management Systems; Raghu Ramakrishnan, Johannes Gehrke 4th Edition, McGraw-Hill.

Reference:

1. Database System Concepts; A. Silberschatz, H. Korth 5th Edition, McGraw-Hill

CS2204 FORMAL LANGUAGES AND AUTOMATA THEORY

Course objectives:

- To introduce the concepts in automata theory and theory of computation to design grammars and recognizers for different formal languages.
- To employ finite state machines to solve problems in computing.
- To introduce finite state machines, context free grammars and Turing Machines and their properties as the basis for the formal expressivity of computer languages for solving linguistic decision problems.
- To understand the concepts of tractability and decidability, the concepts of NP-completeness and NP-hard problem and also the challenges for Theoretical Computer Science and its contribution to other sciences.

Course outcomes:

- Ability to think analytically and intuitively for problem-solving situations in related areas of theory in computer science
- Ability to describe the language accepted by an automata or generated by a regular expression or a context-free grammar;
- Ability to Understand the functioning of Finite-State Machines, Deterministic Finite-State Automata, Nondeterministic Finite-State Automata and Pushdown Automata and Turing Machines.

SYLLABUS

Introduction to Grammars and Languages: Definitions of alphabet, strings, language, grammar, types of grammar, types of machines, generation of languages from grammar, construction of grammar from the given description of languages, Chomsky Hierarchy of languages.

Finite State Machine (FSM): Definition of finite state machine, Representation of FSMs. Classification of FSM's and their construction, Conversion from NFA to DFA, Elimination of ε – transitions from NFA, Equivalence of two FSM's, optimization of finite state machine (Equivalence theorem method and Table filling method), Finite state machine with output: Moore and Mealy machines. Applications of FSM.

Regular Expression and Languages: Regular Expression, Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Properties of Regular Languages: Pumping Lemma for regular Languages, Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, Equivalence and Minimization of Automata.

Context Free Grammars and Languages: Context Free Grammars, Parse Trees, Applications of Context-Free Grammars, Ambiguity in Grammars and Languages, Normal Forms, Pumping Lemma for CFL, Closure properties of CFL, Decision properties for CFL.

Push down Automata: Definition of push down automata, The Languages of a PDA, push down automata, Equivalence of PDA's and CFG's, push down automata to context free grammar, context free grammar to push down automata, Deterministic Pushdown Automata.

Turing Machines: The Definition of Turing Machine, Turing Machine Model, Representation of Turing Machines, Language Acceptability by Turing Machines, Design of Turing Machines, Description of Turing Machines, Techniques for TM Construction, Variants of Turing Machines, Turing Machines and Type 0 Grammars.

Undecidability: A Language That Is Not Recursively Enumerable, An Undecidable Problem That Is RE, Undecidable Problems About Turing Machines, Decidable & Undecidable Problems, Post Correspondence Problem.

Text books:

1. Introduction to automata theory, languages and computation, John.E.H.P croft/ Rajeev Motwani & JD Ullman—pearson education- III edition
2. Theory of computation, K.L.P.Mishra and N.Chandrasekhar, PHI

Reference Books:

1. Theory of computation, formal languages and automata theory, G P Saradhi Varma, B.Thirupathi Rao –Sci Tech publications.

CS2205 MANAGERIAL ECONOMICS

Course Objectives:

- To bring about an awareness about the nature of Managerial Economics and its linkages with other disciplines.
- To understand the Micro and Macro Environment of Business.
- To familiarize the prospective engineers with the concepts and tools of Managerial Economics with an objective to understand the real world of business.

Course Outcomes:

After completion of the course, student will be able to:

- Understand the various economic activities in business and industry.
- Analyse the real-world business problems.
- Make optimal business decisions for the effective and efficient management of Organisations.

SYLLABUS

Significance of Economics and Managerial Economics:

Economics: Definitions of Economics- Wealth, Welfare and Scarcity definitions Classification of Economics- Micro and Micro Economics.

Managerial Economics: Definition, Nature and Scope of Managerial Economics, Differences between Economics and Managerial Economics, Main areas of Managerial Economics, Managerial Economics with other disciplines.

Demand and Utility Analysis:

Demand - Definition, Meaning, Nature and types of demand, Demand function, Law of demand - Assumptions and limitations. Exceptional demand curve.

Elasticity of demand - Definition, Measurement of elasticity, Types of Elasticity

(Price, Income, Cross and Advertisement), Practical importance of Price elasticity of demand, Role of income elasticity in business decisions, Factors governing Price Elasticity of demand.

Utility Analysis: Utility- Meaning, Types of Economic Utilities, Cardinal and Ordinal Utility, Total Utility, Marginal Utility, The law of Diminishing Marginal Utility and its Limitations.

Theory of Production and Cost analysis:

Production - Meaning, Production function and its assumptions, use of production function in decision making; **Cost analysis** - Nature of cost, Classification of costs - Fixed vs. Variable costs, Marginal cost, Controllable vs. Non - Controllable costs, Opportunity cost, Incremental vs. Sunk costs, Explicit vs. Implicit costs, Replacement costs, Historical costs, Urgent vs. Postponable costs, Escapable vs. Unavoidable costs, Economies and Diseconomies of scale.

Market Structures: Definition of Market, Classification of markets; Salient features or conditions of different markets - Perfect Competition, Monopoly, Duopoly , Oligopoly, Importance of kinked demand curve ;Monopolistic Competition.

Pricing and Business Cycles:

Pricing Analysis: Pricing – Significance; Different Pricing methods- Cost plus pricing, Target pricing, Marginal cost pricing, Going -rate pricing, Average cost pricing, Peak load pricing , Pricing of joint Products, Pricing over the life cycle of a Product, Skimming pricing Penetration pricing, Mark- up and Mark- down pricing of retailers.

Business cycles - Definition, Characteristics, Phases, Causes and Consequences; Measures to solve problems arising from Business cycles.

Text Books:

1. Sankaran,S., Managerial Economics, Marghan Publications, 2015, Chennai.
2. Aryasri, A.R., Managerial Economics and Financial Analysis, MC Graw Hill Education, New Delhi,2015.

Reference Books:

1. Dwivedi, D.N., Managerial Economics, Vikhas Publishing House Pvt. Ltd. 6th Edition, New Delhi,2004.
2. Dewett, K.K., Modern Economic Theory, S.Chand & Company Ltd., New Delhi, 2005.

CS2206 ALGORITHMS LAB Through C++

Course objectives:

- The laboratory component will emphasize two areas:
- Implementation of algorithms covered in class: This will involve running the algorithms under varying input sets and measuring running times, use of different data structures for the same algorithm (wherever applicable) to see its effect on time and space, comparison of different algorithms for the same problem etc.
- Design of Algorithms: This will involve design and implementation of algorithms for problems not covered in class but related to topics covered in class.
- The exact set of algorithms to design and implement is to be decided by the instructor. In addition, there will be at least one significantly large design project involving some real world application. An efficient design of the project should require the use of multiple data structures and a combination of different algorithms/techniques.

Course Outcomes:

The student should be able to:

- Design algorithms using appropriate design techniques (brute-force, greedy, dynamic programming, etc.)
- Implement a variety of algorithms such assorting, graph related, combinatorial, etc., in a high level language.
- Analyze and compare the performance of algorithms using language features.
- Apply and implement learned algorithm design techniques and data structures to solve real-world problems.

Programs List:

1. a) Create a CPP class called Student with the following details as variables within it.

   (i) Register_number

   (ii) Student_name

   (iii) Programme_name

   (iv) Phone _number

   Write a program to create nStudent objects and print the Register_number, Student_name, Programme_name, and Phone_number of these objects with suitable headings.

   b). Write a program to implement the Stack using arrays. Write Push (), Pop(), and Display() methods to demonstrate its working.

2. a). Design a superclass called Staff with details as StaffId, Name, Phone, Salary. Extend this class by writing three subclasses namely Teaching (domain, publications), Technical (skills), and Contract (period). Write a CPP program to read and display at least 3 staff objects of all three categories.

b). Write a class called Customer to store their name and date_of_birth. The date_of_birth format should be dd/mm/yyyy. Write methods to read customer data as and display as using StringTokenizer class considering the delimiter character as "/".

3. a). Write a program to read two integers a andb. Compute a/b and print, when b is not zero. Raise an exception when b is equal to zero.

b). Write a program that implements a multi-thread application that has three threads. First thread generates a random integer for every 1 second; second thread computes the square of the number and prints; third thread will print the value of cube of the number.

4. Sort a given set of n integer elements using Quick Sort method and compute its time complexity. Run the program for varied values of n> 5000 and record the time taken to sort. Plot a graph of the time taken versus non graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using CPP how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.

5. Sort a given set of n integer elements using Merge Sort method and compute its time complexity. Run the program for varied values of n> 5000, and record the time taken to sort. Plot a graph of the time taken versus non graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using CPP how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.

6. Implement the Knapsack problem using (a) Dynamic Programming method (b) Greedy method.

7. Write a program-from a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm..

8. Find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal's algorithm. Use Union-Find algorithms in your program.

9. Find Minimum Cost Spanning Tree of a given connected undirected graph using Prim's algorithm.

10. Write programs to

(a) Implement All-Pairs Shortest Paths problem using Floyd's algorithm.

(b) Implement Travelling Sales Person problem using Dynamic programming.

11. Design and implement in CPP, to find a subset of a given set S = {Sl, S2,.....,Sn} of n positive integers whose SUM is equal to a given positive integer d. For example, if S ={1, 2, 5, 6, 8} and d= 9, there are two solutions {1,2,6}and {1,8}. Display a suitable message, if the given problem instance doesn't have a solution.

12. Design and implement in CPP to find all Hamiltonian Cycles in a connected undirected Graph G of n vertices using backtracking principle.

REFERENCES:

1. T. H. Cormen, C. L. Leiserson, R. L. Rivest, and C. Stein, Introduction to Algorithms, MIT Press.
2. J. Kleinberg and E. Tardos, Algorithm Design, Addison-Wesley.
3. Harry R. Lewis and Larry Denenberg, Data Structures and Their Algorithms, Harper Collins.
4. A. Gibbons, Algorithmic Graph Theory, Cambridge University Press.
5. Michael T. Goodrich and Roberto Tamassia, Algorithm Design: Foundations, Analysis, and Internet Examples, John Wiley.
6. R. Sedgewick, Algorithms in C (Parts 1-5), Addison Wesley.
7. M. H. Alsuwaiyel, Algorithm Design Techniques and Analysis, World Scientific.
8. Gilles Brassard and Paul Bratley, Algorithmics: theory and practice, Prentice-Hall.
9. Udi Manber, Introduction to Algorithms: A Creative Approach, Addison-Wesley.
10. Sara Baase and Allen Van Gelder, Computer Algorithms: Introduction to Design and Analysis, Addison-Wesley.

CS2207 DATABASE MANAGEMENT SYSTEMS LAB

Course Objectives

- To introduce to a commercial DBMS such as ORACLE.
- To learn and practice SQL commands for schema creation, data manipulation.
- To learn conceptual and physical database design based on a case study.
- To apply database design stages by studying a case study.

Course Outcomes

By the end of the course, the student should be able to:

- The student is exposed to a commercial RDBMS environment such as ORACLE.
- The student will learn SQL commands for data definition and manipulation.
- The student understands conceptual through physical data base design.
- The student takes up a case study and applies the design steps.

SYLLABUS

Features of a commercial RDBMS package such as ORACLE/DB2, MS Access, MYSQL & Structured Query Language (SQL) used with the RDBMS.

I. Laboratory Exercises Should Include:

a. Defining Schemas for Applications,
b. Creation of Database,
c. Writing SQL Queries,
d. Retrieve Information from Database,
e. Creating Views
f. Creating Triggers
g. Normalization up to Third Normal Form
h. Use of Host Languages,
i. Interface with Embedded SQL,
j. Use of Forms
k. Report Writing

II. Some sample applications are given below:

1. Accounting Package for Shops,

2. Database Manager for Magazine Agency or Newspaper Agency,
3. Ticket Booking for Performances,
4. Preparing Greeting Cards & Birthday Cards
5. Personal Accounts - Insurance, Loans, Mortgage Payments, Etc.,
6. Doctor's Diary & Billing System
7. Personal Bank Account
8. Class Marks Management
9. Hostel Accounting
10. Video Tape Library,
11. History of Cricket Scores,
12. Cable TV Transmission Program Manager,
13. Personal Library.
14. Sailors Database
15. Suppliers and Parts Database

Reference Books

1. Database Management Systems; Raghu Ramakrishnan, Johannes Gehrke 4th Edition, McGraw Hill
2. Database System Concepts; A. Silberschatz, H. Korth 5th Edition, McGraw-Hill

CS2208 ` WEB TECHONOLOGIES

Course objectives

- To facilitate the graduates with the ability to visualize, gather information, articulate, analyze, solve complex problems, and make decisions. These are essential to address the challenges of complex and computation intensive problems increasing their productivity.
- To facilitate the graduates with the technical skills that prepare them for immediate employment and pursue certification providing a deeper understanding of the technology in advanced areas of computer science and related fields, thus encouraging to pursue higher education and research based on their interest.
- To facilitate the graduates with the soft skills that include fulfilling the mission, setting goals, showing self-confidence by communicating effectively, having a positive attitude, get involved in team-work, being a leader, managing their career and their life.

Course outcomes

- Able to understand the working principles of the computer system and its components, apply the knowledge to build, asses, and analyze the software and hardware aspects of it.
- Develops comprehensive skills of Programming Languages, Software process models, methodologies, and able to plan, develop, test, analyze, and manage the software and hardware intensive systems in heterogeneous platforms individually or working in teams.
- Able to use the professional, managerial, interdisciplinary skill set, and domain specific tools in development processes, identify the research gaps, and provide innovative solutions to them.

Syllabus

1. Design the following static web pages required for an online book store web site.
   a) HOME PAGE: The static home page must contain three frames.
   b) LOGIN PAGE
   c) CATOLOGUE PAGE: The catalogue page should contain the details of all the books available in the web site in a table.
   d) REGISTRATION PAGE
2. Write JavaScript to validate the following fields of the Registration page.
   a) First Name (Name should contains alphabets and the length should not be less than 6 characters).
   b) Password (Password should not be less than 6 characters length).
   c) E-mail id (should not contain any invalid and must follow the standard pattern name@domain.com)

d) Mobile Number (Phone number should contain 10 digits only).
e) Last Name and Address (should not be Empty).

3. Develop and demonstrate the usage of inline, internal and external style sheet using CSS
4. Develop and demonstrate JavaScript with POP-UP boxes and functions for the following problems:

   a) Input: Click on Display Date button using onclick( ) function

   Output: Display date in the textbox

   b) Input: A number n obtained using prompt

   Output: Factorial of n number using alert

   c) Input: A number n obtained using prompt

   Output: A multiplication table of numbers from 1 to 10 of n using alert

   d) Input: A number n obtained using prompt and add another number using confirm

   Output: Sum of the entire n numbers using alert

5. Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next in the list. Add CSS to customize the properties of the font of the capital (colour, bold and font size).
6. Write an HTML page including any required JavaScript that takes a number from text field in the range of 0 to 999 and shows it in words. It should not accept four and above digits, alphabets and special characters.
7. Develop and demonstrate PHP Script for the following problems:
   a) Write a PHP Script to find out the Sum of the Individual Digits.
   b) Write a PHP Script to check whether the given number is Palindrome or not
8. Create an XML document that contains 10 users information. Write a Java Program, which takes User Id as input and returns the user details by taking the user information from XML document using DOM parser or SAX parser.
9. Implement the following web applications using (a) PHP (b) Servlets (c) JSP
   a) A web application that takes a name as input and on submit it shows a hello page where name is taken from the request. It shows the start time at the right top corner of the page and provides a logout button. On clicking this button, it should show a logout page with Thank You message with the duration of usage (hint: Use session to store name and time).
   b) Write a PHP Program to display current Date, Time and Day.
   c) A web application that takes name and age from an HTML page. If the age is less than 18, it should send a page with “Hello, you are not authorized to visit the site” message, where should be replaced with the entered name. Otherwise, it should send “Welcome to this site” message.
   d) A web application that lists all cookies stored in the browser on clicking “List Cookies” button. Add cookies if necessary.
10. Implement the web applications with Database using (a) PHP, (b) Servlets and (c) JSP.
11. Modify the above PHP program to use an xml instead of database

12. Write a program to design a simple calculator using
    (a) JavaScript
    (b) PHP
    (c) Servlet and
    (d) JSP.

References:

1. Internet and Web Technologies by Raj Kamal, Tata McGraw-Hill.

2. Programming the World Wide Web by Robert W. Sebesta, Pearson Education.

CS2209 PROFESSIONAL ETHICS AND UNIVERSAL HUMAN VALUES

Course Objectives:

- To recognize the moral values that should guide the Engineering profession.
- To resolve moral issues concerning one's profession.
- To develop and exhibit a set of moral beliefs and attitudes that engineers should inculcate.
- To inculcate social values and morality in one's life.
- To develop awareness about Professional/Engineering Ethics and Human Values.

Learning Outcomes:

Students will be able to:

- Apply the conceptual understanding of ethics and values into everyday practice.
- Understand the importance of moral awareness and reasoning in life.
- Acquire professional and moral etiquette that an engineer requires.
- Develop the acumen for self-awareness and self-development.
- Develop cultural tolerance and integrity.
- Tackle real-life challenges with empathy.

SYLLABUS

HUMAN VALUES
Values - Respect - Caring - Sharing - Honesty- Courage - Self confidence - Communal Harmony
Morals - Virtues

PROFESSIONAL VALUES
Integrity - Discipline - Valuing time - Cooperation - Commitment - Code of conduct - Challenges in the workplace

PROFESSIONAL ETHICS
Overview - Engineering ethics - Moral issues - Profession - Models of professional roles - Responsibility

RESPONSIBILITIES AND RIGHTS
Safety and risk - Collegiality and loyalty - Confidentiality - Occupational crime - Human rights - Employee rights - Intellectual property rights

GLOBAL ISSUES
Globalization - Environmental ethics - Computer ethics - Code of ethics - Multinational corporations - Engineers as advisors in Planning and Policy making

Textbook:
1. R.S. Nagarazan. *A Textbook on Professional Ethics and Human Values.* New Age International Publishers. 2006.

Reference Books:

1. Premvir Kapoor. *Professional Ethics and Human Values.* Khanna Publishing House. 2019.
2. B.S. Raghavan. *Human Values and Professional Ethics*. S.Chand Publications. 2012.
3. R.R. Gaur & Others. *A Foundation Course in Human Values and Proff. Ethics*. Excel Books. 2009.
4. A. N. Tripathi. *Human Values*. New Age International (P) Limited. 2009
5. R. Subramanian. *Professional Ethics*. OUP India. 2013.

SCHEME AND SYLLABUS FOR FIRST & SECOND YEARS
OF
FOUR YEAR UNDER GRADUATE DEGREE COURSE

B. TECH (Computer Science & Engineering with Specialization in Artificial Intelligence and Machine Learning)

(Common with CSE and IT)
For First & Second Years
[W.E.F. 2022 - 2023 ADMITTED BATCH]

DEPARTMENT OF COMPUTER SCIENCE & SYSTEMSENGINEERING
ANDHRA UNIVERSITY COLLEGE OF ENGINEERING
ANDHRA UNIVERSITY
VISAKHAPATNAM-530 003

ANDHRA UNIVERSITY

DEPARTMENT OF COMPUTER SCIENCE AND SYSTEM ENGINEERING

SCHEME AND SYLLABI

(With effect from 2022-23 admitted batch)

B. TECH (Computer Science & Engineering with Specialization in Artificial Intelligence and Machine Learning)

(Common with CSE and IT)

For First & Second Years

I Year – I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
AI1101	BS	Engineering Mathematics –I	4	0	30	70	100	3
AI1102	BS	Green Chemistry	4	0	30	70	100	3
AI1103	HSS	English	4	0	30	70	100	3
AI1104	ES	Computer Programming Using C	4	0	30	70	100	3
AI1105	ES	IT Essentials	4	0	30	70	100	3
AI1106	HSS	Communication skills Lab	0	3	50	50	100	1.5
AI1107	ES	Computer Engineering Workshop Lab	0	3	50	50	100	1.5
AI1108	ES	Computer Programming using C lab	0	3	50	50	100	1.5
Total Credits								**19.5**

I Year-II Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
AI1201	BS	Engineering Mathematics–II	4	0	30	70	100	3
AI1202	BS	Engineering Physics	4	0	30	70	100	3
AI1203	ES	Elements of Electronics Engineering	4	0	30	70	100	3
AI1204	ES	Data Structures Using C	4	0	30	70	100	3
AI1205	ES	Digital Logic Design	4	0	30	70	100	3
AI1206	ES	Linux Administration Lab	0	3	50	50	100	1.5
AI1207	BS	Engineering Physics Lab	0	3	50	50	100	1.5
AI1208	ES	Data Structures Lab	0	3	50	50	100	1.5
Total Credits								**19.5**

B. TECH (Computer Science & Engineering with Specialization in Artificial Intelligence and Machine Learning)

(Common with CSE and IT)
For First & Second Years

B.Tech
II Year - I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
AI2101	ES	Discrete Mathematical Structures	4	0	30	70	100	3
AI2102	PC	Computer Organization and Architecture	4	0	30	70	100	3
AI2103	BS	Probability, Statistics and Queuing theory	4	0	30	70	100	3
AI2104	PC	Operating Systems	4	0	30	70	100	3
AI2105	PC	Object Oriented Programming Through Java	4	0	30	70	100	3
AI2106	PC	Computer Organization & Architecture Lab	0	3	30	70	100	1.5
AI2107	PC	Object Oriented Programming Through Java Lab	0	3	50	50	100	1.5
AI2108	PC	Operating Systems Lab	0	3	50	50	100	1.5
AI2109	SC	Intellectual Property Rights (Internal)	1	2	100	0	100	2
AI2110	MC	Environmental Science	0	0	-	100	100	0
Total credits								**21.5**

II Year - II Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
AI2201	ES	Microprocessors	4	0	30	70	100	3
AI2202	PC	Design and Analysis of Algorithms	4	0	30	70	100	3
AI2203	PC	Database Management Systems	4	0	30	70	100	3
AI2204	PC	Formal Languages & Automata Theory	4	0	30	70	100	3
AI2205	HSS	Managerial Economics	4	0	30	70	100	3
AI2206	PC	Algorithms Lab through C++.	0	3	50	50	100	1.5
AI2207	PC	Database Management Systems Lab	0	3	50	50	100	1.5
AI2208	SC	Web Technologies	1	2	50	50	100	2
AI2209	MC	Professional Ethics & Universal Human Values	0	0	0	100	100	0
AI2210	MC	NCC/NSS	0	2	-	-	-	0
Total credits								**20**
Internship-I								

B. TECH (Computer Science & Engineering with Specialization in Artificial Intelligence and Machine Learning)

(Common with CSE and IT)
For First & Second Years

I Year – I Semester

B. TECH (Computer Science & Engineering with Specialization in Artificial Intelligence and Machine Learning)

(Common with CSE and IT)
For First & Second Years

I Year – I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
AI1101	BS	Engineering Mathematics –I	4	0	30	70	100	3
AI1102	BS	Green Chemistry	4	0	30	70	100	3
AI1103	HSS	English	4	0	30	70	100	3
AI1104	ES	Computer Programming Using C	4	0	30	70	100	3
AI1105	ES	IT Essentials	4	0	30	70	100	3
AI1106	HSS	Communication skills Lab	0	3	50	50	100	1.5
AI1107	ES	Computer Engineering Workshop Lab	0	3	50	50	100	1.5
AI1108	ES	Computer Programming using C lab	0	3	50	50	100	1.5
Total Credits								**19.5**

AI1101 ENGINEERING MATHEMATICS-I

Course Objectives

- To transmit the knowledge of Partial differentiation.
- To know of getting maxima and minima of function of two variables and finding errorsand approximations.
- To evaluate double and triple integrals, volumes of solids and area of curved surfaces.
- To expand a periodical function as Fourier series and half-range Fourier series

Course Outcomes

- Find the partial derivatives of functions of two or more variables.
- Evaluate maxima and minima, errors and approximations.
- Evaluate double and triple integrals, volumes of solids and area of curved surfaces.
- To expand a periodical function as Fourier series and half-range Fourier series.
- Have a fundamental understanding of Fourier series and be able to give Fourier expansions of a given function.

SYLLABUS

Partial Differentiation: Introduction - Functions of two or more variables - Partial derivatives - Homogeneous functions – Euler's theorem - Total derivative - Change of variables – Jacobins.Mean value Theorems (without proofs)

Applications of Partial Differentiation: Geometrical interpretation -Tangent plane and Normal to a surface -Taylor's theorem for functions of two variables - Errors and approximations -Total differential. Maxima and Minima of functions of two variables - Lagrange's method of undetermined multipliers - Differentiation under the integral Sign - Leibnitz's rule.

Multiple Integrals: Introduction - Double Integrals - Change of Order of Integration - Double Integrals in Polar Coordinates - Triple Integrals - Change of Variables.

Multiple Integrals-Applications: Area enclosed by plane curves - Volumes of solids - Area of a curved surface - Calculation of Mass - Centre of gravity - Moment of inertia - product of inertia – principal axes- Beta Function - Gamma Function - Relation between Beta and Gamma Functions. Error Function or Probability Integral.

Fourier Series: Introduction - Euler's Formulae - Conditions for a Fourier Expansion - Functions having points of discontinuity - Change of Interval - Odd and Even Functions - Expansions of Odd or Even Periodic Functions, Half-Range Series - Parseval's Formula. Practical Harmonic analysis

Text Book

1. Scope and Treatment as in "Higher Engineering Mathematics", by Dr. B.S. Grewal,43rd Edition, Khanna publishers.

Reference Books

1. Graduate Engineering Mathematics by V B Kumar Vatti., I.K.International publishinghouse Pvt. Ltd.
2. Advanced Engineering Mathematics by Erwin Kreyszig.
3. A text book of Engineering Mathematics, by N.P. Bali and Dr. Manish Goyal, LakshmiPublications.
4. Advanced Engineering Mathematics by H.K. Dass. S. Chand Company
5. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Graw Hill Company. 6.
6. Higher Engineering Mathematics by Dr. M.K.Venkataraman.

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AI1102 GREEN CHEMISTRY

Course Objectives:

- To apply the basic knowledge of Chemistry to the Engineering Discipline.
- To develop knowledge about water and its treatment for industrial and potable purposes.
- To develop understanding in the areas of Batteries, Fuels Mechanism of Corrosion of Metals and Corrosion Control Methods, Green Chemistry and Technology and Processes involving Green Chemistry and apply the knowledge for solving existing challenges faced in various engineering and societal areas.

Learning outcome:

- The students are able to apply the basic concepts and principles studied in Chemistryto the field of Engineering.
- The students are able to apply chemistry to different branches of engineering
- The students are able to acquire the knowledge in the areas of Water Chemistry, Mechanism of Corrosion of Metals and Corrosion Control Methods, Batteries, Fuel Cells, Green Chemistry and Technology and Processes involving Green Chemistry and suggest innovative solutions for existing challenges in these areas.

SYLLABUS

Water Technology

Sources of Water – Impurities and their influence of living systems – WHO Limits – Hardness and its Determination – Boiler Troubles and their removal – Water Softening Methods – Lime- Soda, Zeolite and Ion Exchange - Municipal Water Treatment-Break Point Chlorination – Desalination of Sea Water – Reverse Osmosis Method, Electro-dialysis.

Batteries

Primary batteries: The chemistry - Types: Zinc-carbon (Leclanche type), zinc alkaline (Duracell), zinc/air batteries; Lithium primary cells – liquid cathode, solid cathode and lithium- ferrous sulphide cells. Secondary batteries: Lead acid and VRLA (valve regulated (sealed) lead acid), nickel-cadmium, nickel-zinc, nickel-metal hydride batteries, lithium ion batteries, ultrathin lithium polymer cells. Advanced Batteries for electric vehicles, requirements of the battery – sodium-beta and redox batteries.

Fuel Cells

Fuel Cells: Description, working principle, anodic, cathodic and cell reactions, fabrication of electrodes and other components, applications, advantages, disadvantages and environmental aspects of the following types of fuel cells: Proton Exchange Membrane Fuel Cells, alkaline fuel cells, phosphoric acid, solid oxide, molten carbonate, direct methanol fuel cells- Membranes and Fuels

Corrosion

Corrosion: Origin and Theory – Types of Corrosion: Chemical and Electrochemical; Pitting, Inter granular, Waterline, Stress – Galvanic Series – Factors Effecting Corrosion. Corrosion Controlling Methods, Protective Coatings, Metallic Coatings, Electroplating and Electroless Plating.

Green Chemistry and Technology

Introduction and significance of green chemistry, Goals of green chemistry, 12 principles of green chemistry, toxicity of chemicals, material safety data sheet (MSDS), concept of zero pollution technologies, atom economy, functional toxicity vs non-functional toxicity, functional group approaches to green chemistry, Elimination of toxic functional group, optimization of frameworks for the design of greener synthetic pathways, Applications of green chemistry - Green solvents, green fuels and propellants, biocatalysis.

Text Books

1. Engineering Chemistry – PC Jain and M. Jain – Dhanpath Rai and Sons, New Delhi.
2. A Text book of Engineering Chemistry – S. S. Dara – S. Chand & Co. New Delhi.
3. Hand Book of Green Chemistry and Technology; by James Clarke and DuncanMacquarrie; Blakwell Publishing.

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AI1103 ENGLISH

Course Objectives

- To make students understand the explicit and implicit meanings of a text/topic;
- To give exposure to new words and phrases, and aid to use them in different contexts;
- To apply relevant writing formats to draft essays, letters, emails and presentations; and
- To adapt oneself to a given situation and develop a functional approach to findingsolutions: adaptability and problem solving.

Course Outcomes

- Students will be able to analyse a given text and discover the various aspects related tolanguage and literature;
- Learn the various language structures, parts of speech and figures of speech;
- Develop one's reading and writing abilities for enhanced communication; and
- Learn to apply the topics in real-life situations for creative and critical use.

SYLLABUS

On the conduct of life: William Hazlitt

Life skills: Values and EthicsIf: Rudyard Kipling The Brook: Alfred Tennyson

Life skills: Self-Improvement How I Became a Public Speaker: George Bernard ShawThe Death Trap: Saki

Life skills: Time ManagementOn saving Time: Seneca Chindu Yellama

Life skills: InnovationMuhammad Yunus Politics and the English Language: George Orwell

Life skills: Motivation Dancer with a White Parasol: Ranjana Dave

Grammar: Prepositions – Articles – Noun-Pronoun Agreement, Subject-Verb Agreement – Misplaced Modifiers–Clichés, Redundancies.

Vocabulary: Introduction to Word Formation – Root Words from other Languages – Prefixesand Suffixes–Synonyms, Antonyms– Common Abbreviations

Writing: Clauses and Sentences – Punctuation – Principals of Good Writing – Essay Writing – Writing a Summary Writing: Essay Writing**Life skills:** Innovation Muhammad Yunus

Textbook

1. Language and Life: A Skills Approach Board of Editors, Orient Blackswan Publishers,India.2018.

References

1. Practical English Usage, Michael Swan. OUP. 1995.
2. Remedial English Grammar, F.T. Wood. Macmillan.2007
3. On Writing Well, William Zinsser. Harper Resource Book. 2001
4. Study Writing, Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
5. Communication Skills, Sanjay Kumar and Pushp Lata. Oxford University Press. 2011.
6. Exercises in Spoken English, Parts. I-III. CIEFL, Hyderabad. Oxford University Press.

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AI1104 COMPUTER PROGRAMMING USING C

Course Objectives

- The course is designed to provide complete knowledge of C language.
- To provide students with understanding of code organization and functional hierarchical decomposition with using complex data types.
- To provide knowledge to the students to develop logics which will help them to create programs, applications in C.
- This course aims to identify tasks in which the numerical techniques learned are applicable and apply them to write programs, and hence use computers effectively to solve the task.
- This course provides the fundamental knowledge which is useful in understanding the other programming languages.

Course Outcomes

- Identify basic elements of C programming structures like data types, expressions, control statements, various simple functions and apply them in problem solving.
- Apply various operations on derived data types like arrays and strings in problem solving.
- Design and implement of modular Programming and memory management using Functions, pointers.
- Apply Structure, Unions and File handling techniques to Design and Solve different engineering programs with minimal complexity.
- Apply Numerical methods to Solve the complex Engineering problems.

SYLLABUS

Introduction to C: Basic structure of C program, Constants, Variables and data types, Operators and Expressions, Arithmetic Precedence and associativity, Type Conversions. Managing Input and Output Operations Formatted Input, Formatted Output.

Decision Making, Branching, Looping: Decision making with if statement, Simple if statement, The if…else statement, Nesting of if…else statement, the else.. if ladder, switch statement, the (?:) operator, the GOTO statement., The while statement, the do statement, The for statement, Jumps in Loops.

Arrays & Strings: One, Two-dimensional Arrays, Character Arrays. Declaration and initialization of Strings, reading and writing of strings, String handling functions, Table of strings.

Functions: Definition of Functions, Return Values and their Types, Function Calls, Function Declaration, Category of Functions: No Arguments and no Return Values, Arguments but no Return Values, Arguments with Return Values, No Argument but Returns a Value, Functions that Return Multiple Values. Nesting of functions, recursion, passing arrays to functions, passing strings to functions, the scope, visibility and lifetime of variables.

Pointers: Accessing the address of a variable, declaring pointer variables, initializing of pointer variables, accessing variables using pointers, chain of pointers, pointer expressions, pointers and arrays, pointers and character strings, array of pointes, pointers as function arguments, functions returning pointers, pointers to functions, pointers to structures-Program Applications.

Structure and Unions: Defining a structure, declaring structure variables, accessing structure members, structure initialization, copying and comparing structure variables, arrays of structures, arrays within structures, structures within structures, structures and functions and unions, size of structures and bit-fields- Program applications.

File handling: Defining and opening a file, closing a file, Input/ Output operations on files, Error handling during I/O operations, random access to files and Command Line Arguments- Program Applications.

Text Books

1. Programming in ANSI C, E Balagurusamy, 6th Edition. McGraw Hill Education (India)Private Limited.

Reference Books

1. Let Us C ,Yashwant Kanetkar, BPB Publications, 5th Edition.
2. Computer Science, A structured programming approach using C", B.A.Forouzan andR.F.Gilberg, " 3rd Edition, Thomson, 2007.
3. The C –Programming Language' B.W. Kernighan, Dennis M. Ritchie, PHI.
4. Scientific Programming: C-Language, Algorithms and Models in Science, Luciano M.Barone (Author), EnzoMarinari (Author), Giovanni Organtini, World Scientific.

AI1105 **IT ESSENTIALS**

Course Objectives

- Select the appropriate computer components to build, repair, or upgrade personal computers.
- Explain how to correctly use tools and safely work in a lab.
- Install components to build, repair, or upgrade personal computers.
- Configure computers to communicate on a network
- Configure devices to connect to the Internet and Cloud services
- Explain how to use, configure, and manage laptops and mobile devices

Course Outcomes

- Understands the roles and responsibilities of the IT professional
- Able to Troubleshoot advanced hardware and software problems
- Provides an experience-oriented course that employs industry-relevant instructional approaches to prepare students for entry-level jobs in the industry.

Syllabus

Introduction to the Personal Computer Describe a Computer System, Identify the Names, Purposes, and Characteristics of Cases and Power Supplies, Identify the Names, Purposes, and Characteristics of Internal Components, Identify the Names, Purposes, and Characteristics of Ports and Cables, Identify the Names, Purposes, and Characteristics of Input Devices, Identify the Names, Purposes, and Characteristics of Output Devices, Explain System Resources and Their Purposes.

Safe Lab Procedures and Tool Use Explain the Purpose of Safe Working Conditions and Procedures, Identify Tools and Software Used with Personal Computer Components and Their Purposes, Implement Proper Tool Use.

Computer Assembly Attach the Components to the Motherboard and Install the Motherboard, Install Internal Drives, Install Drives in External Bays, Install Adapter Cards, Connect the Power Cables Reattach the Side Panels to the Case, Boot the Computer for the First Time. **Basics of Preventive Maintenance and Troubleshooting** Explain the Purpose of Preventive Maintenance, Identify the Steps of the Troubleshooting Process.

Fundamental Laptops and Portable Devices Identify Common Preventive Maintenance Techniques for Laptops and Portable Devices, Describe How to Troubleshoot Laptops and Portable Devices.

Fundamental Operating Systems Explain the Purpose of an Operating System, Describe and Compare Operating Systems to Include Purpose, Limitations, and Compatibilities, Determine Operating System Based on Customer Needs, Install an Operating System, Identify and Apply Common Preventive Maintenance Techniques for Operating Systems, Troubleshoot Operating Systems.

Fundamental Networks Explain the Principles of Networking, Describe Types of Networks, Describe Basic Networking Concepts and Technologies, Describe the Physical Components of a Network, Describe LAN Topologies and Architectures.

Fundamental Security: Explain Why Security Is Important, Describe Security Threats, Identify Security Procedures, Identify Common Preventive Maintenance Techniques for Security, Troubleshoot Security.

Text books:

1. IT Essentials: PC Hardware and Software Companion Guide Fourth Edition, CiscoNetworking Academy.

References:

1. Network security essentials application and standrads, by William stallings, 4th edition,prentice hall.
2. Mike Meyers' CompTIA A+ Guide to Managing and Troubleshooting PCs, Sixth Edition 6th Edition

AIS1106 COMMUNICATION SKILLS LAB

Course Objectives

- To make students recognize the sounds of English through Audio-Visual aids;
- To help students build their confidence and help them to overcome their inhibitions andself- consciousness while speaking in English;
- To familiarize the students with stress and intonation and enable them to speak Englisheffectively; and
- To give learners exposure to and practice in speaking in both formal and informal contexts.

Course Outcomes

- Students will be sensitized towards recognition of English sound patterns and the fluency in their speech will be enhanced;
- A study of the communicative items in the laboratory will help students become successful in the competitive world;
- Students will be able to participate in group activities like roleplays, group discussionsand debates; and
- Students will be able to express themselves fluently and accurately in social as wellprofessional context.

SYLLABUS

Introduction to Phonetics: The Sounds of English (Speech sound – vowels and consonants) - Stress and Intonation - Accent and Rhythm.

Listening Skills: Listening for gist and specific information - listening for Note taking, summarizing and for opinions - Listening to the speeches of eminent personalities.

Speaking Skills: Self-introduction - Conversation Skills (Introducing and taking leave) - Giving and asking for information - Role Play - Just A Minute (JAM) session - Telephone etiquette.

Reading and Writing skills: Reading Comprehension – Précis Writing - E-Mail writing - Punctuation.

Presentation skills: Verbal and non-verbal communication - Body Language - Making aPresentation

Reference Books

1. Ashraf Rizvi. Effective Technical Communication. Tata McGraw Hill Education Private Limited, New Delhi.
2. Speak Well. Orient Blackswan Publishers, Hyderabad.
3. Allan Pease. Body Language. Manjul Publishing House, New Delhi.

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AI1107 COMPUTER ENGINEERING WORKSHOP LAB

Course Objectives

- Explain the internal parts of a computer, peripherals, I/O ports, connecting cables
- Demonstrate basic command line interface commands on LINUX
- Teach the usage of Internet for productivity and self-paced lifelong learning
- Describe about Compression, Multimedia and Antivirus tools
- Demonstrate Office Tools such as Word processors, Spreadsheets and Presentationtools

Course Outcomes

- Assemble and disassemble components of a PC
- Construct a fully functional virtual machine, Summarize various LINUX operating system commands.
- Able to Troubleshoot hardware and software problems.

Syllabus

Module I – Hardware Concepts

1. Every student should identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor. Every student should disassemble and assemble the PC back to working condition.

Module II – Software Installations

1. Every student should individually install operating system like LINUX or MS windows on the personal computer. The system should be configured as dual boot with both windows and LINUX.

2. Hardware Troubleshooting: Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition.

3. Software Troubleshooting: Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition.

4. Cyber Hygiene: Students should learn about viruses on the internet and install antivirus software. Student should learn to customize the browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

5. Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and popup blockers.

Module III – MS-Office

1. MS Word - Features to be covered: Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colours, Inserting Header and Footer, Using Date.

2. Creating project abstract Features to be covered: Formatting Styles, inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

3. Creating a Newsletter: Features to be covered: Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs in word.

4. Spreadsheet Orientation: Accessing, overview of toolbars, saving spreadsheet files, Using help and resources. Creating a Scheduler: Gridlines, Format Cells, Summation, auto fill, Formatting Text.

5. Calculating GPA - Features to be covered: Cell Referencing, Formulae in spreadsheet – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, Sorting, Conditional formatting.

6. Creating Power Point: Student should work on basic power point utilities and tools in Latex and Ms Office/equivalent (FOSS) which help them create basic power point presentation. PPT Orientation, Slide Layouts, Inserting Text, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows, Hyperlinks, Inserting Images, Tables and charts.

AI1108 Computer Programming Using C Lab

Course Objectives

- To impart writing skill of C programming to the students and solving problems.
- To write and execute programs in C to solve problems such as Modularize the problemsinto small modules and then convert them into programs.,
- To write and execute programs in C to solve problems such as arrays, files, strings, structures and different numerical methods.
- This reference has been prepared for the beginners to help them understand the basic to advanced concepts related to Objective-C Programming languages.

Course Outcomes

- Understand various computer components, Installation of software. C programming development environment, compiling, debugging, and linking and executing a program using the development environment.
- Analysing the complexity of problems, Modularize the problems into small modules and then convert them into programs.
- Construct programs that demonstrate effective use of C features including arrays, strings, structures, pointers and files.
- Apply and practice logical ability to solve the real-world problems.
- Apply Numerical methods to Solve the complex Engineering problems.

Syllabus

Practice the following concepts with algorithm, flow chart and implementation.

1. C – Tokens, Data Types - Format Specifiers, I/O Statements.
2. Operators in C, their Precedence and Associativity, ArithmeticExpressions/Instructions, Type casting, Math.h functions.
3. Control Statements (Conditional): If and its Variants, Switch (Break).
4. Goto Statement, Control Statements (Looping): While, Do-While, For Loop, Continue& Break (Unconditional), Nested Loops
5. Arrays, One Dimensional Array: Declaration and Initialization, Accessing Array Elements.
6. Two Dimensional Array: Declaration and Initialization, Accessing Array Elements.
7. Strings: Read & Write, “String.h” Predefined Functions, without predefined functions. Pointers: Declarations, Types, Pointers to Arrays, Pointers to Character Strings, Pointers to Pointers, Array of Pointers
8. Structures: Nested Structures, Pointers to Structures, Unions.
9. Functions: Function Declaration, Classification (Arguments and Return Type), StorageClasses.
10. Parameter Passing Techniques, Passing Parameters Types, Recursion
11. Files: Opening, Closing of Files, Reading and Writing of Files.
12. Binary Files, Random Accessing of Files, Enum, Typedef, Pre-processor Commands.
13. Numerical methods: Bisection method, Newton Raphson method, Lagrange’s interpolation, Simpson’s rule for numerical integration.

References:

1. Programming in ANSI C, E Balagurusamy, 6th Edition. McGraw Hill Education (India)Private Limited.
2. Introduction to Numerical Methods, SS Sastry, Prentice Hall

B. TECH (Computer Science & Engineering with Specialization in Artificial Intelligence and Machine Learning)

(Common with CSE and IT)
For First & Second Years

I Year – II Semester

B. TECH (Computer Science & Engineering with Specialization in Artificial Intelligence and Machine Learning)

(Common with CSE and IT)
For First & Second Years

I Year-II Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
AI1201	BS	Engineering Mathematics–II	4	0	30	70	100	3
AI1202	BS	Engineering Physics	4	0	30	70	100	3
AI1203	ES	Elements of Electronics Engineering	4	0	30	70	100	3
AI1204	ES	Data Structures Using C	4	0	30	70	100	3
AI1205	ES	Digital Logic Design	4	0	30	70	100	3
AI1206	ES	LINUX Administration Lab	0	3	50	50	100	1.5
AI1207	BS	Engineering Physics Lab	0	3	50	50	100	1.5
AI1208	ES	Data Structures Lab	0	3	50	50	100	1.5
Total Credits								**19.5**

AI1201 ENGINEERING MATHEMATICS – II

Course Objectives

- The way of obtaining rank, eigen values and eigen vectors of a matrix.
- To know the importance of Cayley-Hamilton theorem and getting canonical form froma given quadratic form.
- To solve the system of equations by using direct and indirect methods.
- To solve first order and higher order differential equations by various methods.
- To obtain the Laplace transforms and inverse Laplace transforms for a given functions and their applications.

Course Outcomes

- Find rank, eigen values and eigen vectors of a matrix and understand the importance of Cayley- Hamilton theorem.
- Reduce quadratic form to canonical forms and solving linear systems by direct and indirect methods.
- Demonstrate solutions to first order differential equations by various methods and solve basic applications problems related to electrical circuits, orthogonal trajectories and Newton's law of cooling
- Discriminate among the structure and procedure of solving higher order differential equations with constant and variable coefficients.
- Understand Laplace transforms and its properties and finding the solution of ordinary differential equations.

SYLLABUS

Linear Algebra: Rank of a matrix- Echelon form, Normal Form - Solution of Linear System of Equations - Consistency of Linear System of Equations - Direct & Indirect Methods: Gauss elimination method, LU Factorization method, Gauss Seidal Method. Complex Matrices: Hermitian, Skew-Hermitian and Unitary Matrices and their Properties.

Eigen Values and Eigen Vectors: Eigen Values and Eigen Vectors of a Matrix - Cayley- Hamilton theorem - Inverse and Powers of a Matrix using Cayley-Hamilton's theorem and its applications. Diagonalization of a Matrix - Quadratic Forms - Reduction of Quadratic Form to Canonical Form - Nature of a Quadratic Form.

Ordinary Differential Equations of First Order and its Applications: Formation of ordinary differential equations (ODEs) - Solution of an ordinary differential equation - Equations of the first order and first degree - Linear differential equation - Bernoulli's equation - Exact differential equations - Equations reducible to exact equations - Orthogonal Trajectories - Simple Electric (LR & CR) Circuits - Newton's Law of Cooling - Law of Natural growth and decay.

Differential Equations of Higher Order: Solutions of Linear Ordinary Differential Equations with Constant Coefficients - Rules for finding the complimentary function - Rules for finding the particular integral - Method of variation of parameters - Cauchy's linear equation - Legendre's linear equation - Simultaneous linear differential equations.

Laplace Transforms: Introduction - Existence Conditions - Transforms of Elementary Functions - Properties of Laplace Transforms - Transforms of Derivatives - Transforms of Integrals - Multiplication by tn - Division by t – Evaluation of integrals by Laplace Transforms
- Inverse Laplace Transform - Applications of Laplace Transforms to Ordinary Differential Equations - Simultaneous Linear Differential Equations with Constant Coefficients - Second Shifting Theorem - Laplace Transforms of Unit Step Function, Unit Impulse Function and Laplace Transforms of Periodic Functions.

Text Book

1. Scope and Treatment as in "Higher Engineering Mathematics", by Dr. B.S. Grewal,43rd edition, Khanna publishers.

Reference Books

1. Graduate Engineering Mathematics by V B Kumar Vatti., I.K. International publishinghouse Pvt. Ltd.
2. Advanced Engineering Mathematics by Erwin Kreyszig.
3. A text book of Engineering Mathematics, by N.P. Bali and Dr. Manish Goyal. LakshmiPublications.
4. Advanced Engineering Mathematics by H.K. Dass. S. Chand Company.
5. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Graw Hill Company.

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AI1202 ENGINERING PHYSICS

Course Objectives

- To impart knowledge in basic concept of physics of Thermodynamics relevant to engineering applications.
- To grasp the concepts of physics for electromagnetism and its application to engineering. Learn production of Ultrasonics and their applications in engineering.
- To Develop understanding of interference, diffraction and polarization: connect it to a few engineering applications.
- To Learn basics of lasers and optical fibres and their use in some applications.
- To Understand concepts and principles in quantum mechanics and Nanophase Materials. Relate them to some applications.

Course Outcomes

- Understand the fundamentals of Thermodynamics and Laws of thermodynamics. Understand the working of Carnot cycle and concept of entropy.
- Gain Knowledge on the basic concepts of electric and magnetic fields. Understand the concept of the nature of magnetic materials. Gain knowledge on electromagnetic induction and its applications.
- Understand the Theory of Superposition of waves. Understand the formation of Newton's rings and the working of Michelson's interferometer. Remember the basics of diffraction, Evaluate the path difference. Analysis of Fraunhofer Diffraction due toa single slit
- Understand the interaction of matter with radiation, Characteristics of Lasers, Principle, working schemes of Laser and Principle of Optical Fibre. Realize their role in optical fibre communication.
- Understand the intuitive ideas of the Quantum physics and understand dual nature of matter. Compute Eigen values, Eigen functions, momentum of Atomic and subatomic particles using Time independent one-Dimensional Schrodinger's wave equation. Understand the fundamentals and synthesis processes of Nanophase materials.

SYLLABUS

Thermodynamics: Introduction, Heat and Work, First law of thermodynamics and applications, Reversible and Irreversible process, Carnot cycle and Efficiency, Second law of thermodynamics, Carnot's Theorem, Entropy, Second law in terms of entropy, Entropy and disorder, Third law of thermodynamics (statement only).

Electromagnetism: Concept of electric flux, Gauss's law - some applications, Magnetic field - Magnetic force on current, torque on current loop, The Biot-Savart's Law, B near a long wire, B for a circular Current loop, Ampere's law, B for a solenoid, Hall effect, Faraday's law of induction, Lenz's law, Induced magnetic fields, Displacement current, Maxwell's equations (no derivation), Magnetic materials: Classification of magnetic materials and properties.

Ultrasonics: Introduction, Production of Ultrasonics – Piezoelectric and Magnetostriction methods, acoustic grating, applications of ultrasonics.

Optics-

Interference: Principles of superposition – Young's Experiment – Coherence - Interference in thin films (reflected light), Newton's Rings, Michelson Interferometer and its applications.

Diffraction: Introduction, Differences between interference and diffraction, Fresnel and Fraunhofer diffraction, Fraunhofer diffraction at a single slit (Qualitative and quantitativetreatment).

Polarisation: Polarisation by reflection, refraction and double refraction in uniaxial crystals, Nicol prism, Quarter and Half wave plate, circular and elliptical polarization.

Lasers And Fibre Optics: Introduction, characteristics of a laser beam, spontaneous and stimulated emission of radiation, population inversion, Ruby laser, He-Ne laser, Semiconductor laser, applications of lasers Introduction to optical fibres, principle of propagation of light in optical fibres, Acceptance Angle and cone of a fibre, Numerical aperture, Modes of propagations, classification of fibres, Fibre optics in communications, Application of optical fibres.

Modern Physics-

Introduction, De Broglie concept of matter waves, Heisenberg uncertainty principle, Schrodinger time independent wave equation, application to a particle in a box. Free electron theory of metals, Kronig - Penney model (qualitative treatment), Origin of energy band formation in solids, Classification of materials into conductors, semi-conductors and insulators.

Nanophase Materials: Introduction, properties, Top-down and bottom-up approaches, Synthesis - Ball milling, Chemical vapour deposition method, sol-gel methods, Applications of nano materials.

Text Books

1. Physics by David Halliday and Robert Resnick – Part I and Part II - Wiley.
2. A textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar - S.Chand
3. Engineering Physics by R.K. Gaurand S.L. Gupta–Dhanpat Rai

Reference Books

1. Modern Engineering Physics by A.S. Vadudeva
2. University Physics by Young and Freedman

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AI1203 ELEMENTS OF ELECTRONICS ENGINEERING

Course Objectives

- Introduce students to basics of semiconductors, their classification and properties
- To provide theory of PN junction diode, its characteristics and applications
- To introduce basics of rectifying circuits and bipolar junction transistor
- To provide basics of transistor biasing, transistor amplifiers and field effect transistors

Course Outcomes

- By the end of the course, the student should be able to:
- Explain the basics of semiconductors and their classification
- Understand the theory of PN junction diode, rectifying circuits and bipolar junctiontransistor
- Explain the concepts of transistor biasing, transistor amplifiers and field effect transistors

SYLLABUS

Introduction to Electronics and Semiconductors: Energy band theory, Conduction in Insulators, Semiconductors and metals, Electron emission from metals, Classification of semiconductors, Carrier concentration in an intrinsic semiconductor, Properties of intrinsic semiconductor, Drift and diffusion currents.

Semi-Conductor Diode: Theory of PN junction diode, Open circuited PN junction, V-I characteristics of a PN diode, Diode current equation, Transition and diffusion capacitances, Break down in PN diode, Applications of PN diodes. Zener diode, Zener regulator, Tunnel diode, Schottky diode.

Rectifying circuits: Half wave and full wave rectifiers, Bridge rectifiers, Efficiency, Ripple and regulation of each rectifier, Capacitor filters.

Bipolar Junction Transistor: Introduction, construction, Operation of PNP and NPN Transistors – Transistor Circuit configurations- Characteristics of a CE configurations – h parameters, low frequency small signal equivalent circuit of a Transistor.

Transistor Biasing and thermal stabilization: Transistor Biasing, Stabilization, Different methods of transistor biasing – Fixed bias, Collector feedback bias – self bias – Bias compensation.

Transistor Amplifiers: CE, CB, CC amplifier configurations –Multistage amplifier – A Two Stage RC coupled amplifier – frequency response curve and bandwidth.

Field Effect Transistors: Junction Field Effect Transistors (JFET) – JFET characteristics, JFET Parameters, Small signal equivalent circuit – MOSFETS – Depletion and Enhancement MOSFETS.

Text Books:

1. Electronic Device and Circuits by Sanjeev Guptha.

Reference Books:

1. Electronic Device and Circuits Theory by Robert L. Boylested Electronic Device andCircuits by David. A. Bell

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AI1204 DATA STRUCTURES USING C

Course objectives

- Assess how the choice of data structures and algorithm design methods impacts the performance of programs.
- Choose the appropriate data structure and algorithm design method for a specified application.
- Solve problems using data structures such as linear lists, stacks, queues, binary trees, heaps binary search trees, and graphs and writing programs for these solutions.

Course outcomes

- Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithm.
- Demonstrate different methods for traversing trees.
- Compare alternative implementations of data structures with respect to performance.
- Discuss the computational efficiency of the principal algorithms for sorting and searching

SYLLABUS

Introduction to Data Structures: Review of C Programming, Recursive Definition and Processes, Recursion in C, Simulation of Recursion, Efficiency of Recursion, Abstract Data Types, Meaning and Definition of Data Structures, Arrays.

Stacks: Stack as an Abstract Data Type, Primitive Operations, Implementing Stack Operations using Arrays, Infix, Postfix and Prefix: Definitions, Evaluation and Conversions.

Queues: Queue as an Abstract Data Type, Sequential Representation, Types of Queues, Operations, Implementation using Arrays.

Linked List: Operations, Implementation of Stacks, Queues and priority Queues using Linked Lists+, Circular Lists: Insertion, Deletion and Concatenation Operations, Stacks and Queues as Circular Lists, Doubly Linked Lists.

Trees: Binary Trees - Definitions and Operations, Binary Tree Representation: Node Representation, Implicit array Representation, Binary Tree Traversal, Threaded Binary Trees and their Traversal, Trees and their Applications; Tree Searching: Insertion and Deletion of a node from a Binary Search Tree, Efficiency of Binary Search Tree operations.

Searching: Basic Searching Techniques: Dictionary as an Abstract Data Type, Algorithmic Notation, Sequential Searching and its Efficiency, Binary Search, Interpolation Search.

Sorting: General Background: Efficiency, Asymptotic Notations, Efficiency of Sorting, Bubble Sort and Quick Sort and their Efficiency, Selection Sorting, Binary Tree Sort, Heap Sort, Insertion Sorts, Shell Sort, Address calculation Sort, Merge and Radix Sorts.

Graphs and Their Application: Definition of Graphs, Representation of Graphs, Transitive closure, Linked Representation of Graphs, Topological Ordering of nodes, Graph Traversal and Spanning Forests, Undirected Graphs and their Traversals, Applications of Graphs, Minimal Spanning Trees.

Textbooks

1. Data Structures Using C and C++ Yddish Langsam, Moshe J. Augenstein and Aaron M.Tanenbaum, Prentice Hall Of India (2nd Edition)
2. Data Structures, Algorithms and Applications with C++, Sahani Mc-Graw Hill.

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AI1205 DIGITAL LOGIC DESIGN

Course objectives

- To introduce the basic principles for design of combinational circuit and sequential circuits.
- To learn simple digital circuits in preparation for computer engineering.

Course Outcomes

A student who successfully fulfils the course requirements will have demonstrated:

- An ability to define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.
- An ability to understand the different Boolean algebra theorems and apply them for logic functions.
- An ability to define the Karnaugh map for a few variables and perform an algorithmic reduction of logic functions.
- An ability to define the following combinational circuits: multiplexer, de-multiplexers encoders/decoders, comparators, arithmetic-logic units; and to be able to build simple circuits.
- An ability to understand asynchronous and synchronous sequential circuits, like counters and shift registers.
- An ability to understand memories like RAM and ROM, Programmable Logic Array and Programmable Array Logic.

SYLLABUS

Binary Systems: Digital Systems. Binary Numbers. Number Base Conversions. Octal and Hexadecimal Numbers. Complements. Signed Binary Numbers. Binary Codes. Binary Storage and Registers. Binary Logic

Boolean Algebra and Logic Gates: Basic Definitions. Axiomatic Definition of Boolean Algebra. Basic Theorems and Properties of Boolean Algebra. Boolean Functions. Canonical and Standard Forms. Other Logic Operations. Digital Logic Gates. Integrated Circuits.

Combinational Logic Design, Gate-Level Minimization: The Map Method. Four Variable Map. Five-Variable Map. Product of Sums Simplification. Don't-Care Conditions. NAND and NOR Implementation. Other Two- Level Implementations. Exclusive-OR Function. Hardware Description Language (HDL).

Combinational Logic: Combinational Circuits. Analysis Procedure. Design Procedure. Binary Adder Subtractor. Decimal Adder. Binary Multiplier. Magnitude Comparator. Decoders. Encoders. Multiplexers. HDL For Combinational Circuits.

Sequential Logic Design, Synchronous Sequential Logic: Sequential Circuits. Latches Flipflops. Analysis of Clocked Sequential Circuits. HDL For Sequential Circuits. State Reduction and Assignment. Design Procedure.

Registers ad Counters: Registers. Shift Registers. Ripple Counters. Synchronous Counters. Other Counters. HDL for Registers and Counters.

Memory and Programmable Logic: Introduction. Random-Access Memory. Memory Decoding, Error Detection and Correction. Read-Only Memory. Programmable Logic Array. Programmable Array Logic. Sequential Programmable Devices.

Text Book

1. DigitalDesign,3rdEdition, M. Morris Mano, Pearson Education.

Reference Books

1. Digital Logic Design Principles, Norman Balabanian & Bradley Carlson, John Wiley&Sons (Asia) Pvt.Ltd.,2002
2. Fundamentals of Digital Logic with VHDL Design, Stephen Brown andZvonkoVranesic, TataMcGraw-HillEdition,2002.

AI1206 LINUX ADMINISTRATION LAB

Course Objectives

- To understand LINUX operating system and its internals.
- To understand LINUX file system structure and its operations.
- To understand LINUX shell environment and its programming.
- To understand communication in LINUX and the corresponding primitives.

Course Outcomes

- The student learns about LINUX features for multiuser, multitasking capabilities.
- The student learns about file system organization, file and directory manipulation, setting file permissions, and disk free space administration.
- The student learns about writing shell scripts for different applications.
- The student learns about how users communicate with each other in LINUX environment.

SYLLABUS

1) Study and practice on file system / handling files with commands, syntax, usage, application.
2) Practice on vi editor.
3) Study and practice on redirection operators with relevant commands, syntax, usage, application.
4) Study and practice on filters with relevant commands, syntax, usage, application.
5) Study and practice on Backup with relevant commands, syntax, usage, application.
6) Study and practice on internet related commands, syntax, usage, application.
7) Study and practice on shells/shell programming with relevant programming constructs,syntax, usage, application.
8) Study and practice on awk with relevant commands, syntax, usage, application.
9) Study and practice on regular expressions and the grep family with relevant commands,syntax, usage, application.
10) Study and practice on compilation process of C programs under UNIX.

References:

1. Unix concepts and applications by Sumitabha Das, TMH Publications.
2. Shell programming by Yashwanth Kanetkar.

AI1207 ENGINNERING PHYSICS LAB

Course Objectives

- To enable the students to acquire skill, technique and utilization of the Instruments
- Draw the relevance between the theoretical knowledge and to imply it in a practical manner with respect to analyse various electronic circuits and its components.
- To impart the practical knowledge in basic concepts of Wave optics, Lasers and fibreoptics.
- To familiarize the handling of basic physical apparatus like Vernier callipers, screwgauge, spectrometers, travelling microscope, laser device, optical fibre, etc.

Course Outcomes

- Ability to design and conduct experiments as well as to analyse and interpret
- Ability to apply experimental skills to determine the physical quantities related to Heat,Electromagnetism and Optics
- The student will learn to draw the relevance between theoretical knowledge and the means to imply it in a practical manner by performing various relative experiments.

SYLLABUS

1. Determination of Radius of Curvature of a given Convex Lens By forming Newton'sRings.
2. Determination of Wavelength of Spectral Lines in the Mercury Spectrum by NormalIncidence method.
3. Study the Intensity Variation of the Magnetic Field along axis of Current CarryingCircular Coil.
4. Determination of Cauchy's Constants of a Given Material of the Prism using Spectrometer.
5. Determination of Refractive Index of Ordinary ray □o and Extraordinary □e ray.
6. Determination of Thickness Given Paper Strip by Wedge Method.
7. Calibration of Low Range Voltmeter.
8. Calibration of Low Range Ammeter.
9. Determination of Magnetic Moment and Horizontal Component of Earth's MagneticField.
10. Lees Method - Coefficient of thermal Conductivity of a Bad Conductor.
11. Carey Foster's Bridge – Verification of laws of Resistance and Determination of Specific Resistance.
12. Melde's Apparatus – Frequency of electrically maintained Tuning Fork.
13. Photoelectric cell-Characteristics.
14. Planks Constants.
15. Laser- Diffraction.

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AI1208 DATA STRUCTURES LAB

Course Objectives

- To implement stacks and queues using arrays and linked lists.
- To develop programs for searching and sorting algorithms.
- To write programs using concepts of various trees.
- To implement programs using graphs.

Course Outcomes

- Student will be able to write programs to implement stacks and queues.
- Ability to implement various searching and sorting techniques.
- Ability to implement programs using trees and graphs.

SYLLABUS

List of Programs:

1. Write a C program for sorting a list using Bubble sort and then apply binary search.
2. Write a C program for implementing the operations of a queue.
3. Write a C program to implement the operations on priority queues.
4. Write a C to implement the operations on circular queues.
5. Write a C program to implement the operations on stacks.
6. Write a C program for evaluating a given postfix expression using stack.
7. Write a C program for converting a given infix expression to postfix form usingstack.
8. Write a C program to implement the operations on single linked list.
9. Write a C program for demonstrate operations on double linked list.
10. Write a C program for the representation of polynomials using circular linked listand for the addition of two such polynomials
11. Write a C program to create a binary search tree and for implementing the in order,Pre order, post order traversal using recursion
12. a) Write a C program for finding the transitive closure of a digraph
    b) Write a C program for finding the shortest path from a given source to any vertexin a digraph using Dijkstra's algorithm.
13. a) Write a C program for finding the Depth First Search of a graph.
    b) Write a C program for finding the Breadth First Search of a graph

References:

1. Data Structures Using C and C++ Yddish Langsam, Moshe J. Augenstein andAaron M.Tanenbaum, Prentice Hall Of India (2nd Edition)
2. Data Structures, Algorithms and Applications with C++, Sahani Mc-Graw Hill.

B. TECH (Computer Science & Engineering with Specialization in Artificial Intelligence and Machine Learning)

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For First & Second Years

II Year – I Semester

B. TECH (Computer Science & Engineering with Specialization in Artificial Intelligence and Machine Learning)

(Common with CSE and IT)
For First & Second Years

II Year - I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
AI2101	ES	Discrete Mathematical Structures	4	0	30	70	100	3
AI2102	PC	Computer Organization and Architecture	4	0	30	70	100	3
AI2103	BS	Probability, Statistics and Queuing theory	4	0	30	70	100	3
AI2104	PC	Operating Systems	4	0	30	70	100	3
AI2105	PC	Object Oriented Programming Through Java	4	0	30	70	100	3
AI2106	PC	Computer Organization & Architecture Lab	0	3	30	70	100	1.5
AI2107	PC	Object Oriented Programming Through Java Lab	0	3	50	50	100	1.5
AI2108	PC	Operating Systems Lab	0	3	50	50	100	1.5
AI2109	SC	Intellectual Property Rights (Internal)	1	2	100	0	100	2
AI2110	MC	Environmental Science	0	0	-	100	100	0
Total credits								**21.5**

AI2101 DISCRETE MATHEMATICAL STRUCTURES

Course Objectives

- To understand mathematical arguments using logical connectives and quantifiers and verify the validity of logical flow of arguments using propositional, predicate logic and truth tables.
- To understand about permutations and combinations.
- To understand various types of relations and discuss various properties of the relations.
- To study the graphs, graph isomorphism and spanning trees.
- To study about Boolean algebra and Finite State Machines.

Course Outcomes

At the end of the course student will be able to

- Rewrite mathematical arguments using logical connectives and quantifiers and verifythe validity of logical flow of arguments using propositional, predicate logic.
- Identify and give examples of various types of relations and describe various properties of the relations.
- Ability to solve problems using permutations and combinations.
- Determine isomorphism of graphs and spanning tree of a given graph using BFS/DFS algorithms. Also determine minimal spanning tree of a given graph.

SYLLABUS

The Foundations-Logic and Proofs: Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers Rules of Inference, Introduction to Proofs, Proof Methods and Strategy, Basic Structures-Sets, Functions, Sequences and Sums: Sets, Set Operations, Functions, Sequences and Summations.

The Fundamentals-Algorithms, the Integers and Matrices: Algorithms, The Growth of Functions, Complexity of Algorithms, The Integers and Division, Primes and Greatest Common Devisors, Integers and Algorithms, Applications of Number Theory, Matrices.

Induction and Recursion: Mathematical Induction, Strong Induction and Well-Ordering, Recursive Definitions and Structural Induction, Recursive Algorithms, Program Correctness.

Counting: The Basics of Counting, The Pigeonhole Principle, Permutations and Combinations, Binomial Coefficients, Generalized Permutations and Combinations, Generating Permutations and Combinations.

Advanced Counting Techniques: Recurrence Relations, Solving Linear Recurrence Relations, Divide-and-Conquer Algorithms and Recursion Relations, Generating Functions, Inclusion-Exclusion, and Applications of Inclusion-Exclusion.

Relations: Relations and their properties, n-ary relations, applications, Representation, closure, equivalence relations, Partial orderings.

Graphs: Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Colouring.

Trees: Introduction to Trees, Applications of Trees, Tree Traversal, Spanning Trees, Minimum Spanning Trees,

Boolean Algebra: Boolean Functions, Representing Boolean Functions, Logic Gates, Minimization of Circuits

Modelling Computation: Languages and Grammars, Finite-State Machines with Output, Finite-State Machines with No Output, Language Recognition, Turing Machines.

Text Book

1. Discrete Mathematics & Its Applications with Combinatorics and Graph Theory byKenneth H Rosen, Tata McGraw-Hill Publishing Company Ltd., New Delhi.

Reference Books

1. Discrete Mathematics for Computer Scientists & Mathematicians by Joe L. Mott, Abraham Kandel, Theodore P. Baker, Prentice-Hall, India.
2. Discrete Mathematics by Richard Johnson Baug, Pearson Education, New Delhi.
3. Discrete and Combinatorial Mathematics by Ralph. G. Grimaldi, Pearson Education, New Delhi.

AI2102 COMPUTER ORGANIZATION AND ARCHITECTURE

Course Objectives

- To study about structure and functional components of a computer.
- Understanding the hierarchical organization of a computer system which consists of instruction set of commands.
- Learn about the architecture of a computer from a programming view.
- To design a balance system that minimizes performance and utilization of all elements.

Course Outcomes

By the end of the course, the student should be able to:

- Demonstrate knowledge about major components of a computer such as processor, memory and I/O modules along with their interconnections internally with outside world.
- have detailed idea about architecture of central processing unit, functions of control unit, memory, I/O devices and their issues.
- Understand simple and multiple processor organization and their issues.

SYLLABUS

Register Transfer and Micro operations: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations, Arithmetic Logic Shift Unit.

Basic Computer Organization and Design: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-ReferenceInstructions, Input- Output and Interrupt, Complete Computer Description, Design of Basic Computer, Design of Accumulator Logic.

Micro programmed Control: Control Memory, Address Sequencing, Micro program Example, Design of Control Unit.

Central Processing Unit: Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer (RISC), Architecture and Programming of 8085 Microprocessor

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISK Pipeline, Vector Processing, Array Processors.

Input/output Organization: Peripheral Devices, I/O interface, Asynchronous data transfer, Modes of transfer, priority Interrupt, Direct memory access, Input-Output Processor (IOP), Serial Communication.

Memory Organization: Memory Hierarchy, Main memory, Auxiliary memory, Associate Memory, Cache Memory, and Virtual memory, Memory Management Hardware.

Text Books

1. Computer System Architecture, M. Morris Mano, Prentice Hall of India Pvt. Ltd., ThirdEdition, Sept.2008.
2. Computer Architecture and Organization, P.Chakraborty.
3. Microprocessor Architecture, Programming and Applications with the 8085by RameshS Gaonkar

Reference Books

1. Computer Architecture and Organization, William Stallings, PHI Pvt. Ltd., EasternEconomy Edition, Sixth Edition, 2003.
2. Computer Organization and Architecture, Linda Null, Julia Lobur, Narosa PublicationsISBN81- 7319-609-5
3. Computer System Architecture", John. P.Hayes.

AI2103 PROBABILITY, STATISTICS AND QUEUING THEORY

Course objectives

- To provide foundations of probabilistic and statistical analysis
- To provide an understanding on concepts of probability, random variables, probability distributions, sampling, estimation, hypothesis testing, regression, correlation, multiple regression, hypothesis testing, sample test, queuing methods
- To explore applications of probabilistic and statistical tools to solve real world problems.

Course outcomes

After completion of the course the student should be able to:

- Define and explain basic concepts in probability theory and how to translate real-world problems into probability models
- Solve standard problems that include random variables, discrete and continuous probability distributions
- Perform Test of Hypothesis and construct a confidence interval to estimate population parameters
- Compute and interpret the results of Correlation Analysis, Multivariate Regression, Chi-Square test for Independence and Goodness of Fit
- Explain basic concepts in Markov processes, M/M/1 and M/M/C queueing systems.

SYLLABUS

Probability: Definitions of probability, Addition theorem, Conditional probability, Multiplication theorem, Bayes Theorem of Probability and Geometric Probability.

Random variables and their properties: Discrete Random Variable, Continuous Random Variable, Probability Distribution, Joint Probability Distributions their Properties, Transformation Variables, Mathematical Expectations, Probability Generating Functions.

Probability Distributions: Discrete Distributions: Binomial, Poisson Negative Binominal Distributions and Their Properties; **Continuous Distributions:** Uniform, Normal, Exponential Distributions And Their Properties.

Multivariate Analysis: Correlation, Correlation Coefficient, Rank Correlation, Regression Analysis, Multiple Regression, Attributes, Coefficient Of Association, Chi Square Test For Goodness Of Fit, Test For Independence.

Estimation: Sample, Populations, Statistic, Parameter, Sampling Distribution, Standard Error, Un-biasedness, Efficiency, Maximum Likelihood Estimator, Notion & Interval Estimation.

Testing of Hypothesis: Formulation of Null hypothesis, critic al region, level of significance, power of the test;

Sample Tests: Small Sample Tests: Testing equality of means, testing equality of variances, test of correlation coefficient, test for Regression Coefficient; Large Sample tests: Tests based on normal distribution

Queuing Theory: Queue description, characteristics of a queuing model, study state solutions of M/M/1: Model, M/M/1; N Model, M/M/C: Model, M/M/C: N Model, Case studies.

Text Books

1. Probability & Statistics for Engineers and Scientists, Walpole, Myers, Myers, Ye. Pearson Education.
2. Probability, Statistics and Random Processes T.Veerarajan Tata McGraw – Hill

Reference Book

1. Probability & Statistics with Reliability, Queuing and Computer Applications, Kishor S. Trivedi, Prentice Hall of India ,1999

AI2104 OPERATING SYSTEMS

Course objectives:

- To understand evolution of Operating System.
- To understand operating system as a layer of abstraction above physical hardware that facilitates usage convenience and efficient resource management of computer system resources.
- To learn design and implementation of policies and mechanisms for OS subsystem.
- To investigate case studies to understand the design philosophies / paradigm for popularmultiuser or single user operating system.

Course Outcomes:

- The student understands OS evolution, its structure and services provided by it.
- Learn process life cycle, process scheduling objectives, policies and mechanisms, process synchronization, inter process communication, deadlocks and other process subsystem related concepts.
- Learn memory hierarchy, allocation and deallocation policies and mechanism for main and auxiliary memory, file system design and implementation issues.
- investigate UNIX/ LINUX and Windows OS platforms w.r.t similarities and differences in design philosophies.

SYLLABUS

Introduction to Operating Systems: Over View of Operating Systems, Types of Operating Systems, Operating System Structures, Operating System Services, System Calls, Virtual Machines, Operating System Design and Implementation.

Process Management: Process Concepts, Operations on Processes, Cooperating Processes, Threads, Inter Process Communication, Process Scheduling, Scheduling Algorithms, Multiple- Processor Scheduling, Thread Scheduling.

Process Synchronization: The Critical Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classical Problems of Synchronization, Critical Regions, Monitors.

Deadlocks: System Model, Deadlock Characterization, Methods For Handling Deadlocks, Deadlock Prevention, Avoidance, Deadlock Detection, Recovery from Deadlocks.

Memory Management: Logical versus Physical Address, Swapping, contiguous memory allocation, paging, structure of the page table, segmentation, Virtual Memory, Demand Paging, Page Replacement, Allocation of Frames, Thrashing, Memory-Mapped files.

File Systems, Implementation, and Secondary-storage Structure: Concept of a file, Access Methods, Directory Structure, Protection, File System Structure, Allocation Methods, Free Space Management, Directory Management, Device Drivers, overview of Mass-storage structure, Disk structure, disk attachment, disk scheduling, swap-space management.

Case study: Overview of LINUX, Windows Operating systems.

Text Book:

1. Operating Systems, Abraham Silberschatz, Peter Baer Galvin, and Greg Gagne, JohnWiley Publ., Seventh Edition.
2. Operating Systems; A Practical Approach. Rajiv Chopra.

Reference Books:

1. Modern Operating Systems, Andrew S. Tanenbaum, ,2nd edition, 1995, PHI.
2. Operating Systems, William Stallings 5th Edition -PHI
3. Operating Systems: A Design-Oriented Approach', Charles Crowley, 'Tata Hill Co.,1998 edition.

AI2105 OBJECT ORIENTED PROGRAMMING THROUGH JAVA

Course Objectives:

- This subject will help to improve the analytical skills of object-oriented programming
- Overall development of problem solving and critical analysis
- Formal introduction to Java programming language

Course Outcome:

On successful completion of this course, the student should be able to:

- Show competence in the use of the Java programming language in the development of small to medium-sized application programs that demonstrate professionally acceptable coding and performance standard
- Understand the basic principles of the object-oriented programming
- Demonstrate an introductory understanding of graphical user interfaces, multi-threaded programming, and event-driven programming.

SYLLABUS

Introduction to Java: Basics of Java programming, Data types, Variables, Operators, Control structures including selection, Looping, Java methods, Overloading, Math class, Arrays in java.

Objects and Classes: Basics of objects and classes in java, Constructors, Finalizer, Visibility modifiers, Methods and objects, Inbuilt classes like String, Character, StringBuffer, File, this reference

Inheritance and Polymorphism: Inheritance in java, Super and sub class, Overriding, Object class, Polymorphism, Dynamic binding, Generic programming, Casting objects, Instance of operator, Abstract class, Interface in java, Package in java, UTIL package.

Event and GUI programming: Event handling in java, Event types, Mouse and key events, GUI Basics, Panels, Frames, Layout Managers: Flow Layout, Border Layout, Grid Layout, GUI components like Buttons, Check Boxes, Radio Buttons, Labels, Text Fields, Text Areas, Combo Boxes, Lists, Scroll Bars, Sliders, Windows, Menus, Dialog Box, Applet and its life cycle, Introduction to swing

I/O programming: Text and Binary I/O, Binary I/O classes, Object I/O, Random Access Files.

Multithreading in java: Thread life cycle and methods, Runnable interface, Thread synchronization, Exception handling with try-catch-finally, Collections in java, Introduction to JavaBeans and Network Programming.

Java Database Connectivity (JDBC): JDBC Product, Types of Drivers, Two-Tier Client/Server Model, Three-Tier Client/Server Model, Basic Steps of JDBC, Creating and Executing SQL Statement, The Result Set Object, Working with Database MetaData Interface

Reference Books:

1 Introduction to Java Programming (Comprehensive Version), Daniel Liang, SeventhEdition, Pearson.

2 Programming in Java, Sachin Malhotra & Saurabh Chaudhary, Oxford University Press.

3 Murach's Beginning Java 2, Doug Lowe, Joel Murach and Andrea Steelman, SPD.

4 Core Java Volume-I Fundamentals, Eight Edition, Horstmann & Cornell, Pearson Education.

5 The Complete Reference, Java 2 (Fourth Edition), Herbert Schild, TMH.

6 Java Programming, D. S. Malik, Cengage Learning.

AI2106 COMPUTER ORGANIZATION & ARCHITECTURE LAB

SCourse Objectives

- to design and analyse the operational behaviour of IC gates, multiplexers, decoders,flip-flops, counters, shift registers, binary adders and subtractors and ALU.
- to implement assembly language programming using various trainers.
- to make students familiar with Pentium class PC architecture.

Course Outcomes

After completion of the course the student should be able to:

- analyse the operational behaviour of various digital logic units such as multiplexers, decoders, flip-flops, counters, shift registers, binary adders and subtractors and ALU.
- write assembly language code using various trainers.
- understand Pentium class PC architecture.

SYLLABUS

I - Cycle: Digital Logic Design
ExperimentsTTL Characteristics and TTL
IC Gates Multiplexers & Decoders
Flip-Flops
Counters
Shift Registers
Binary Adders &
SubtractorsA L U

II - CYCLE: 8085 Assembly Language Programming
8085 Assembly Language Programming according to theory course microprocessors-I usingthe following trainers:
Keyboard Monitor of 8085µP Trainer
Serial Monitor of 8085µP Trainer with Terminal
8085 Line Assembler of 8085µP Trainer with PC as Terminal
8085 Cross Assembler using In-Circuit Emulator (ICE) with 8085µP Trainer and PC asTerminal
Graded Problems are to be used according to the syllabus of computer organization
Pentiumclass pc architecture familiarization hardware & software parts demonstration

Reference Books

1. Computer System Architecture, M. Morris Mano, Prentice Hall of India Pvt. Ltd., ThirdEdition, Sept.2008
2. Microprocessor Architecture, Programming and Applications with the 8085 by RameshS
   Gaonkar.

AI2107 OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB

Course Objectives:

- To develop programs using basic OOPS concepts such as classes and objects.
- To implement programs using Inheritance concepts.
- To implement programs using Exception handling.
- To develop programs using operator overloading concepts.

Course Outcomes:

- Student will be able to use OOPs concepts.
- Ability to apply Inheritance concepts to several problems.
- Ability to use Exception Handling concepts.

List of Programs:

1. Program to define a structure of a basic JAVA program
2. Program to define the data types, variable, operators, arrays and control structures.
3. Program to define class and constructors. Demonstrate constructors.
4. Program to define class, methods and objects. Demonstrate method overloading.
5. Program to define inheritance and show method overriding.
6. Program to demonstrate Packages.
7. Program to demonstrate Exception Handling.
8. Program to demonstrate Multithreading.
9. Program to demonstrate I/O operations.
10. Program to demonstrate Network Programming.
11. Program to demonstrate Applet structure and event handling.
12. Program to demonstrate Layout managers.

AI2108 OPERATING SYSTEMS LAB

Course Objectives:

- To learn about UNIX/LINUX operating system environment.
- To learn about system calls for UNIX/LINUX Operating System.
- To understand resource management policies and mechanisms and their performance evaluation.

Course Outcomes:

- The student learns about multiprogramming, and multitasking capabilities of UNIX/LINUX.
- The student develops skill in writing C programs using system calls for process management, inter process communication and other aspects.
- The student learns to simulate OS resource management aspects like process scheduling, page replacement, disk scheduling, free space management and others to evaluate performance.

Syllabus

Module I

1. OS lab familiarization, Home Assignment on Unix commands, Vi editor
2. Simple shell programming exercises
3. Shell programming using decision making constructs, loop constructs, file anddirectory manipulation
4. Simple C programs using command line arguments, system calls, library function calls,make utility
5. C programs using system call to create processes and study parent, child process mechanism
6. C programs to create process chaining, spawning
7. C programs to error handling using errno(), perror() function
8. C programs to use pipe system call for inter process communication

Module II

1. C programs to study process scheduling implementing FCFS, Shortest Job First, andRound Robin algorithms
2. C programs to study page replacement implementing FIFO, Optimal, and LRU pagereplacement algorithms
3. C programs to study deadlock avoidance and detection
4. C Programs to simulate free space management (first fit, best fit, worst fit).
5. C programs to study disk scheduling algorithms (i.e., SCAN, SSTF, LOOK, etc.,)

References:

1. Unix concepts and applications by Sumitabha Das, TMH Publications.
2. Unix programming by Stevens, Pearson Education.
3. Shell programming by Yashwanth Kanetkar.
4. Operating System Concepts by Silberschatz, and Peter Galvin.

AI2109 INTELLECTUAL PROPERTY RIGHTS

Course Objective:

- To introduce the students to Intellectual Property Rights (IPR) which is a key component in modern knowledge management processes
- To create consciousness on IPR in students at an early stage of their education so that they develop an appreciation for ethical and rightful use of existing knowledge
- To make them understand how to take ownership of knowledge they may develop as a result of their creative innovations, take ownership and either drive themselves in becoming entrepreneurs or become responsible knowledge users in society
- To expose students some of the recent debates on the societal implications of IPR and its role in national/international trade and socio-economic development.

Course outcome:

Learners will be able to

- identify the types of intellectual property protection available for their research outcome
- conduct patent search and analyse patentability of the invention
- understand the basic structure of Patent document
- understand the registration and prosecution of different IPs
- understand the basics of IP commercialization and techno/commercial/legal issues in IPR commercialization

SYLLABUS

Introduction: Concept of property, Intellectual Property (IP) and Intellectual Property Rights (IPR), Importance of IP, Value creation through IP, Advantages of IP protection, Competitive advantage, Promotion of social good, Prevention of duplicates, counterfeit products and IP.

Evolution of IP system: Historical view of IP system in India and abroad, Legal basis and rationale behind development of IP system, WTO and TRIPS agreement, Role of WIPO.

Types of IPR: Major forms of IP in India and globally, Acts enacted in India related to IP.

Patent: Concept, Life of patent, Rights of Patentee, Criteria of patentability- novelty, non- obviousness, and utility, Non-patentable inventions.

Patent filing and prosecution: Prior art search, Process of obtaining a patent in India, Provisional and complete specification, Convention application, Patent Cooperation Treaty (PCT), Patent Infringement and Enforcement.

Trademark: Types of trademarks, Trademark and Brand, Trademark Registration, Trademark Infringement.

Copyright: Copyrights and related rights, Copyright registration, Copyright infringement, Section 52 of Indian Copyright Act.

Industrial Design: What is Industrial design, Design registration, Design infringement.

Trade Secret: What are Trade Secrets, How trade secrets are maintained in trade and business.

Other forms of IP: Semiconductor Integrated Circuits Layout Design, Geographical Indications, Protection of Plant Varieties & Farmers' right, Traditional knowledge.

IP commercialization: Licensing & Royalty; Technology Transfer; IP assignment, Compulsory License.

Emerging areas: Pat informatics, IP and bank loan, IP insurance, IP audit, IP valuation, IP management, Use of artificial intelligence in IP enforcement, Open innovation.

Text Books

1. Ganguli Prabuddha, Gearing up for Patents The Indian Scenario", Universities Press (1998)
2. Ganguli Prahuddha "Intellectual Property Rights-Unleashing the Knowledge Economy". Tata McGraw Hill (2001)
3. Geographical Indications of Goods Act 1990 Ganguli Piabaddha "Geographical Indications-its evolving contours accessible in http ips. nminsoda/files/2012/05/main book pdf (2009)

Reference Books

1. Ganguli Prabuddha and Jahade Siddharth, "Nanotechnology Intellectual Property Rights Research, Design, and Commercialisation", CRC Press, Taylor and Francis Group, USA (2012)
2. Beyond Intellectual Property: Toward Traditional Resource Rights for Indigenous Peoples and Local Communities [Paperback J,Darrell A. Posey and Graham Dotfield, IDRC Books; annotated edition (June (1996)
3. Netancl Neil Weinstock, Copyright's Paradox, Oxford University Press (2010)
4. The Indian Patents Act 1970 (as amended in 2005)
5. The Indian Copyright Act 1950 as amended in 2017)
6. Indian Trademarks Act 1999
7. The Indian Industrial Designs Act 2000
8. The Protection of Plant Varieties and Farmers' Right Act 2001
9. Inventing the Future: An Introduction to Patents for small and medium sized enterprises, WIPO publication No 917 www.wipo.int/ebookshop
10. Looking Good: An Introduction to Industrial Designs for Small and Medium sized Enterprises; WIPO publication No.498 www.wipo.int/ebookshop

AI2110 ENVIRONMENTAL SCIENCE

Course Objectives

The objectives of the Environmental Science course are to

- Familiarize the fundamental aspects of environment and the environmental management'
- Provide information of some of the important international conventions which will beuseful during the future endeavours after graduation.
- Make realize the importance of natural resources management for the sustenance of thelife and the society.
- Apprise the impact of pollution getting generated through the anthropogenic activitieson the environment
- Provide the concept of Sustainable Development, energy and environmental management
- Impart knowledge on the new generation waste like e-waste and plastic waste.

Course Outcomes

After completion of the course the students will have

- Knowledge on the fundamental aspects of environment and the environmental management
- The knowledge on the salient features of the important international conventions
- Understanding of the importance of natural resources management for the sustenanceof the life and the society.
- Familiarity on various forms of pollution and its impact on the environment.
- Understand the elements of Sustainable Development, energy and environmental management
- Knowledge on the new generation waste like e-waste and plastic waste.

SYLLABUS

Introduction: Structure and functions of Ecosystems-Ecosystems and its Dynamics-Value of Biodiversity-impact of loss of biodiversity, Conservation of bio-diversity. Environmental indicators - Global environmental issues and their impact on the ecosystems. Salient features of international conventions on Environment: Montreal Protocol, Kyoto protocol, Ramsar Convention on Wetlands, Stockholm Convention on Persistent Organic Pollutants, United Nations Framework Convention on Climate Change (UNFCCC),

Natural Resources Management: Importance of natural resources management-Land as resource, Land degradation, Soil erosion and desertification, Effects of usage of fertilizer, herbicides and pesticide-watershed management.

Forest resources: Use and over-exploitation, Mining and dams – their effects on forest ecosystems and the living beings.

Water resources: Exploitation of surface and groundwater, Floods, droughts, Dams: benefits and costs.

Mineral Resources: Impact of mining on the environment and possible environmental management options in mining and processing of the minerals. Sustainable resource management (land, water, and energy), and resilient design under thechanging environment.

Environmental Pollution: Local and Global Issues. Causes, effects and control measures. Engineering aspects of environmental pollution control systems.

Air pollution: impacts of ambient and indoor air pollution on human health. Water pollution: impacts water pollution on human health and loss of fresh water resources. Soil pollution and its impact on environment. Marine pollution and its impact on blue economy. Noise pollution.

Solid waste management: Important elements in solid waste management- Waste to energy concepts. Air (prevention and control of pollution) Act, Water (prevention and control of pollution) Act and their amendments. Salient features of Environmental protection Act, 1986.

Sustainable Development: Fundamentals of Sustainable Development– Sustainability Strategies and Barriers – Industrialization and sustainable development. Circular economy concepts in waste (solid and fluid) management.

Energy and Environment: Environmental Benefits and challenges, Availability and need of conventional energy resources, major environmental problems related to the conventional energy resources, future possibilities of energy need and availability. Solar Energy: process of photovoltaic energy conversion, solar energy conversion technologies and devices, their principles, working and applications, disposal of solar panel after their usage. Biomass energy:

Concept of biomass energy utilization, types of biomass energy, conversion processes, Wind Energy, energy conversion technologies, their principles, equipment and suitability in context of India.

Management of plastic waste and E-waste: Sources, generation and characteristics of various e- and plastic wastes generated from various industrial and commercial activities; Waste management practices including onsite handling, storage, collection and transfer. E-waste and plastic waste processing alternatives. E-Waste management rules and Plastic waste management rules, 2016 and their subsequent amendments.

Text Books:

1. Bharucha,Erach (2004). Textbook for Environmental Studies for Undergraduate Courses of all Branches of Higher Education, University Grants Commission, New Delhi.
2. Basu, M., Xavier, S. (2016). Fundamentals of Environmental Studies, Cambridge University Press, India
3. Masters, G. M., &Ela, W. P. (1991). Introduction to environmental engineering and science. Englewood Cliffs, NJ: Prentice Hall.
4. Enger, E. and Smith, B., Environmental Science: A Study of Interrelationships, Publisher: McGraw-Hill Higher Education; 12th edition, 2010.

Reference Books:

1. Sharma, P. D., & Sharma, P. D. (2005). Ecology and environment. Rastogi Publications
2. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
3. Clark R.S. (2001). Marine Pollution, Clanderson Press Oxford (TB)
4. Jadhav, H & Bhosale, V.M. (1995). Environmental Protection and Laws. Himalaya Pub. House, Delhi 284 p.
5. MoEF&CC, Govt. of India, CPCB: E-waste management rules, 2016 and its amendments 2018.
6. MoEF&CC, Govt. of India, CPCB: Plastic waste management rules, 2016.

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B. TECH (Computer Science & Engineering with Specialization in Artificial Intelligence and Machine Learning)

(Common with CSE and IT)
For First & Second Years

II Year – II Semester

B. TECH (Computer Science & Engineering with Specialization in Artificial Intelligence and Machine Learning)

(Common with CSE and IT)
For First & Second Years

II Year - II Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
AI2201	ES	Microprocessors	4	0	30	70	100	3
AI2202	PC	Design and Analysis of Algorithms	4	0	30	70	100	3
AI2203	PC	Database Management Systems	4	0	30	70	100	3
AI2204	PC	Formal Languages & Automata Theory	4	0	30	70	100	3
AI2205	HSS	Managerial Economics	4	0	30	70	100	3
AI2206	PC	Algorithms Lab through CPP.	0	3	50	50	100	1.5
AI2207	PC	Database Management Systems Lab	0	3	50	50	100	1.5
AI2208	SC	Web Technologies	1	2	50	50	100	2
AI2209	MC	Professional Ethics& Universal Human Values	0	0	0	100	100	0
AI2210	MC	NCC/NSS	0	2	-	-	-	0
							Total credits	**20**
Internship-I								

AI2201 MICROPROCESSORS

Course Objectives:

- To discuss the architectures of 8085, 8086 microprocessors, their instruction sets and related ALP programs.
- To discuss interfacing semiconductor memories, interfacing peripheral to Intel 8086.
- To study interfacing data converters to 8086 and discuss about micro controller 8051 architecture.

Course Outcomes:

- Understand the basic architectures of 8085 and 8086 microprocessors.
- Ability to write ALP programs using instruction sets.
- Understand the various interfacing concepts and micro controllers.

SYLLABUS

Introduction to Microprocessors and Microcomputers: A Brief Architecture and Programming of 8085Microprocessor.

Architecture: Instruction Set and Programming of 8086Microprocessor

Interfacing Semiconductor Memories and I/O Devices: Semiconductor Memories: Classification Internal Organization& Functional Description, Interfacing SRAMs and EPROMs to8086, Interfacing Characteristics of I/Devices, I/O Device addressing methods, I/O Device Programming Methods.

Interfacing Peripherals to Intel8086 -1: Parallel I/O Interface- 8255, Serial I/O Interface – 8251, Timer Interface -8253/8254

Interfacing Peripheral to Intel 8086 - 2: Keyboard / Display Interface – 8279, Interrupt Controller Interface – 8259

Interfacing Data Converters to 8086: D/A Conversion Methods, A/D Conversion methods, Interfacing DAC, Interfacing ADC.

Introduction to Micro controllers: Intel 8051Architecture and Programming

Text Books:

1. Microprocessor Architecture, Programming, and Applications with the 8085 RameshS.Gaonkar, 4thEdition, PenramInternational,1999
2. The 80x86 Family, Design, Programming and Interfacing, John E.Uffenbeck,3rdEdition,Pearson Education Inc.,2002
3. KennethJ.Ayala, 8051 Microcontroller Architecture, Programming And Applications,2ndEdition, Penram InternationalPublications,1999

Reference Books:

1. BARRYB.BREY, The Intel Microprocessors 8086 / 8088, 80186 / 80188, 80286, 80386 and 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium4, Architecture, Programming and Interfacing, 8th Edition, Pearson Education Inc.,2009
2. Walter A. Tribeland, Avtar Singh, The 8088 and 8086 Microprocessors, Programming, interfacing, Software, Hardware, and Applications, 4thEdition, Pearson Education Inc.,20033. Microprocessors and Interfacing, Programming and Hardware, 2ndEdition, Douglass V. Hall, TMH Edition,1999
3. Sanjay K Bose, Hardware and Software of Personal Computers, New Age International (P)Ltd.,1991 Myke Predko, Programming and Customizing the 8051 Microcontroller, TMH,1999

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AI2202 DESIGN AND ANALYSIS OF ALGORITHMS

Course Objectives:
Upon completion of this course, students will be able to do the following:

- Analyse the asymptotic performance of algorithms.
- Write rigorous correctness proofs for algorithms.
- Demonstrate a familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations

Course Outcomes:
Students who complete the course will have demonstrated the ability to do the following:

- Argue the correctness of algorithms using inductive proofs and invariants.
- Analysis worst-case running times of algorithms using asymptotic analysis.
- Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and conquer algorithms. Derive and solve recurrences describing the performance of divide and-conquer algorithms.
- Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic programming algorithms, and analysis them.
- Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms, and analysis them.

SYLLABUS

Introduction: What is an Algorithm, Algorithm Specification, Pseudocode Conventions Recursive Algorithm, Performance Analysis, Space Complexity, Time Complexity, Amortized Complexity, Amortized Complexity, Asymptotic Notation, Practical Complexities, Performance Measurement.

Divide and Conquer: General Method, Defective Chessboard, Binary Search, Finding the Maximum and Minimum, Merge Sort, Quick Sort, Performance Measurement, Randomized Sorting Algorithms.

The Greedy Method: The General Method, Knapsack Problem, Job Sequencing with Deadlines, Minimum-cost Spanning Trees, Prim's Algorithm, Kruskal's Algorithms, An Optimal Randomized Algorithm, Optimal Merge Patterns, Single Source Shortest Paths.

Dynamic Programming: All - Pairs Shortest Paths, Multistage graphs, optimal binary search tree, String editing, 0/1 Knapsack, Reliability Design.

Backtracking: The General Method, The 8-Queens Problem, Sum of Subsets, Graph Colouring, Hamiltonian Cycles, Knapsack problem

Branch and Bound: Least cost (LC) Search, The 15-Puzzle, Control Abstraction for LC- Search, Bounding, FIFO Branch-and-Bound, LC Branch and Bound, 0/1 Knapsack Problem, LC Branch-and Bound Solution, FIFO Branch-and-Bound Solution, Traveling Salespersonproblem.

Limitations of Algorithm Power: Lower-Bound Arguments, Decision Trees, P, NP and NP – complete problems – Challenges of Numerical Algorithms. Limitations of Algorithms Power: Backtracking – Branch-and Bound– Approximation Algorithms for NP-hard Problems – Algorithms for solving Nonlinear Equations.

Text Books:

1. Fundamentals of computer algorithms E. Horowitz S. Sahni, Sanguthevar Rajasekaran, University Press.
2. Introduction to Algorithms by Thomas H. Corman, Charles E. Leiserson, Ronald R.Rivest & Clifford Stein, Prentice Hall of India, New Delhi, New Delhi.

Reference Books:

1. Data structures and algorithm analysis in C++ / Mark Allen Weiss, Florida International University. — Fourth edition.
2. Introduction to Design & Analysis of Algorithms by Anany Levitin, PearsonEducation, New Delhi, 2003
3. Introduction to Algorithms by Thomas H. Corman, Charles E. Leiserson, Ronald R.Rivest & Clifford Stein, Prentice Hall of India, New Delhi, New Delhi.
4. The Design and Analysis of Computer Algorithms, Alfred V. Aho, John E.Hopcroft, Jeffrey D. Ullman

AI2203 DATABASE MANAGEMENT SYSTEMS

Course Objectives:

- To learn the evolution of DBMS Versus File systems, data models, and layers of abstraction.
- To understand conceptual and physical aspects of database design.
- To learn formal and commercial query language specifications.
- To understand concurrency control, recovery management, and other related issues.

Course Outcomes:

- The student will understand ER-modelling for conceptual database design and relational model.
- The student is introduced to formal and commercial query languages: Relational Algebra, calculus and SQL.
- The student will learn schema refinement and normalization.
- The student understands locking protocols concurrency control, and crash recovery methods.

SYLLABUS

Introduction: File system versus a DBMS, Advantages of a DBMS, Describing and Storing Data in a DBMS, The Relational model, Levels of abstraction, Data Independence, Transaction management, Structure of a DBMS.

Introduction to Database Design and The Relational Model: Database Design and ER Diagrams, Entities, Attributes and Entity Sets, Relationships & Relationship Sets, Additional Features of the ER Model, Conceptual Design with ER Model, Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity Constraints, Querying Relational Data, Logical Database Design: ER to Relational, Introduction to Views,Destroying/ Altering Tables and Views.

Relational Algebra and SQL: Preliminaries, Relational Algebra, The form of a Basic SQL Query, UNION, INTERSECT and EXCEPT, Nested Queries, Aggregate Operators, Null Values, Complex Integrity Constraints in SQL, Triggers and Active Databases, Embedded SQL, Dynamic SQL, JDBC.

Database Design: Schema Refinement and Normal Forms, Introduction to Schema Refinement, Functional Dependencies, Reasoning about FD's, Normal Forms, Properties of Decomposition, Normalization, Other kinds of Dependencies.

Transaction Management: The ACID Properties, Transactions & Schedules, Concurrent Execution of Transactions, Lock-Based Concurrency Control.

Concurrency Control: 2PL, Serializability and Recoverability, Introduction to Lock Management, Lock Conversions, Dealing with Deadlocks, Specialized Locking Techniques, Concurrency Control without Locking.

Crash Recovery: Introduction to ARIES, The Log, Other Recovery-Related Structures, The Write-Ahead Log Protocol, Check pointing, Recovering from a System Crash, Media Recovery.

Text Books:

1. Database Management Systems; Raghu Ramakrishnan, Johannes Gehrke 4th Edition, McGraw-Hill.

Reference:

1. Database System Concepts; A. Silberschatz, H. Korth 5th Edition, McGraw-Hill

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AI2204 FORMAL LANGUAGES AND AUTOMATA THEORY

Course objectives:

- To introduce the concepts in automata theory and theory of computation to design grammars and recognizers for different formal languages.
- To employ finite state machines to solve problems in computing.
- To introduce finite state machines, context free grammars and Turing Machines and their properties as the basis for the formal expressivity of computer languages for solving linguistic decision problems.
- To understand the concepts of tractability and decidability, the concepts of NP-completeness and NP-hard problem and also the challenges for Theoretical Computer Science and its contribution to other sciences.

Course outcomes:

- Ability to think analytically and intuitively for problem-solving situations in related areas of theory in computer science
- Ability to describe the language accepted by an automata or generated by a regular expression or a context-free grammar;
- Ability to Understand the functioning of Finite-State Machines, Deterministic Finite-State Automata, Nondeterministic Finite-State Automata and Pushdown Automata and Turing Machines.

SYLLABUS

Introduction to Grammars and Languages: Definitions of alphabet, strings, language, grammar, types of grammar, types of machines, generation of languages from grammar, construction of grammar from the given description of languages, Chomsky Hierarchy oflanguages.

Finite State Machine (FSM): Definition of finite state machine, Representation of FSMs. Classification of FSM's and their construction, Conversion from NFA to DFA, Elimination of ε – transitions from NFA, Equivalence of two FSM's, optimization of finite state machine (Equivalence theorem method and Table filling method), Finite state machine with output: Moore and Mealy machines. Applications of FSM.

Regular Expression and Languages: Regular Expression, Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Properties of Regular Languages: Pumping Lemma for regular Languages, Application ofPumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, Equivalence and Minimization of Automata.

Context Free Grammars and Languages: Context Free Grammars, Parse Trees, Applications of Context-Free Grammars, Ambiguity in Grammars and Languages, Normal Forms, Pumping Lemma for CFL, Closure properties of CFL, Decision properties for CFL.

Push down Automata: Definition of push down automata, The Languages of a PDA, push down automata, Equivalence of PDA's and CFG's, push down automata to context free grammar, context free grammar to push down automata, Deterministic Pushdown Automata.

Turing Machines: The Definition of Turing Machine, Turing Machine Model, Representation of Turing Machines, Language Acceptability by Turing Machines, Design of Turing Machines, Description of Turing Machines, Techniques for TM Construction, Variants of Turing Machines, Turing Machines and Type 0 Grammars.

Undecidability: A Language That Is Not Recursively Enumerable, An Undecidable Problem That Is RE, Undecidable Problems About Turing Machines, Decidable & Undecidable Problems, Post Correspondence Problem.

Text books:

1. Introduction to automata theory, languages and computation, John.E.H.P croft/ Rajeev Motwani & JD Ullman—pearson education- III edition
2. Theory of computation, K.L.P.Mishra and N.Chandrasekhar, PHI

Reference Books:

1. Theory of computation, formal languages and automata theory, G P Saradhi Varma,B.Thirupathi Rao –Sci Tech publications.

AI2205 MANAGERIAL ECONOMICS

Course Objectives:

- To bring about an awareness about the nature of Managerial Economics and its linkageswith other disciplines.
- To understand the Micro and Macro Environment of Business.
- To familiarize the prospective engineers with the concepts and tools of Managerial Economics with an objective to understand the real world of business.

Course Outcomes:

After completion of the course, student will be able to:

- Understand the various economic activities in business and industry.
- Analyse the real-world business problems.
- Make optimal business decisions for the effective and efficient management ofOrganisations.

SYLLABUS

Significance of Economics and Managerial Economics:

Economics: Definitions of Economics- Wealth, Welfare and Scarcity definitions Classification of Economics- Micro and Micro Economics.

Managerial Economics: Definition, Nature and Scope of Managerial Economics, Differences between Economics and Managerial Economics, Main areas of Managerial Economics, Managerial Economics with other disciplines.

Demand and Utility Analysis:

Demand - Definition, Meaning, Nature and types of demand, Demand function, Law of demand - Assumptions and limitations. Exceptional demand curve.

Elasticity of demand - Definition, Measurement of elasticity, Types of Elasticity (Price, Income, Cross and Advertisement), Practical importance of Price elasticity of demand, Role of income elasticity in business decisions, Factors governing Price Elasticity of demand.

Utility Analysis: Utility- Meaning, Types of Economic Utilities, Cardinal and Ordinal Utility, Total Utility, Marginal Utility, The law of Diminishing Marginal Utility and its Limitations.

Theory of Production and Cost analysis:

Production - Meaning, Production function and its assumptions, use of production function in decision making; **Cost analysis** - Nature of cost, Classification of costs - Fixed vs. Variable costs, Marginal cost, Controllable vs. Non - Controllable costs, Opportunity cost, Incremental vs. Sunk costs, Explicit vs. Implicit costs, Replacement costs, Historical costs, Urgent vs. Postponable costs, Escapable vs. Unavoidable costs, Economies and Diseconomies of scale.

Market Structures: Definition of Market, Classification of markets; Salient features or conditions of different markets - Perfect Competition, Monopoly, Duopoly , Oligopoly, Importance of kinked demand curve ;Monopolistic Competition.

Pricing and Business Cycles:

Pricing Analysis: Pricing – Significance; Different Pricing methods- Cost plus pricing, Target pricing, Marginal cost pricing, Going -rate pricing, Average cost pricing, Peak load pricing , Pricing of joint Products, Pricing over the life cycle of a Product, Skimming pricing Penetration pricing, Mark- up and Mark- down pricing of retailers.

Business cycles - Definition, Characteristics, Phases, Causes and Consequences; Measures to solve problems arising from Business cycles.

Text Books:

1. Sankaran,S., Managerial Economics, Marghan Publications, 2015, Chennai.
2. Aryasri, A.R., Managerial Economics and Financial Analysis, MC Graw HillEducation, New Delhi,2015.

Reference Books:

1. Dwivedi, D.N., Managerial Economics, Vikhas Publishing House Pvt. Ltd. 6thEdition, New Delhi,2004.
2. Dewett, K.K., Modern Economic Theory, S.Chand & Company Ltd., New Delhi,2005.

AI2206 ALGORITHMS LAB Through C++

Course objectives:

- The laboratory component will emphasize two areas:
- Implementation of algorithms covered in class: This will involve running the algorithms under varying input sets and measuring running times, use of different data structures for the same algorithm (wherever applicable) to see its effect on time and space, comparison of different algorithms for the same problem etc.
- Design of Algorithms: This will involve design and implementation of algorithms for problems not covered in class but related to topics covered in class.
- The exact set of algorithms to design and implement is to be decided by the instructor. In addition, there will be at least one significantly large design project involving some real world application. An efficient design of the project should require the use of multiple data structures and a combination of different algorithms/techniques.

Course Outcomes:

The student should be able to:

- Design algorithms using appropriate design techniques (brute-force, greedy, dynamicprogramming, etc.)
- Implement a variety of algorithms such assorting, graph related, combinatorial, etc., in ahigh level language.
- Analyze and compare the performance of algorithms using language features.
- Apply and implement learned algorithm design techniques and data structures to solvereal-world problems.

Programs List:

1. a) Create a CPP class called Student with the following details as variables within it.
   (i) Register_number
   (ii) Student_name
   (iii) Programme_name
   (iv) Phone _number
   Write a program to create nStudent objects and print the Register_number, Student_name, Programme_name, and Phone_number of these objects with suitable headings.
   b). Write a program to implement the Stack using arrays. Write Push (), Pop(), and Display() methods to demonstrate its working.

2. a). Design a superclass called Staff with details as StaffId, Name, Phone, Salary. Extend this class by writing three subclasses namely Teaching (domain, publications), Technical (skills), and Contract (period). Write a CPP program to read and display at least 3 staff objects of all three categories.
   b). Write a class called Customer to store their name and date_of_birth. The date_of_birth format should be dd/mm/yyyy. Write methods to read customer data as and display as using StringTokenizer class considering the delimiter character as "/".

3. a). Write a program to read two integers a andb. Compute a/b and print, when b is not zero. Raise an exception when b is equal to zero.
   b). Write a program that implements a multi-thread application that has three threads. First thread generates a random integer for every 1 second; second thread computes the square of the number and prints; third thread will print the value of cube of the number.

4. Sort a given set of n integer elements using Quick Sort method and compute its time complexity. Run the program for varied values of n> 5000 and record the time taken to sort. Plot a graph of the time taken versus non graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using CPP how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.
5. Sort a given set of n integer elements using Merge Sort method and compute its time complexity. Run the program for varied values of n> 5000, and record the time takento sort. Plot a graph of the time taken versus non graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using CPP how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.
6. Implement the Knapsack problem using (a) Dynamic Programming method (b) Greedy method.
7. Write a program-from a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm..
8. Find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal's algorithm. Use Union-Find algorithms in your program.
9. Find Minimum Cost Spanning Tree of a given connected undirected graph using Prim's algorithm.
10. Write programs to
    (a) Implement All-Pairs Shortest Paths problem using Floyd's algorithm.
    (b) Implement Travelling Sales Person problem using Dynamic programming.
11. Design and implement in CPP, to find a subset of a given set S = {Sl, S2,.... ,Sn} of n positive integers whose SUM is equal to a given positive integer d. For example, if S ={1, 2, 5, 6, 8} and d= 9, there are two solutions {1,2,6}and {1,8}. Display a suitablemessage, if the given problem instance doesn't have a solution.
12. Design and implement in CPP to find all Hamiltonian Cycles in a connected undirectedGraph G of n vertices using backtracking principle.

REFERENCES:

1. T. H. Cormen, C. L. Leiserson, R. L. Rivest, and C. Stein, Introduction to Algorithms,MIT Press.
2. J. Kleinberg and E. Tardos, Algorithm Design, Addison-Wesley.
3. Harry R. Lewis and Larry Denenberg, Data Structures and Their Algorithms, HarperCollins.
4. A. Gibbons, Algorithmic Graph Theory, Cambridge University Press.
5. Michael T. Goodrich and Roberto Tamassia, Algorithm Design: Foundations, Analysis,and Internet Examples, John Wiley.
6. R. Sedgewick, Algorithms in C (Parts 1-5), Addison Wesley.
7. M. H. Alsuwaiyel, Algorithm Design Techniques and Analysis, World Scientific.
8. Gilles Brassard and Paul Bratley, Algorithmics: theory and practice, Prentice-Hall.
9. Udi Manber, Introduction to Algorithms: A Creative Approach, Addison-Wesley.
10. Sara Baase and Allen Van Gelder, Computer Algorithms: Introduction to Design andAnalysis, Addison-Wesley.

AI2207 DATABASE MANAGEMENT SYSTEMS LAB

Course Objectives

- To introduce to a commercial DBMS such as ORACLE.
- To learn and practice SQL commands for schema creation, data manipulation.
- To learn conceptual and physical database design based on a case study.
- To apply database design stages by studying a case study.

Course Outcomes

By the end of the course, the student should be able to:

- The student is exposed to a commercial RDBMS environment such as ORACLE.
- The student will learn SQL commands for data definition and manipulation.
- The student understands conceptual through physical data base design.
- The student takes up a case study and applies the design steps.

SYLLABUS

Features of a commercial RDBMS package such as ORACLE/DB2, MS Access, MYSQL &Structured Query Language (SQL) used with the RDBMS.

I. Laboratory Exercises Should Include:

a. Defining Schemas for Applications,
b. Creation of Database,
c. Writing SQL Queries,
d. Retrieve Information from Database,
e. Creating Views
f. Creating Triggers
g. Normalization up to Third Normal Form
h. Use of Host Languages,
i. Interface with Embedded SQL,
j. Use of Forms
k. Report Writing

II. Some sample applications are given below:

1. Accounting Package for Shops
2. Database Manager for Magazine Agency or Newspaper Agency,
3. Ticket Booking for Performances,
4. Preparing Greeting Cards & Birthday Cards
5. Personal Accounts - Insurance, Loans, Mortgage Payments, Etc.,
6. Doctor's Diary & Billing System
7. Personal Bank Account
8. Class Marks Management
9. Hostel Accounting
10. Video Tape Library,
11. History of Cricket Scores,
12. Cable TV Transmission Program Manager,
13. Personal Library.
14. Sailors Database
15. Suppliers and Parts Database

Reference Books

1. Database Management Systems; Raghu Ramakrishnan, Johannes Gehrke 4th Edition,McGraw Hill
2. Database System Concepts; A. Silberschatz, H. Korth 5th Edition, McGraw-Hill

AI2208 ` WEB TECHONOLOGIES

Course objectives

- To facilitate the graduates with the ability to visualize, gather information, articulate, analyze, solve complex problems, and make decisions. These are essential to address the challenges of complex and computation intensive problems increasing their productivity.
- To facilitate the graduates with the technical skills that prepare them for immediate employment and pursue certification providing a deeper understanding of thetechnology in advanced areas of computer science and related fields, thus encouraging to pursue higher education and research based on their interest.
- To facilitate the graduates with the soft skills that include fulfilling the mission, setting goals, showing self-confidence by communicating effectively, having a positive attitude, get involved in team-work, being a leader, managing their career and their life.

Course outcomes

- Able to understand the working principles of the computer system and its components, apply the knowledge to build, asses, and analyze the software and hardware aspects of it.
- Develops comprehensive skills of Programming Languages, Software process models, methodologies, and able to plan, develop, test, analyze, and manage the software and hardware intensive systems in heterogeneous platforms individually or working in teams.
- Able to use the professional, managerial, interdisciplinary skill set, and domain specific tools in development processes, identify the research gaps, and provide innovative solutions to them.

Syllabus

1. Design the following static web pages required for an online book store web site.
   a) HOME PAGE: The static home page must contain three frames.
   b) LOGIN PAGE
   c) CATOLOGUE PAGE: The catalogue page should contain the details of all thebooks available in the web site in a table.
   d) REGISTRATION PAGE
2. Write JavaScript to validate the following fields of the Registration page.
   a) First Name (Name should contains alphabets and the length should not be less than6 characters).
   b) Password (Password should not be less than 6 characters length).
   c) E-mail id (should not contain any invalid and must follow the standard patternname@domain.com)
   d) Mobile Number (Phone number should contain 10 digits only).
   e) Last Name and Address (should not be Empty).
3. Develop and demonstrate the usage of inline, internal and external style sheet usingCSS
4. Develop and demonstrate JavaScript with POP-UP boxes and functions for the following problems:
   a) Input: Click on Display Date button using onclick( ) functionOutput: Display date in the textbox
   b) Input: A number n obtained using promptOutput: Factorial of n number using alert
   c) Input: A number n obtained using prompt
   Output: A multiplication table of numbers from 1 to 10 of n using alert
   d) Input: A number n obtained using prompt and add another number using confirm Output: Sum of the entire n numbers using alert

5. Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next in the list. Add CSS to customize the properties of the font of the capital (colour, bold and font size).
6. Write an HTML page including any required JavaScript that takes a number from text field in the range of 0 to 999 and shows it in words. It should not accept four and above digits, alphabets and special characters.
7. Develop and demonstrate PHP Script for the following problems:
   a) Write a PHP Script to find out the Sum of the Individual Digits.
   b) Write a PHP Script to check whether the given number is Palindrome or not
8. Create an XML document that contains 10 users information. Write a Java Program, which takes User Id as input and returns the user details by taking the user information from XML document using DOM parser or SAX parser.
9. Implement the following web applications using (a) PHP (b) Servlets (c) JSP
   a) A web application that takes a name as input and on submit it shows a hello page where name is taken from the request. It shows the start time at the right top corner of the page and provides a logout button. On clicking this button, it should show a logout page with Thank You message with the duration of usage (hint: Use session to store name and time).
   b) Write a PHP Program to display current Date, Time and Day.
   c) A web application that takes name and age from an HTML page. If the age is less than 18, it should send a page with "Hello, you are not authorized to visit the site" message, where should be replaced with the entered name. Otherwise, it should send "Welcome to this site" message.
   d) A web application that lists all cookies stored in the browser on clicking "List Cookies" button. Add cookies if necessary.
10. Implement the web applications with Database using (a) PHP, (b) Servlets and (c) JSP.
11. Modify the above PHP program to use an xml instead of database
12. Write a program to design a simple calculator using
    (a) JavaScript
    (b) PHP
    (c) Servlet and
    (d) JSP.

References:

1. Internet and Web Technologies by Raj Kamal, Tata McGraw-Hill.
2. Programming the World Wide Web by Robert W. Sebesta, Pearson Education.

AI2209 PROFESSIONAL ETHICS AND UNIVERSAL HUMAN VALUES

Course Objectives:

- To recognize the moral values that should guide the Engineering profession.
- To resolve moral issues concerning one's profession.
- To develop and exhibit a set of moral beliefs and attitudes that engineers should inculcate.
- To inculcate social values and morality in one's life.
- To develop awareness about Professional/Engineering Ethics and Human Values.

Learning Outcomes:

Students will be able to:

- Apply the conceptual understanding of ethics and values into everyday practice.
- Understand the importance of moral awareness and reasoning in life.
- Acquire professional and moral etiquette that an engineer requires.
- Develop the acumen for self-awareness and self-development.
- Develop cultural tolerance and integrity.
- Tackle real-life challenges with empathy.

SYLLABUS

HUMAN VALUES
Values - Respect - Caring - Sharing - Honesty- Courage - Self confidence - Communal Harmony
Morals - Virtues

PROFESSIONAL VALUES
Integrity - Discipline - Valuing time - Cooperation - Commitment - Code of conduct - Challenges in the workplace

PROFESSIONAL ETHICS
Overview - Engineering ethics - Moral issues - Profession - Models of professional roles - Responsibility

RESPONSIBILITIES AND RIGHTS
Safety and risk - Collegiality and loyalty - Confidentiality - Occupational crime - Humanrights - Employee rights - Intellectual property rights

GLOBAL ISSUES
Globalization - Environmental ethics - Computer ethics - Code of ethics - Multinational corporations - Engineers as advisors in Planning and Policy making

Textbook:

1. R.S. Nagarazan. *A Textbook on Professional Ethics and Human Values.* New Age International Publishers. 2006.

2. Reference Books:

1. Premvir Kapoor. *Professional Ethics and Human Values.* Khanna Publishing House. 2019.
2. B.S. Raghavan. *Human Values and Professional Ethics.* S.Chand Publications. 2012.
3. R.R. Gaur & Others. *A Foundation Course in Human Values and Proff. Ethics*. Excel Books. 2009.
4. A. N. Tripathi. *Human Values*. New Age International (P) Limited. 2009
5. R. Subramanian. *Professional Ethics*. OUP India. 2013.

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
A U COLLEGE OF ENGINEERING
ANDHRA UNIVERSITY
SCHEME AND SYLLABI
(with effect from 2022-23 admitted Batch)

B.Tech & B.Tech+M.Tech
I Year - I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
EC1101	BS	Mathematics – I	4	0	30	70	100	3
EC1102	BS	Physics	4	0	30	70	100	3
EC1103	ES	Digital Logic Design	4	0	30	70	100	3
EC1104	ES	Electronic Devices and Circuits	4	0	30	70	100	3
EC1105	ES	Network Theory and Machines	4	0	30	70	100	3
EC1106	ES	Digital Logic Design Lab	0	3	50	50	100	1.5
EC1107	BS	Physics Lab	0	3	50	50	100	1.5
EC1108	ES	Electronic Devices and Circuits Lab	0	3	50	50	100	1.5
							Total Credits	**19.5**

B.Tech & B.Tech+M.Tech
I Year - II Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
EC1201	BS	Mathematics – II	4	0	30	70	100	3
EC1202	BS	Green Chemistry	4	0	30	70	100	3
EC1203	HSS	English	4	0	30	70	100	3
EC1204	ES	Computer Programming and Numerical Methods	4	0	30	70	100	3
EC1205	ES	Electronic Circuit Analysis	4	0	30	70	100	3
EC1206	HSS	English Language Lab	0	3	50	50	100	1.5
EC1207	BS/ES	Electronic Circuit Analysis Lab	0	3	50	50	100	1.5
EC1208	ES	Computer Programming and Numerical Methods Lab	0	3	50	50	100	1.5
							Total Credits	**19.5**

B.Tech & B.Tech+M.Tech
II Year - I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
EC2101	BS	Mathematics -III	4	0	30	70	100	3
EC2102	PC	Python Programming	4	0	30	70	100	3
EC2103	PC	Analog Communications	4	0	30	70	100	3
EC2104	PC	Signals & Systems	4	0	30	70	100	3
EC2105	HSS	Managerial Economics	4	0	30	70	100	3
EC2106	PC	Python Programming Lab	0	3	50	50	100	1.5
EC2107	PC	Analog Communications Lab	0	3	50	50	100	1.5
EC2108	PC	Signals & Systems Simulation Lab	0	3	50	50	100	1.5
EC2109	SC	Digital Circuits Simulation	1	2	50	50	100	2
EC2110	MC	Professional Ethics and Universal Human Values	0	0	00	100	100	0
EC2111	MC	NCC/NSS	0	2	-	-	-	0
							Total Credits	**21.5**

B.Tech & B.Tech+M.Tech
II Year - II Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
EC2201	ES	Probability theory and Random Process	4	0	30	70	100	3
EC2202	PC	Electromagnetic Field Theory and Transmission Lines	4	0	30	70	100	3
EC2203	PC	Microprocessors and Microcontrollers	4	0	30	70	100	3
EC2204	PC	Linear ICs & Applications	4	0	30	70	100	3
EC2205	PC	Pulse and Digital Circuits	4	0	30	70	100	3
EC2206	PC	Microprocessors & Microcontrollers Lab	0	3	50	50	100	1.5
EC2207	PC	Linear ICs & Pulse Circuits Lab	0	3	50	50	100	1.5
EC2208	SC	Electronic Circuits Simulation	1	2	50	50	100	2
EC2209	MC	Environmental Science	0	0	00	100	100	0
							Total Credits	**20**
Internship-I								

EC1101 MATHEMATICS-I

Course Objectives: The objectives of this course are

- To transmit the knowledge of Partial differentiation.
- To know of getting maxima and minima of function of two variables and finding errors and approximations.
- To evaluate double and triple integrals, volumes of solids and area of curved surfaces.
- To expand a periodical function as Fourier series and half-range Fourier series.

Course Outcomes: At the completion of the course the student will be able to

- Find the partial derivatives of functions of two or more variables.
- Evaluate maxima and minima, errors and approximations.
- Evaluate double and triple integrals, volumes of solids and area of curved surfaces.
- To expand a periodical function as Fourier series and half-range Fourier series.
- Have a fundamental understanding of Fourier series and be able to give Fourier expansions of a given function.

SYLLABUS

Partial Differentiation: Introduction - Functions of two or more variables - Partial derivatives - Homogeneous functions – Euler's theorem - Total derivative - Change of variables – Jacobins. Mean value Theorems (without proofs)

Applications of Partial Differentiation: Geometrical interpretation -Tangent plane and Normal to a surface -Taylor's theorem for functions of two variables - Errors and approximations -Total differential. Maxima and Minima of functions of two variables - Lagrange's method of undetermined multipliers - Differentiation under the integral Sign - Leibnitz's rule.

Multiple Integrals: Introduction - Double Integrals - Change of Order of Integration - Double Integrals in Polar Coordinates - Triple Integrals - Change of Variables.

Multiple Integrals-Applications: Area enclosed by plane curves - Volumes of solids - Area of a curved surface - Calculation of Mass - Center of gravity - Moment of inertia - product of inertia – principal axes- Beta Function - Gamma Function - Relation between Beta and Gamma Functions. Error Function or Probability Integral.

Fourier series: Introduction - Euler's Formulae - Conditions for a Fourier Expansion - Functions having points of discontinuity - Change of Interval - Odd and Even Functions - Expansions of Odd or Even Periodic Functions, Half-Range Series - Parseval's Formula. Practical Harmonic analysis.

Text Books:

1. Scope and Treatment as in "Higher Engineering Mathematics", by Dr. B.S. Grewal, 43rd Edition, Khanna publishers.

Reference Books:

1. Graduate Engineering Mathematics by V B Kumar Vatti., I.K.International publishing house Pvt. Ltd.
2. Advanced Engineering Mathematics by Erwin Kreyszig.
3. A text book of Engineering Mathematics, by N.P. Bali and Dr. Manish Goyal, Lakshmi Publications.
4. Advanced Engineering Mathematics by H.K. Dass. S. Chand Company.
5. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Graw Hill Company.
6. Higher Engineering Mathematics by Dr. M.K.Venkataraman.

EC1102 PHYSICS

Course Objectives: The objectives of this course are

- To impart knowledge in basic concept of physics of Thermodynamics relevant to engineering applications.
- To grasp the concepts of physics for electromagnetism and its application to engineering. Learn production of Ultrasonic's and their applications in engineering.
- To Develop understanding of interference, diffraction and polarization: connect it to a few engineering applications.
- To learn basics of lasers and optical fibers and their use in some applications.
- To understand concepts and principles in quantum mechanics and Nanopahse Materials. Relate them to some applications.

Course Outcomes: At the completion of the course the student will be able to

- Understand the fundamentals of Thermodynamics and Laws of thermodynamics. Understand the working of Carnot cycle and concept of entropy.
- Gain Knowledge on the basic concepts of electric and magnetic fields. Understand the concept of the nature of magnetic materials. Gain knowledge on electromagnetic induction and its applications.
- Understand the Theory of Superposition of waves. Understand the formation of Newton's rings and the working of Michelson's interferometer. Remember the basics of diffraction, Evaluate the path difference. Analysis of Fraunhofer Diffraction due to a single slit.
- Understand the interaction of matter with radiation, Characteristics of Lasers, Principle, working schemes of Laser and Principle of Optical Fiber. Realize their role in optical fiber communication.
- Understand the intuitive ideas of the Quantum physics and understand dual nature of matter. Compute Eigen values, Eigen functions, momentum of Atomic and subatomic particles using Time independent one-Dimensional Schrodinger's wave equation. Understand the fundamentals and synthesis processes of Nanophase materials.

SYLLABUS

Thermodynamics: Introduction, Heat and Work, First law of thermodynamics and applications, Reversible and Irreversible process, Carnot cycle and Efficiency, Second law of thermodynamics, Carnot's Theorem, Entropy, Second law in terms of entropy, Entropy and disorder, Third law of thermodynamics (statement only).

Electromagnetism: Concept of electric flux, Gauss's law - some applications, Magnetic field - Magnetic force on current, torque on current loop, The Biot-Savart's Law, B near a long wire, B

for a circular Current loop, Ampere's law, B for a solenoid, Hall effect, Faraday's law of induction, Lenz's law, Induced magnetic fields, Displacement current, Maxwell's equations (no derivation), Magnetic materials: Classification of magnetic materials and properties.

Ultrasonic's: Introduction, Production of Ultrasonic's – Piezoelectric and Magnetostriction methods, acoustic grating, applications of ultrasonic.
Optics: Interference: Principles of superposition – Young's Experiment – Coherence - Interference in thin films (reflected light), Newton's Rings, Michelson Interferometer and its applications. **Diffraction**: Introduction, Differences between interference and diffraction, Fresnel and Fraunhofer diffraction, Fraunhofer diffraction at a single slit (Qualitative and quantitative treatment). **Polarization:** Polarization by reflection, refraction and double refraction in uniaxial crystals, Nicol prism, Quarter and Half wave plate, circular and elliptical polarization.

LASERS and FIBER OPTICS: Introduction, characteristics of a laser beam, spontaneous and stimulated emission of radiation, population inversion, Ruby laser, He-Ne laser, Semiconductor laser, applications of lasers. Introduction to optical fibers, principle of propagation of light in optical fibers, Acceptance Angle and cone of a fiber, Numerical aperture, Modes of propagations, classification of fibers, Fiber optics in communications, Application of optical fibers.

Modern Physics: Introduction, De Broglie concept of matter waves, Heisenberg uncertainty principle, Schrodinger time independent wave equation, application to a particle in a box. Free electron theory of metals, Kronig - Penney model (qualitative treatment), Origin of energy band formation in solids, Classification of materials into conductors, semiconductors and insulators.

Nanophase Materials
Introduction, properties, Top-down and bottom-up approaches, Synthesis - Ball milling, Chemical vapor deposition method, sol-gel methods, Applications of Nano materials.

Text Books:
1. Physics by David Halliday and Robert Resnick – Part I and Part II - Wiley.
2. A textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar - S. Chand
3. Engineering Physics by R.K. Gaur and S.L. Gupta –Dhanpat Rai

Reference Books:
1. Modern Engineering Physics by A.S. Vadudeva
2. University Physics by Young and Freedman

EC1103 DIGITAL LOGIC DESIGN

Course Objectives: The objectives of this course are

- To understand Different number systems, digital logic, simplification and minimization of Boolean functions.
- To analyze logic processes and implement logical operations using combinational logic circuits.
- To analyze the characteristics of memory and their classification.
- To design combinational & sequential digital circuits and state machines.
- To understand about programmable logic devices.

Course Outcomes: At the completion of the course the student will be able to

- Discuss the significance of number systems, conversions, binary codes.
- Apply different simplification methods for minimizing Boolean functions.
- Analyze the design concepts of various combinational circuits.
- Analyze the concepts of sequential logic design.
- Categorize Mealy & Moore models and Design Synchronous Sequential machines.

SYLLABUS

Number systems and codes: Number systems, Base conversion methods, Complement of numbers, Codes: Binary, Non binary, Decimal, Alphanumeric, Gray, and Error detecting and error correcting codes. Logic Gates: AND, OR, NOT, NAND, NOR, XOR, EX-NOR and Universal Gates

Minimization of Boolean Functions: Fundamental postulates of Boolean algebra, Basic theorems, Simplification of Boolean equations, Min terms, Max terms, Standard form of Boolean functions. Simplification of functions: Karnaugh map method and Quine-McClusky methods (up to six variables), Multiple Output functions, and incomplete specified functions.

Combinational Logic-Circuit Design-1: Logic design of combinational circuits: Adders and Subtractions: Binary, BCD, Excess -3 and Look –ahead-carry adder, Code converters, Multiplexers, De multiplexers, Encoders, Decoders and priority encoders, Realization of Boolean functions using multiplexers, De multiplexers and Decoders.

Combinational Logic-Circuit Design-I1: Design of 4-bit comparator, Parity checker/Generator, Seven segment decoders, Hazards in combinational circuits, Hazard free realizations. Basics of PLDs: Basic structure of PROM, PAL, PLA, CPLD, FPGAs, Realization of Boolean functions with PLDs and their merits and demerits.

Sequential circuits: Classification of sequential circuits, SR-latch, Gated latches, Flip flops: RS, JK, D, T and Master slave flip flops, Excitation tables, flip flop conversion from one type to

another. Design of counters: Ripple counters, Synchronous counters, asynchronous counters, up-down counters, Johnson counter, ring counter. Design of registers: Buffer registers, Shift registers, Bi directional shift registers, Universal shift register.

Analysis and design of finite state machines: State assignment, State tables, Equivalent states, Elimination of Redundant states, Determination of state equivalence, Reduction using implication table, and reducing incompletely specified state tables.

Text Books:

1. Switching and finite Automatic theory, ZuiKohari, TMH
2. Switching theory and logic design by Frederick.J.Hill and Gerald.R.Peterson
3. Switching theory and logic design, Ananda kumar, PHI.

Reference Books:

1. Fundamentals of Logic Design, Charles.R.Roth, Thomson Publications.

2. Digital Design by Morries Mono, PHI.

EC1104 ELECTRONIC DEVICES AND CIRCUITS

Course Objectives: The objectives of this course are

- To understand the operation of semiconductor devices.
- To understand DC analysis and AC models of semiconductor devices.
- To apply concepts for the design of Filters, Regulators, Oscillators and Amplifiers for different applications.
- To Analyze the theoretical concepts through laboratory and simulation experiments.
- To apply how to implement mini projects using electronic circuit concepts.

Course Outcomes: At the completion of the course the student will be able to

- Illustrate fundamentals of semiconductor physics for active devices.
- Demonstrate the characteristics of PN Junction diodes and Zener Diode.
- Illustrate the functional behavior of rectifiers and filters.
- Examine the V-I characteristics in different types of transistors.
- Analyze the V-I Characteristics and applications of Special Devices.
- Analyze the frequency response of the BJT amplifiers

SYLLABUS

Energy band theory of solids and transport phenomenon in semiconductors: Energy Band Theory of Solids Intrinsic and Extrinsic Semiconductors Doping, Doping Materials, Carrier Mobility, Conductivity, Diffusion and continuity equation, Hall – Effect. Semiconductor Diodes Band structure of PN Junction, Quantitative Theory of PN Diode, and Volt – Amp. Characteristics, Temperature Dependence, Transition and Diffusion Capacitance of PN Junction.

Rectifiers and special diodes: Diode Rectifiers: Half-wave, Full-wave and Bridge Rectifiers with and without Filters, Ripple Factor and Regulation Characteristics. Zener and Avalanche Breakdowns, Tunnel Diode, LED, Schottky Barrier Diode, Varactor Diode, Photo Diode, PIN Diode.

Transistor Characteristics and Transistor Biasing: Bipolar Junction Transistor NPN and PNP junction Transistor, Characteristics of Current Flow across the Base Regions, Minority and Majority Carrier Profiles, CB, CE and CC Configurations and their Input and Output Characteristics. Comparison of CE, CB, and CC Configurations. Junction Biasing for Saturation, Cutoff and Active Region, α and β Parameters and the relation between them, Biasing circuits, thermal runaway, thermal stability, stabilizations circuits.

Transistor at Low Frequencies: Small Signal: Low Frequency Transistor Amplifier Circuits Transistor as an Amplifier, h – parameter model, Analysis of Transistor Amplifier Circuits using h –parameters. CB, CE and CC Amplifier configurations and performance factors. Analysis of Single Stage Amplifier, RC Coupled Amplifiers. Effects of Bypass and Coupling Capacitors. Frequency Response of CE Amplifier, Emitter – Follower, Cascaded Amplifier.

Field Effect Transistors: JFET and its characteristics, Pinch off Voltage, Drain Saturation Current, , MOSFET –Enhancement and Depletion Modes, JFET Configurations, JFET biasing, Small signal models of FET, JFET Common Source amplifier.

Text Books:

1. Integrated Electronics, Analog Digital Circuits and systems, Jacob Millman and D. Halkias, McGraw Hill.
2. Electronic Devices and Circuits, G.S.N. Raju, I.K. International Publications, New Delhi, 2006.

Reference Books:

1. Adel S. Sedra, Kenneth C. Smith, Arun N. Chandorkar, Microelectronic Circuits, 6/e, Oxford University Press, 2013.

2. Electronic Devices and Circuits 2nd Edition, B. V. Rao and K. Raja Rajeswari, Pearson Education.

3. Electronic Devices and Circuits, K. Venkat Rao, K. Rama Sudha, McGraw Hill education, Edition-2015.

4. Electronic Devices and Circuits Theory, Boylsted and Nashelsky, Prentice Hall Publications.

EC1105 NETWORK THEORY AND MACHINES

Course objectives: The objectives of this course are

- will be able to articulate in working of various components of a circuit.
- will be familiar with application of theorems to ac and dc circuits
- ability to Express given Electrical Circuit parameter and Solve the circuits.
- understand the operating principle of DC motor and DC generator
- will know about construction features of dc and ac machines
- able to find the performance of a dc and ac machines for a given specifications

Course Outcome:

Upon completion of the course the student should have the ability to

- analyze the Fundamentals of D.C circuits.
- apply the concept of Node and Mesh analysis.
- analyze the Network theorems.
- analyze and determine Fundamentals of A.C circuits.
- apply and analyze the working of DC machines.
- apply and analyze the working of AC machines.

Analysis of DC Circuits

Active elements, Passive elements, Reference directions for current and voltage, Kirchoffs Laws, Voltage and Current Division, Nodal Analysis, Mesh analysis, Linearity and superposition, Thevinin's theorem and Norton's theorem, star-delta transformations, Source Transformation, Maximum power transfer theorem, Reciprocity theorem, Z,Y,H,S parameters.

DC transients

Inductor, Capacitor, source free RL, RC and RLC response, Evaluation of Initial conditions, Application of unit-step function to RL, RC and RLC circuits, concepts of Natural, Forced and Complete response.

Introduction to AC circuits

The sinusoidal forcing function instantaneous, Phasor concept, Average and Effective value of Voltage and Current, instantaneous and Average Power, Complex Power steady state analysis using mesh and node analysis, application of network theorems to AC circuits, resonance, Concept of Duality.

DC Machines

Principle of operation of DC machines, Constructional Details, EMF equation, Types of DC machines, Torque Equation, Characteristics of DC Generators, necessity of starters, speed control methods, DC Motor Characteristics, applications of DC Machines, Swinburne's Test, Brake test on DC shunt motor.

AC Machines

Transformer Principle of operation and construction Details, EMF equation, Open Circuit & Short Circuit Test, Principle of operation of Three Phase Induction Motors, Constructional Details, Principle of operation of Single Phase Motor, Double Revolving Field Theory, Universal Motor, Stepper Motor, Principle of operation of synchronous machines, Synchronous Condenser and Applications.

Text Books:

1. Electrical Circuits by A.Chakrabarthy- Dhanapat Raj and Sons.
2. Engineering Circuit analysis By William Hayt and JackE,kemmerly-TMH.
3. A Textbook of Electrical Technology : Ac and Dc Machines (volume - 2) by B L Theraja and A K Theraja.
4. A First Course In Electrical Engineering, S. M. Tiwari, A. S. Binsaroor, Wheeler Publications.

Reference Books:

1. Principles Of Electrical Engineering And Electronics by V.k. Mehta and Rohit Mehta, S.Chand.
2. Electrical Machines, S. K. Bhattacharya, TMH Publications N. Delhi.

EC1106 DIGITAL LOGIC DESIGN LAB

Course Objectives: The objectives of this course are

- To Verify Logic gates
- To Verify Half adders and full adders
- To Design ripple counter and synchronous counter
- To Design shift registers and seven segment display.

Course Outcomes: At the end of the course the student will be able to

- Implement logic gates and their realization using ICs
- Implement and analyze combinational and sequential circuits using ICs
- Implement the logic gates, full Adder, Decoder, Encoder, MUX and DeMUX.
- Implement and Analyze Flip-Flops, Shift Register and Counters.

SYLLABUS

List of Hardware Experiments:

1. Logic Gates
2. Realization of Gates by using universal building blocks
3. Realization of SOP and POS
4. Verification of Demorgan's Laws
5. Half Adder & Full adder
6. Function generation by using Decoders & Multiplexers.
7. Realization of Flip - flops
8. 4-bit Ripple counter
9. Mod-8 Synchronous counter
10. Up down counter
11. 4 - bit Shift-register
12. Seven segment display

EC1107 PHYSICS LAB

Course Objectives: The objectives of this course are

- To enable the students to acquire skill, technique and utilization of the Instruments
- To draw the relevance between the theoretical knowledge and to imply it in a practical manner with respect to analyze various electronic circuits and its components.
- To impart the practical knowledge in basic concepts of Wave optics, Lasers and Fiber optics.
- To familiarize the handling of basic physical apparatus like Venire calipers, screw gauge, spectrometers, travelling microscope, laser device, optical fiber, etc.

Course Outcomes: At the completion of the course the student will be able to

- Ability to design and conduct experiments as well as to analyze and interpret.
- Ability to apply experimental skills to determine the physical quantities related to Heat, Electromagnetism and Optics**.**
- The student will learn to draw the relevance between theoretical knowledge and the means to imply it in a practical manner by performing various relative experiments.
- Determine the Thickness for given paper strip by wedge method

SYLLABUS

List of Experiments:

1. Determination of Radius of Curvature of a given Convex Lens By forming Newton's Rings.
2. Determination of Wavelength of Spectral Lines in the Mercury Spectrum by Normal Incidence method.
3. Study the Intensity Variation of the Magnetic Field along axis of Current Carrying Circular Coil.
4. Determination of Cauchy's Constants of a Given Material of the Prism using Spectrometer.
5. Determination of Refractive Index of Ordinary ray μ_o and extraordinary μ_e ray.
6. Determination of Thickness Given Paper Strip by Wedge Method.
7. Calibration of Low Range Voltmeter.
8. Calibration of Low Range Ammeter.
9. Determination of Magnetic Moment and Horizontal Component of Earth's Magnetic Field.
10. Lees Method - Coefficient of thermal Conductivity of a Bad Conductor.
11. Carey Foster's Bridge – Verification of laws of Resistance and Determination of Specific Resistance.
12. Melde's Apparatus – Frequency of electrically maintained Tuning Fork.
13. Photoelectric cell-Characteristics.
14. Planks Constants.
15. Laser- Diffraction.

EC1108 ELECTRONIC DEVICES AND CIRCUITS LAB

Course Objectives: The objectives of this course are

- To Study semiconductor diodes; verify their characteristics and applications of diodes as regulators, rectifiers.
- To Measure the V-I characteristics of various devices that are used in the electronic equipment.
- To Verify functionality through V-I characteristics of active devices like BJT, JFET, MOSFETS and their applications.
- To Determine the gain of CE amplifier

Course Outcomes: At the completion of the course the student will be able to

- Comprehend the depth of semiconductor devices like diodes, transistor, JFET, MOSFETs characteristics.
- Measure voltage, frequency and phase of any waveform using CRO.
- Generate sine, square and triangular waveforms with required frequency and amplitude using function generator.
- Gain hands on experience in handling electronic components and devices.
- Study and verify various amplifier designs with calculation of impedance and band width.

SYLLABUS

List of Experiments:

1. Study of CRO and Applications.

2. V-I Characteristics of PN Junction Diode
3. V-I Characteristics of Zener Diode and Zener regulator characteristics.
4. V-I Characteristics of LED
5. V-I characteristics of Photo diode
6. Half-wave and full-wave rectifiers
7. Half-wave and full-wave rectifiers with capacitor filter
8. CE characteristics of BJT, h-parameters
9. CB characteristics of BJT, h-parameters
10. Voltage gain, input impedance and output impedance of emitter follower
11. Drain and transfer characteristics of JFET
12. Frequency response of CE amplifier

EC1201 MATHEMATICS – II

Course Objectives: The objectives of this course are

- The way of obtaining rank, Eigen values and Eigen vectors of a matrix.
- To know the importance of Clayey-Hamilton theorem and getting canonical form from a given quadratic form.
- To solve the system of equations by using direct and indirect methods.
- To solve first order and higher order differential equations by various methods.
- To obtain the Laplace transforms and inverse Laplace transforms for a given functions and their applications.

Course Outcomes: At the completion of the course the student will be able to

- Find rank, Eigen values and Eigen vectors of a matrix and understand the importance of Cayley-Hamilton theorem.
- Reduce quadratic form to canonical forms and solving linear systems by direct and indirect methods.
- Demonstrate solutions to first order differential equations by various methods and solve basic applications problems related to electrical circuits, orthogonal trajectories and Newton's law of cooling.
- Discriminate among the structure and procedure of solving higher order differential equations with constant and variable coefficients.
- Understand Laplace transforms and its properties and finding the solution of ordinary differential equations.

SYLLABUS

Linear Algebra: Rank of a matrix- Echelon form, Normal Form - Solution of Linear System of Equations - Consistency of Linear System of Equations - Direct & Indirect Methods: Gauss elimination method, LU Factorization method, Gauss Seidal Method. Complex Matrices: Hermitian, Skew-Hermitian and Unitary Matrices and their Properties.

Eigen Values and Eigen Vectors: Eigen Values and Eigen Vectors of a Matrix - Cayley-Hamilton theorem - Inverse and Powers of a Matrix using Cayley-Hamilton's theorem and its applications. Diagonalization of a Matrix - Quadratic Forms - Reduction of Quadratic Form to Canonical Form - Nature of a Quadratic Form.

Ordinary Differential Equations of First Order and its Applications: Formation of ordinary differential equations (ODEs) - Solution of an ordinary differential equation - Equations of the first order and first degree - Linear differential equation - Bernoulli's equation - Exact differential equations - Equations reducible to exact equations - Orthogonal Trajectories - Simple Electric (LR & CR) Circuits - Newton's Law of Cooling - Law of Natural growth and decay.

Differential Equations of Higher Order: Solutions of Linear Ordinary Differential Equations with Constant Coefficients - Rules for finding the complimentary function - Rules for finding the particular integral - Method of variation of parameters - Cauchy's linear equation - Legendre's linear equation - Simultaneous linear differential equations.

Laplace Transforms: Introduction - Existence Conditions - Transforms of Elementary Functions - Properties of Laplace Transforms - Transforms of Derivatives - Transforms of Integrals - Multiplication by t^n - Division by t – Evaluation of integrals by Laplace Transforms - Inverse Laplace Transform - Applications of Laplace Transforms to Ordinary Differential Equations - Simultaneous Linear Differential Equations with Constant Coefficients - Second Shifting Theorem - Laplace Transforms of Unit Step Function, Unit Impulse Function and Laplace Transforms of Periodic Functions.

Text Books:

1. Scope and Treatment as in "Higher Engineering Mathematics", by Dr. B.S. Grewal, 43r^d edition, Khanna publishers.

Reference Books:

1. Graduate Engineering Mathematics by V B Kumar Vatti., I.K. International publishing house Pvt. Ltd.
2. Advanced Engineering Mathematics by Erwin Kreyszig.
3. A text book of Engineering Mathematics, by N.P. Bali and Dr. Manish Goyal. Lakshmi Publications.
4. Advanced Engineering Mathematics by H.K. Dass. S. Chand Company.
5. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Graw Hill Company.

EC1202 GREEN CHEMISTRY

Course Objectives:

- To apply the basic knowledge of Chemistry to the Engineering Discipline.
- To develop knowledge about water and its treatment for industrial and potable purposes.
- To develop understanding in the areas of Batteries, Fuels Mechanism of Corrosion of Metals and Corrosion Control Methods, Green Chemistry andTechnology and Processes involving Green Chemistry and apply the knowledge for solving existing challenges faced in various engineering and societal areas.

Course outcomes:

- The students are able to apply the basic concepts and principles studied in Chemistry to the field of Engineering.
- The students are able to apply chemistry to different branches of engineering
- The students are able to acquire the knowledge in the areas of Water Chemistry, Mechanism of Corrosion of Metals and Corrosion Control Methods, Batteries, Fuel Cells, Green Chemistry and Technology and Processes involving Green Chemistry and suggest innovative solutions for existing challenges in these areas.

SYLLABUS

Unit 1: Water Technology

Sources of Water – Impurities and their influence of living systems – WHO Limits – Hardness and its Determination – Boiler Troubles and their removal – Water Softening Methods – Lime-Soda, Zeolite and Ion Exchange - Municipal Water Treatment-Break Point Chlorination – Desalination of Sea Water – Reverse Osmosis Method, Electro-dialysis.

Unit 2: Batteries

Primary batteries: The chemistry - Types: Zinc-carbon (Leclanche type), zinc alkaline (Duracell), zinc/air batteries; Lithium primary cells – liquid cathode, solid cathode and lithium-ferrous sulphide cells. Secondary batteries: Lead acid and VRLA (valve regulated (sealed) lead acid), nickel-cadmium, nickel-zinc, nickel-metal hydride batteries, lithium ion batteries, ultrathin lithium polymer cells. Advanced Batteries for electric vehicles, requirements of the battery – sodium-beta and redox batteries.

Unit 3: Fuel Cells

Fuel Cells: Description, working principle, anodic, cathodic and cell reactions, fabrication of electrodes and other components, applications, advantages, disadvantages and environmental aspectsof the following types of fuel cells: Proton Exchange Membrane Fuel Cells, alkaline fuel cells, phosphoric acid, solid oxide, molten carbonate, direct methanol fuel cells- Membranes and Fuels

Unit 4: Corrosion

Corrosion: Origin and Theory – Types of Corrosion: Chemical and Electrochemical; Pitting, Inter granular, Waterline, Stress – Galvanic Series – Factors Effecting Corrosion. Corrosion Controlling Methods: Protective Coatings: Metallic Coatings, Electroplating and Electroless Plating – Chemical conversion Coatings – Phosphate, Chromate, Anodized, Organic Coatings – Paints and Special Paints.

Unit 5: Green Chemistry and Technology

Green Chemistry and its 12 principles, toxicity of chemicals, material safety data sheet (MSDS), concept of zero pollution technologies, atom economy, functional toxicity vs non-functional toxicity, alternative solvents, energy minimization, microwave and sonochemical reactions, renewable feed stock, carbon dioxide as a feed stock.

Unit 6: Processes involving Green Chemistry

Processes involving solid catalysts – zeolites, ion exchange resins, Nafion/silica nano composites and enhanced activity. Polymer supported reagents, green oxidations using TAML catalyst, membrane reactors. Green chemistry in material science, synthesis of porous polymers, green nanotechnology.

Text Books :

1. Engineering Chemistry – PC Jain and M. Jain – Dhanpath Rai and Sons, New Delhi.
2. A Text book of Engineering Chemistry – S. S. Dara – S. Chand & Co. New Delhi.
3. Dell, Ronald M Rand, David A J, 'Understanding Batteries', Royal Society of Chemistry, (2001).
4. M. Aulice Scibioh and B. Viswanathan 'Fuel Cells – principles and applications', University Press, India (2006).
5. Hand Book of Green Chemistry and Technology; by James Clarke and Duncan Macquarrie; Blakwell Publishing.
6. Anastas, P. T., Warner, J. C. Green Chemistry: Theory and Practice, Oxford University Press Inc., New York, 1998.

EC1203 ENGLISH

Course Objectives: The objectives of this course are

- To make students understand the explicit and implicit meanings of a text/topic;
- To give exposure to new words and phrases, and aid to use them in different contexts.
- To apply relevant writing formats to draft essays, letters, emails and presentations.
- To adapt oneself to a given situation and develop a functional approach to finding solutions: adaptability and problem solving.

Course Outcomes: At the completion of the course the student will be able to

- Analyze a given text and discover the various aspects related to language and literature;
- Learn the various language structures, parts of speech and figures of speech;
- Develop one's reading and writing abilities for enhanced communication
- To apply the topics in real-life situations for creative and critical use.

SYLLABUS

On the conduct of life: William Hazlitt
Life skills: Values and Ethics
If: Rudyard Kipling

The Brook: Alfred Tennyson
Life skills: Self-Improvement
How I Became a Public Speaker: George Bernard Shaw

The Death Trap: Saki
Life skills: Time Management
On saving Time: Seneca
Chindu Yellama
Life skills: Innovation
Muhammad Yunus

Politics and the English Language: George Orwell
Life skills: Motivation
Dancer with a White Parasol: Ranjana Dave

Grammar:

Prepositions – Articles – Noun-Pronoun Agreement, Subject-Verb Agreement – Misplaced Modifiers – Clichés, Redundancies.

Vocabulary:

Introduction to Word Formation – Root Words from other Languages – Prefixes and Suffixes – Synonyms, Antonyms – Common Abbreviations

Writing:

Clauses and Sentences – Punctuation – Principals of Good Writing – Essay Writing – Writing a Summary

Writing: Essay Writing

Life skills: Innovation

Muhammad Yunus

Text Books: Language and Life: A Skills Approach Board of Editors, Orient Blackswan Publishers, India. 2018.

Reference Books:

1. Practical English Usage, Michael Swan. OUP. 1995.
2. Remedial English Grammar, F.T. Wood. Macmillan.2007
3. On Writing Well, William Zinsser. Harper Resource Book. 2001
4. Study Writing, Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
5. Communication Skills, Sanjay Kumar and PushpLata. Oxford University Press. 2011.
6. Exercises in Spoken English, Parts. I-III. CIEFL, Hyderabad. Oxford University Press.

EC1204 COMPUTER PROGRAMMING AND NUMERICAL METHODS

Course Objectives: The objectives of this course are

- To provide complete knowledge of C language.
- To provide students with understanding of code organization and functional hierarchical decomposition with using complex data types.
- To provide knowledge to the Students to develop logics this will help them to create programs, applications in C.
- This course aims to identify tasks in which the numerical techniques learned are applicable and apply them to write programs, and hence use computers effectively to solve the task.
- This course provides the fundamental knowledge which is useful in understanding the other programming languages.

Course Outcomes: At the completion of the course the student will be able to

- Identify basic elements of C programming structures like data types, expressions, control statements, various simple functions and apply them in problem solving.
- Apply various operations on derived data types like arrays and strings in problem solving.
- Design and implement of modular Programming and memory management using Functions, pointers.
- Apply Structure, Unions and File handling techniques to Design and Solve different engineering programs with minimal complexity.
- Apply Numerical methods to solve the complex Engineering problems.

SYLLABUS

Introduction to C: Basic structure of C program, Constants, Variables and data types, Operators and Expressions, Arithmetic Precedence and associativity, Type Conversions. Managing Input and Output Operations Formatted Input, Formatted Output.

Decision Making, Branching, Looping, Arrays & Strings: Decision making with if statement, Simple if statement, The if…else statement, Nesting of if…else statement, the else..if ladder, switch statement, the (?:) operator, the GOTO statement., The while statement, the do statement, The for statement, Jumps in Loops ,One, Two-dimensional Arrays, Character Arrays. Declaration and initialization of Strings, reading and writing of strings, String handling functions, Table of strings.

Functions: Definition of Functions, Return Values and their Types, Function Calls, Function Declaration, Category of Functions: No Arguments and no Return Values, Arguments but no Return Values, Arguments with Return Values, No Argument but Returns a Value, Functions that Return Multiple Values. Nesting of functions, recursion, passing arrays to functions, passing strings to functions, the scope, visibility and lifetime of variables.

Pointers: Accessing the address of a variable, declaring pointer variables, initializing of pointer variables, accessing variables using pointers, chain of pointers, pointer expressions, pointers and arrays, pointers and character strings, array of pointes, pointers as function arguments, functions returning pointers, pointers to functions, pointers to structures-Program Applications.

Structure and Unions: Defining a structure, declaring structure variables, accessing structure members, structure initialization, copying and comparing structure variables, arrays of structures, arrays within structures, structures within structures, structures and functions and unions, size of structures and bit-fields- Program applications.

File handling: Defining and opening a file, closing a file, Input/ Output operations on files, Error handling during I/O operations, random access to files and Command Line Arguments-Program Applications

Numerical Methods: Solutions of Algebraic and Transcendental Equations, Bisection Method, Newton Raphson Method. Newton's forward and backward Interpolation, Lagrange's Interpolation in unequal intervals. Numerical Integration: Trapezoidal rule, Simpson's 1/3 rules. Solutions of Ordinary First Order Differential Equations: Euler's Method, Modified Euler's Method and Runge-Kutta Method.

Text Books:

1. Programming in ANSI C, E Balagurusamy, 6th Edition. McGraw Hill Education (India) Private Limited.
2. Introduction to Numerical Methods, SS Sastry, Prentice Hall

Reference Books:

1. Let Us C, Yashwant Kanetkar, BPB Publications, 5th Edition.
2. Computer Science, A structured programming approach using C", B.A.Forouzan and R.F.Gilberg, " 3rd Edition, Thomson, 2007.
3. The C –Programming Language' B.W. Kernighan, Dennis M. Ritchie, PHI.
4. Scientific Programming: C-Language, Algorithms and Models in Science, Luciano M. Barone (Author), Enzo Marinari (Author), Giovanni Organtini, World Scientific.

EC1205 ELECTRONIC CIRCUIT ANALYSIS

Course Objectives: The objectives of this course are

- To prepare students to perform the analysis of any Analog electronics circuit.
- To empower students to understand the design and working of BJT / FET.
- To empower students to understand the design and working of amplifiers and oscillators.
- To empower students to understand the design and working of Operational Amplifier.
- To prepare the students for advanced courses in Communication system Circuit Design.

Course Outcomes: At the end of the course the student will be able to

- Acquire basic knowledge of physical and electrical conducting properties of semiconductors.
- Develop the Ability to understand the design and working of BJT / FET amplifiers and Operational Amplifier.
- Develop the Ability to understand the design and working of BJT / FET oscillators.
- Develop the Ability to understand the design and working of Communication system Circuit Design.

SYLLABUS

Small Signal High Frequency Transistor Amplifier models: BJT: Transistor at high frequencies, Hybrid- common emitter transistor model, Hybrid- conductance's, Hybrid-capacitances, validity of Hybrid- model, determination of high frequency parameters in terms of low frequency parameters, CE short circuit current gain, current gain with resistive load, cut-off frequencies, frequency response and gain bandwidth product. **FET:** Analysis of common source and common drain amplifier circuits at high frequencies.

Multistage Amplifiers: BJT and FET RC Coupled Amplifiers – Frequency Response. Cascaded Amplifiers. Calculation of Band Width of Single and Multistage Amplifiers. Concept of Gain Bandwidth Product.

Feedback Amplifiers: Concept of Feedback Amplifiers – Effect of Negative feedback on the amplifier Characteristics. Four Feedback Amplifier Topologies. Method of Analysis of Voltage Series, Current Series, Voltage Shunt and Current Shunt feedback Amplifiers.

Sinusoidal Oscillators: Condition for oscillations –LC Oscillators – Hartley, Colpitts, Clapp and Tuned Collector Oscillators, Frequency and amplitude Stability of Oscillators – Crystal Oscillators – RC Oscillators -- RC Phase Shift and Wein bridge Oscillators (BJT and JFET models)

Tuned Voltage Amplifiers and Power Amplifiers: Single Tuned and Stagger Tuned Amplifiers – Analysis, Double Tuned Amplifier, Bandwidth Calculation. Classification of Power Amplifiers – Class A, Class B and Class AB power Amplifiers. Series Fed, Single Ended Transformer Coupled and Push Pull Class A and Class B Power Amplifiers. Cross-over Distortion in Pure Class B Power Amplifier, Class AB Power Amplifier – Complementary Push Pull Amplifier, Derating Factor – Heat Sinks.

Text Books:

1. Integrated Electronics, Analog Digital Circuits and systems, Jacob Millman and D. Halkias, McGraw Hill, 1972.
2. Electronic Devices , G.S.N. Raju, IK International Publications, New Delhi, 2006.
3. Adel S. Sedra, Kenneth C. Smith, Arun N. Chandorkar, Microelectronic Circuits, 6/e, Oxford University Press, 2013.

Reference Books:

1. Electronic Circuit Analysis, B.V.Rao, K. RajaRajeswari et.al, Pearson Publishers.
2. Electronic Devices and Circuits by Salivahanan, N.Suresh Kumar andA.Vallava Raj TMH, 2nd Edition, 1998
3. Electronic Devices and Circuits – G.K.Mithal, Khanna Publishers, 23rd Edition, 2004.

EC1206 ENGLISH LANGUAGE LAB

Course Objectives: The objectives of this course are

- To make students recognize the sounds of English through Audio-Visual aids;
- To help students build their confidence and help them to overcome their inhibitions and self-consciousness while speaking in English;
- To familiarize the students with stress and intonation and enable them to speak English effectively;
- To give learners exposure to and practice in speaking in both formal and informal contexts.

Course Outcomes: At the completion of the course the student will be able to

- Students will be sensitized towards recognition of English sound patterns and the fluency in their speech will be enhanced;
- A study of the communicative items in the laboratory will help students become successful in the competitive world;
- Students will be able to participate in group activities like roleplays, group discussions and debates; and
- Students will be able to express themselves fluently and accurately in social as well professional context.

SYLLABUS

1. **Introduction to Phonetics:** The Sounds of English (Speech sound – vowels and consonants) - Stress and Intonation - Accent and Rhythm.
2. **Listening Skills:** Listening for gist and specific information - listening for Note taking, summarizing and for opinions - Listening to the speeches of eminent personalities.
3. **Speaking Skills**: Self-introduction - Conversation Skills (Introducing and taking leave) - Giving and asking for information - Role Play - Just A Minute (JAM) session - Telephone etiquette.
4. **Reading and Writing skills:** Reading Comprehension – Précis Writing - E-Mail writing - Punctuation.
5. **Presentation skills**: Verbal and non-verbal communication - Body Language - Making a Presentation.

Reference Books:

1. Ashraf Rizvi. Effective Technical Communication. Tata McGraw Hill Education Private Limited, New Delhi.
2. Speak Well. Orient Blackswan Publishers, Hyderabad.
3. Allan Pease. Body Language. Manjul Publishing House, New Delhi.

EC1207 ELECTRONIC CIRCUIT ANALYSIS LAB

Course Objectives: The objectives of this course are

- To Design feedback amplifiers
- To generate a sinusoidal signal using oscillators
- To simulate oscillators and power amplifiers
- To determine the frequency response of op-amp

Course Outcomes: At the end of the course the student will be able to

- Design oscillators to generate sinusoidal signal of desired frequency
- Determine the frequency response of BJT and JFETs amplifiers.
- Design the applications of op-amp and determine the frequency response of op-amp
- Simulate BJT, JFET amplifiers using Multisim
- Simulate power amplifiers using Multisim

SYLLABUS

List of Experiments:

1. Current series feedback Amplifier
2. Voltage Shunt feedback amplifier
3. Voltage series feedback Amplifier
4. Colpitts oscillator
5. RC-Phase shift oscillator
6. Wein bridge oscillator
7. Hartley Oscillator
8. JFET Common source Amplifier
9.Two stage RC-Coupled Amplifier
10. JFET two stage amplifier
11. Class A power amplifier.
12. Class-B Push pull Amplifier

EC1208 COMPUTER PROGRAMMING AND NUMERICAL METHODS LAB

Course Objectives: The objectives of this course are

- To impart writing skill of C programming to the students and solving problems.
- To write and execute programs in C to solve problems such as Modularize the problems into small modules and then convert them into programs.,
- To write and execute programs in C to solve problems such as arrays, files, strings structures and different numerical methods.
- This reference has been prepared for the beginners to help them understand the basic to advanced concepts related to Objective-C Programming languages.

Course Outcomes: At the completion of the course the student will be able to

- Understand various computer components, Installation of software. C programming development environment, compiling, debugging, and linking and executing a program using the development environment.
- Analyzing the complexity of problems, modularize the problems into small modules and then convert them into programs.
- Construct programs that demonstrate effective use of C features including arrays, strings, structures, pointers and files.
- Apply and practice logical ability to solve the real world problems.
- Apply Numerical methods to solve the complex Engineering problems.

SYLLABUS

1. Write a program to read x, y coordinates of 3 points and then calculate the area of a triangle formed by them and print the coordinates of the three points and the area of the triangle. What will be the output from your program if the three given points are in a straight line?
2. Write a program, which generates 100 random integers in the range of 1 to 100. Store them in an array and then print the arrays. Write 3 versions of the program using different loop constructs. (e.g. for, while, and do while).
3. Write a set of string manipulation functions e.g. for getting a sub-string from a given position, Copying one string to another, Reversing a string, adding one string to another.
4. Write a program which determines the largest and the smallest number that can be stored in different data types like short, int, long, float, and double. What happens when you add 1 to the largest possible integer number that can be stored?

5. Write a program, which generates 100 random real numbers in the range of 10.0 to 20.0, and sort them in descending order.
6. Write a function for transposing a square matrix in place (in place means that you are not allowed to have full temporary matrix).
7. First use an editor to create a file with some integer numbers. Now write a program, which reads these numbers and determines their mean and standard deviation.
8. Given two points on the surface of the sphere, write a program to determine the smallest arc length between them.
9. Implement bisection method to find the square root of a given number to a given accuracy.
10. Implement Newton Raphson method to det. a root of polynomial equation.
11. Given table of x and corresponding f(x) values, Write a program which will determine f(x) value at an intermediate x value by using Lagrange's interpolation/
12. Write a function which will invert a matrix.
13. Implement Simpson's rule for numerical integration.
14. Write a program to solve a set of linear algebraic equations.

EC2101 Mathematics – III

Course Objectives: The student should be able to learn the concepts:

- About the differential operators like gradient, divergence and curl.
- Evaluation of Line integrals, Surface integrals, Volume integrals and their transformations using Green's theorem, Stoke's theorem, Gauss Divergence theorems along with their applications in Engineering..
- Differentiation and integration of complex functions and evaluation of complex integration using Cauchy's theorem and Cauchy's integral formula.
- Conformal mappings, expansion of complex functions as Taylor's and Laurent's series. Evaluation of integrals using Cauchy's Residue Theorem.
- Formulate the Partial Differential Equations. Solving first order linear and non-linear Partial Differential Equations, Homogeneous and Non homogeneous linear partial differential equations with constant coefficients. The concept of Fourier Transforms, Fourier Sine, Cosine and their applications to Engineering problems.

Course outcomes: On completion of this course, students are able to

- Interpret the meaning and evaluation of different differential operators such as gradient, curl and divergence.
- Apply Line integrals, Surface integrals, Volume integrals and their relations using Green's theorem, Stoke's theorem, Gauss Divergence theorems in various engineering applications .
- Apply Cauchy-Riemann equations to complex functions to verify analyticity. Evaluation of integration along the given path using Cauchy's theorem and Cauchy's integral formula.
- Represent a given complex function in Taylor's & Laurent's series in the given region. Make use of the Cauchy residue theorem to evaluate certain integrals.
- Formation, solution of first order linear, non-linear Partial Differential Equations, solution of higher order linear Partial Differential Equations The use of the knowledge of Fourier transforms, Fourier Sine, Cosine as a mathematical tool to evaluated certain wave forms.

SYLLABUS

Unit-I

(VECTOR CALCULUS-DIFFERENTIATION)

Differentiation of vectors, curves in space, velocity and acceleration, scalar and vector point functions, vector operator ∇ applied to scalar point functions- gradient, ∇ applied to vector point functions- divergence and curl. Physical interpretation of gradient, divergence and curl (i.e.,

∇f, $\nabla.\overline{F}$, $\nabla\times\overline{F}$), Irrotational and Solenoidal fields, the relations obtained after ∇ applied twice to point functions, ∇ applied to products of two functions.

Unit-II

(VECTOR INTEGRATION)

Integration of vectors, line integral, circulation, work done, surface integral-flux, Green's theorem in the plane, Stoke's theorem, volume integral, Gauss Divergence theorem. (All theorems without proofs)

Unit-III

(Functions of Complex Variables)

Introduction-Limit and continuity of f(z)- Derivative of f(z), Cauchy-Reimann Equations, Analytic Functions, Harmonic functions, Applications to flow problems. Integration of complex functions, Cauchy's theorem, Cauchy's integral formula and their applications.

Unit-IV

(Conformal Mappings and Contour Integration)

Introduction to Conformal transformation, Bilinear transformation $w = \frac{az+b}{cz+d}$, Series of complex terms -Taylor's and Laurent's series (without proofs), Zero's and Singularities. Residues and Calculations of residues, Cauchy's Residue Theorem (without proofs).

Unit-V

PARTIAL DIFFERENTIAL EQUATIONS & FOURIER TRANSFORM

Introduction and formation of partial differential equations, solutions of partial differential equations, linear equations of first order: Lagrange's Linear equation, non-linear equations of first order. Homogeneous linear equations with constant coefficients- complementary function, particular integral, non- homogeneous linear equations.

Introduction, Fourier integral, Sine and Cosine integrals, Complex form of Fourier integral, Fourier transform, Fourier Sine and Cosine transforms, properties of Fourier transforms. Convolution theorem, Parseval's identity for Fourier transforms.

TEXT BOOKS:

Scope and treatment as in "Higher Engineering Mathematics", by Dr. B.S.Grewal, **43rd Edition**, Khanna Publishers.

REFERENCE BOOKS:

1. Advanced Engineering Mathematics by Erwin Kreyszig.
2. A Text book of Engineering Mathematics by N.P. Bali and Dr. Manish Goyal, Lakshmi Publications.
3. Advanced Engineering Mathematics by H.K.Dass. S.Chand Company.
4. Complex variables and applications, James Ward Brown, Ruel V. Churchill, McGraw Hill.

EC2102 PYTHON PROGRAMMING

Course Objectives :

- To develop skills on procedural oriented and object oriented programming in Python.
- To understand and apply different data wrangling techniques using Python.
- To perform data analysis using python libraries like NumPy, Pandas and exploratory data analysis using Matplotlib

Course Outcomes :

At the end of the course, a student should be able to:

- acquire programming knowledge on Basics of Python
- acquire programming knowledge on Text and File Handling
- develop Python programs to Mean, Median, Mode, Correlation
- acquire programming knowledge on NumPy, Pandas Library
- acquire programming knowledge on Graph Visualizations in Python and Data Analysis using Python

SYLLABUS

1. **Introduction to Python: Rapid Introduction to Procedular Programming, Data Types**: Identifiers and Keywords, Integral Types, Floating Point Types

   Strings: Strings, Comparing Strings, Slicing and Striding Strings, String Operators and Methods, String formatting with str.format
   Collections Data Types: Tuples, Lists, Sets, dictionaries, Iterating and copying collections
2. **Python Control Structures, Functions and OOP:Control Structures and Functions**: Conditional Branching, Looping, Exception Handling, Custom Fuctions

   Python Library Modules: random, math, time, os, shutil, sys, glob, re, statistics,creating a custom module
   Object Oriented Programming: Object Oriented Concepts and Terminology, Custom Classes, Attributes and Methods, Inheritance and Polymorphism, Using Properties to Control Attribute Access
   File Handling: Writing and Reading Binary Data, Writing and Parsing Text Files
3. **NumPy Arrays and Vectorized Computation**: NumPy arrays, Array creation, Indexing and slicing, Fancy indexing, Numerical operations on arrays, Array functions, Data processing using arrays, Loading and saving data, Saving an array, Loading an array, Linear algebra with NumPy, NumPy random numbers
4. **Data Analysis with Pandas**: An overview of the Pandas package, The Pandas data structure-Series, The DataFrame, The Essential Basic Functionality: Reindexing and altering labels , Head and tail, Binary operations, Functional statistics , Function application Sorting,

Indexing and selecting data, Computational tools, Working with Missing Data, Advanced Uses of Pandas for Data Analysis - Hierarchical indexing, The Panel data

5. **Data Analysis Application Examples**: Data munging,Cleaning data, Filtering, Merging data, Reshaping data, Data aggregation, Grouping data
6. **Data Visualization**: The matplotlib API primer-Line properties, Figures and subplots, Exploring plot types-Scatter plots, Bar plots, Histogram plots, Legends and annotations, Plotting functions with Pandas

Text Books :

1. Programming in Python 3: A Complete Introduction to Python Language, Mark Summerfield, Second Edition, Addison-Wesley Publications
2. Python: End-to-End Data Analysis Learning Path, Module 1: Getting Started with Python Data Analysis , Phuong VothiHong , Martin Czygan, , Packt Publishing Ltd

Reference Books :

1. Learning Python, 5th Edition, Mark Lutz, Orielly Publications
2. Python for Data Analysis, Wes McKinney, Orielly Publications
3. How to Think Like a Computer Scientist: Learning with Python 3 Documentation 3rd Edition, Peter Wentworth, Jeffrey Elkner, Allen B. Downey, Chris Meyers
4. Core Python Programming, Second Edition, Wesley J. Chun, Prentice Hall
5. Python Cookbook – Recipes for Mastering Python 3,3rdEdition, David Beazley, Brian K. Jones, Oreilly.

EC2103 ANALOG COMMUNICATIONS

Course Objectives: The objectives of this course are

- To familiarize with the fundamentals of analog communication systems
- To learn various techniques for analog modulation and demodulation of signals
- To develop the ability to classify and understand various functional blocks of radio transmitters and receivers
- To know basic techniques for generating and demodulating various pulse modulated signals.

Course Outcomes: At the end of the course the student will be able to

- Understand the basic concepts of analog communication system and compare various amplitude modulation techniques with spectral characteristics.
- Differentiate the angle modulation schemes with linear modulation techniques.
- Categorize the noise behaviours of analog communication systems.
- Classify Radio transmitters and understand their performances.
- Classify Radio receivers and understand their performances.
- Compare the various analog pulse modulation systems.

SYLLABUS

Linear Modulation Systems: Need for Modulation, Frequency Translation, Method of Frequency Translation, Amplitude Modulation, Modulation Index, Spectrum of AM Signal, Modulators and Demodulators (Diode detector), DSB-SC Signal and its Spectrum, Balanced Modulator, Synchronous Detectors, SSB Signal, SSB Generation Methods, Power Calculations in AM Systems, Application of AM Systems.

Angle Modulation Systems: Angle Modulation, Phase and Frequency Modulation and their Relationship, Phase and Frequency Deviation, Spectrum of an FM Signal, Bandwidth of Sinusoidally Modulated FM Signal, Effect of the Modulation Index on Bandwidth, Spectrum of Constant Bandwidth FM, Phasor Diagram for FM Signals, FM Generation: Parameter variation method, Indirect method of Frequency Modulation (Armstrong Method), Frequency Multiplication, PLL FM Demodulator, Pre – emphasis and De – emphasis, Comparison of FM and AM.

Noise in AM and FM Systems: Sources of Noise, Resistor Noise, Shot Noise, Calculation of Noise in a Linear System, Frequency Domain representation of Noise, The effect of Filtering on the Probability density of Gaussian Noise, Effect of filter on the power spectral Density of Noise, Narrow Bandwidth, Quadrature components of Noise, Power spectral density of Noise, Probability Density of Noise and their time derivatives, representation of Noise using

Orthonormal coordinates, Noise in AM Systems, Noise in Angle Modulation Systems, Comparison between AM and FM with respect to Noise, Threshold Improvement in Discriminators, Comparisons between AM and FM.

Radio Transmitters: Classification of Radio Transmitters, Principle of a Radio Transmitters, AM and FM Transmitters, Radio Telegraph and Radio Telephone Transmitters, SSB Transmitters.

Radio Receivers: Radio receiver Types, AM Receivers – RF Section, Frequency Changing and Tracking, Intermediate Frequency and IF Amplifiers, Automatic Gain Control (AGC); FM Receivers – Amplitude Limiting, FM Demodulators, Ratio Detectors, ISB Receiver, Comparison with AM Receivers, Extensions of the Super-heterodyne Principles, Additional Circuits.

Pulse Analog Modulation methods: Pulse Modulation techniques, Sampling, Types of Sampling and its analysis, Time division Multiplexing, Pulse Amplitude Modulation, Pulse Width Modulation, Pulse position modulation, Pulse Code Modulation.

Text Books:

1. Principles of Communication Systems, H. Taub, D. L. Schilling and Glutamate, TMH 3rd edition, 2007.
2. Principle of Communication Systems, Simon Haykins (2nd Edition).
3. Electronic Communication Systems, G. Kennedy, McGraw Hill, 1977 (2nd Edition).

References:

1. Modern Digital and Analog Communication Systems, B. P. Lathi (2nd Edition).
2. Communication systems, R.P. Singh and S.D. Sapre 2nd edition TMH 2008
3. Electronic Communications Modulation and Transmission, Robert J. Schoenbeck, PHI N. Delhi, 1999.

EC2104 SIGNALS AND SYSTEMS

Course Objectives: The objectives of this course are

- To explain signals and systems representations/classifications and also describe the time and frequency domain analysis of continuous time signals with Fourier series.
- Fourier transforms and Laplace transforms.
- To understand Sampling theorem, with time and frequency domain analysis of discrete time signals with DTFS, DTFT and Z-Transform.
- To present the concepts of convolution and correlation integrals and also understand the properties in the context of signals/systems and lay down the foundation for advanced courses.

Course Outcomes: At the end of the course the student will be able to

- Analyze the discrete time signals and system using different transform domain techniques.
- Design and implement LTI filters for filtering different real-world signals.
- Analyze the frequency domain representation of signals using CTFT and DTFT.
- Interpret signals and analyze system response using convolution integral and compute the correlation of signals.
- Understand the process of sampling and the effects of under sampling.
- Apply the Laplace transform and Z- transform for analyzing continuous-time and discrete-Time signals and systems.

SYLLABUS

Introduction to signals and linear time Invariant systems: Basic signals, elementary signals in continues and discrete domain, classification of signals, useful signal operations, discrete signal models, discrete signal operations, classification of systems, basic system properties, Casual LTI Systems Described by Differential and Difference Equations, unit impulse response of a system, system response to external input, classical solutions of difference equations, system stability.

Frequency analysis of continuous time signals : Fourier Series Representation of continuous time Periodic Signals, convergence of the Fourier Series, exponential Fourier series, Properties of continuous time Fourier Series, power density spectrum of periodic signals, representation of aperiodic signals, Fourier Transform, transform of some useful functions, Fourier Transform for periodic signals, theorems and properties of Fourier transforms, signal energy.

Frequency analysis of Discrete time signals :. Discrete time Fourier series(DTFS), properties of DTFS, power density spectrum of discrete periodic signals, representation of aperiodic signals, discrete time Fourier transform (DTFT),convergence of DTFT, DTFT theorems and properties, energy density spectrum of discrete aperiodic signals.

Convolution and correlation of signals: System analysis by Convolution, Convolution as a superposition of impulse response, some Convolution relationships, Graphical interpretation of Convolution, Convolution of a function with a unit impulse, Signal comparison, Correlation and Convolution, Some properties of correlation functions, Correlation functions for nonfinite energy signals, Detection of periodic signals in the presence of Noise by correlation, Determination of the waveform of a periodic signal masked by Noise, Extraction of a signal from Noise by filtering.

Laplace Transform: Introduction, The Laplace Transform, the region of convergence for Laplace Transforms, The Inverse Laplace Transform, Geometrical evaluation of the Fourier transform from the Pole-Zero plot, Properties of Laplace Transforms, the initial and Final value theorems, Analysis and characterization of LTI systems using the Laplace Transforms.

Sampling Theorem and Z-transform: sampling theorem, reconstruction of a signal from its samples using interpolation, The effect of Under sampling, aliasing, Discrete time processing of continuous time signals, sampling of Discrete time signals. unilateral Z-Transforms and bilateral Z-Transforms, Properties of Z-Transform, relationship of the Fourier transform to the Z-transform, Inverse Z-Transform by contour integral, power series, partial fraction expansion. decomposing of rational Z-transform, causality and stability, the initial value theorem and final value theorem, some common Z-transform pairs, Analysis and characterization of LTI systems using the Z-Transforms.

Text Books:

1.Signals and Systems, Alan V. Oppenheim, Alan S. Will sky and Ian T. Young, PHI, 2ndEdn.
2.Signal Processing and Linear Systems , B. P. Lathi, Berkeley Cambridge Press.
3. Signals and Systems, K. Raja Rajeswari and B. V. Rao, Prentice Hall of India.

Reference Books:

1. Signals and Systems- Simon Haykin and Van Veen, Wiley 2ndEdn.
2. Signals and Systems – P. Ramesh Babu and R. Ananda Natarajan 3rdEdn.

EC2105 MANAGERIAL ECONOMICS

Course Objectives: The objectives of this course are

- To integrate the concept of price and output decisions of firms under various market structure.
- To impart the knowledge of economics as a subject and its importance while business.
- The business decisions are made scientifically on the basis of all available information.
- To familiarize the students with the basic concept of microeconomics.
- To understand the demand and supply analysis in business applications
- To familiarize with the production and cost structure under different stages of production.

Course Outcomes: At the end of the course the student will be able to

- To understand the concepts of cost, nature of production and its relationship to Business operations.
- To apply marginal analysis to the "firm" under different market conditions.
- To analyze the causes and consequences of different market conditions.
- To integrate the concept of price and output decisions of firms under various market structure.

SYLLABUS

Significance of Economics and Managerial Economics: Economics: Definitions of Economics- Wealth, Welfare and Scarcity definition Classification of Economics- Micro and Micro Economics. **Managerial Economics:** Definition, Nature and Scope of Managerial Economics, Differences between Economics and Managerial Economics, Main areas of Managerial Economics, Managerial Economics with other disciplines.

Demand Analysis: Demand - Definition, Meaning, Nature and types of demand, Demand function, Law of demand -Assumptions and limitations. Exceptional demand curve. **Elasticity of demand** - Definition, Measurement of elasticity, Types of Elasticity (Price, Income, Cross and Advertisement), Practical importance of Price elasticity of demand, Role of income elasticity in business decisions, Factors governing Price Elasticity of demand.

Demand Forecasting - Need for Demand forecasting, Factors governing demand forecasting, Methods of demand forecasting: Survey methods- Experts' opinion survey method and consumers Survey methods. **Utility Analysis:** Utility- Meaning, Types of Economic Utilities, Cardinal and Ordinal Utility, Total Utility, Marginal Utility, The law of Diminishing Marginal Utility and its Limitations**.**

Theory of Production and Cost analysis: Production - Meaning, Production function and its assumptions, use of production function in decision making; Law of Variable Proportions: three stages of the law. **Cost analysis -** Nature of cost, Classification of costs - Fixed vs. Variable

costs, Marginal cost, Controllable vs. Non - Controllable costs, Opportunity cost, Incremental vs. Sunk costs, Explicit vs. Implicit costs, Replacement costs, Historical costs, Urgent vs. Postponable costs, Escapable vs. unavoidable costs, Economies and Diseconomies of scale.

Market Structures: Definition of Market, Classification of markets; Salient features or conditions of different markets - Perfect Competition, Monopoly, Duopoly, Oligopoly, Importance of kinked demand curve; Monopolistic Competition.

Pricing Analysis: Pricing - Significance: Different Pricing methods- Cost plus pricing, Target pricing, Marginal cost pricing, Going -rate pricing, Average cost pricing, Peak load pricing, Pricing of joint Products, Pricing over the life cycle of a Product, Skimming pricing Penetration pricing, Mark- up and Mark- down pricing of retailers.

Business cycles, Inflation and Deflation: Business cycles - Definition, Characteristics, Phases, Causes and Consequences; Measures to solve problems arising from Business cycles. **Inflation -** Meaning, Types, Demand- pull and Cost push inflation, Effects of Inflation, Anti- inflationary measures. **Deflation-** Meaning, Effects of Deflation, Control of Deflation, Choice between Inflation and Deflation.

Text Books:

1. Sankaran,S., **Managerial Economics,** Marghan Publications, 2015, Chennai.
2. Aryasri, A.R., **Managerial Economics and Financial Analysis,** MC Graw Hill Education, New Delhi,2015.

Reference Books:

1. Dwivedi, D.N., **Managerial Economics,** Vikhas Publishing House Pvt. Ltd. 6th Edition, New Delhi,2004.
2. Dewett, K.K., **Modern Economic Theory**, S. Chand & Company Ltd., New Delhi, 2005.

EC2106 PYTHON PROGRAMMING LAB

Course Objectives :

- familiarize students with key data structures in Python including lists and dictionaries and apply them in context of searching, sorting, text and file handling
- introduce students to calculation of statistical measures using Python such as measures of central tendency, correlation
- familiarize students with important Python data related libraries such as Numpy and Pandas and use them to manipulate arrays and dataframes
- introduce students to data visualization in Python through creation of line plots, histograms, scatter plots, box plots and others
- implementation of basic machine learning tasks in Python including pre-processing data, dimensionality reduction of data using PCA, clustering, classification and cross-validation.

Course Outcomes :

After completion of the course the student should be able to:

- implement searching, sorting and handle text and files using Python data structures such as lists and dictionaries
- calculate statistical measures using Python such as measures of central tendency, correlation
- use Python data related libraries such as Numpy and Pandas and create data visualizations
- implement basic machine learning tasks pre-processing data, compressing data, clustering, classification and cross-validation.

SYLLABUS

1. Python Programs on lists & Dictionaries
2. Python Programs on Searching and sorting
3. Python Programs on Text Handling
4. Python Programs on File Handling
5. Python Programs for calculating Mean, Mode, Median, Variance, Standard Deviation
6. Python Programs for Karl Pearson Coefficient of Correlation, Rank Correlation
7. Python Programs on NumPy Arrays, Linear algebra with NumPy
8. Python Programs for creation and manipulation of DataFrames using Pandas Library

9. Write a Python program for the following**.**
    - Simple Line Plots,
    - Adjusting the Plot: Line Colors and Styles, Axes Limits, Labeling Plots,
    - Simple Scatter Plots,
    - Histograms,
    - Customizing Plot Legends,
    - Choosing Elements for the Legend,
    - Boxplot
    - Multiple Legends,
    - Customizing Colorbars,
    - Multiple Subplots,
    - Text and Annotation,
    - Customizing Ticks
10. Python Programs for Data preprocessing: Handling missing values, handling categorical data, bringing features to same scale, selecting meaningful features
11. Python Program for Compressing data via dimensionality reduction: PCA
12. Python Programs for Data Clustering
13. Python Programs for Classification
14. Python Programs for Model Evaluation: K-fold cross validation

Reference Books :

1. Core Python Programming, Second Edition, Wesley J. Chun, Prentice Hall
2. Chris Albon, "Machine Learning with Python Cookbook-practical solutions from preprocessing to Deep learning", O'REILLY Publisher,2018
3. Mark Summerfield, Programming in Python 3--A Complete Introduction to the Python Language, Second Edition, Additson Wesley
4. Phuong Vo.T.H , Martin Czygan, Getting Started with Python Data Analysis, Packt Publishing Ltd
5. Armando Fandango, Python Data Analysis, Packt Publishing Ltd
6. Magnus Vilhelm Persson and Luiz Felipe Martins, Mastering Python Data Analysis, Packt Publishing Ltd
7. Sebastian Raschka& Vahid Mirjalili, "Python Machine Learning", Packt Publisher, 2017

EC2107 ANALOG COMMUNICATIONS LAB

Course Objectives: The objectives of this course are

- To understand all types of analog modulation / demodulation principles such as AM, SSB-SC, FM.
- To recognize the importance of pre-emphasis and de-emphasis.
- To design the filters using passive components.
- To Substantiate pulse modulation techniques.

Course Outcomes: At the end of the course the student will be able to

- Generate, detect and analyze different amplitude modulation & demodulation techniques.
- Analyze and design various analog filters using passive components.
- Detect and Analyze frequency modulation & demodulation techniques.
- Construct pre-emphasis and de-emphasis at the transmitter and receiver respectively.
- Able to Analyze T – Type attenuator and Mixer characteristics.

SYLLABUS

List of Experiments:

1. AM Modulation and Demodulation
2. Low Pass Filter using passive components
3. High Pass Filter using passive components
4. Active Notch Filter
5. Frequency Modulation and Demodulation
6. Pre-emphasis and De-emphasis
7. T – Type attenuator
8. Band pass filter using passive components
9. Mixer characteristics
10. SSB-SC modulation and demodulation.

EC2108 SIGNALS AND SYSTEMS SIMULATION LAB

Course Objectives:

- To provide background and fundamentals of MATLAB tool for the analysis and processing of signalsand to generate various continuous and discrete time signals.
- To understand discrete signal design and analysis.
- To provide an overview of signal transmission through linear systems, convolution and correlation ofsignals and sampling.
- To understand signal representation in digital domain.
- To understand the concept and importance of Fourier and Z-Transforms

Course Outcomes: Upon completion of this course, students will able to:

- **Design:** Generation of Various Signals and Sequences in MATLAB, including the operations on signals and sequences.
- **Verification** of Sampling Theorem, Linearity and Time Invariance Properties of a given Signals/Systems.
- **Analyze** the Fourier Transform of a given signal and plotting its magnitude and phase spectrum andalso plot Pole-Zero Maps in Z-Plane.

SYLLABUS

LIST OF EXPERIMENTS

1. Basic Operations on Matrices.
2. Write a program for Generation of Various Signals and Sequences (Periodic and Aperiodic), such as Unit impulse, unit step, square, saw tooth, triangular, sinusoidal, ramp and sinc functions.
3. Write a program to perform operations like addition, multiplication, scaling, shifting, and folding on signals and sequences and computation of energy and average power.
4. Write a program for finding the even and odd parts of the signal / sequence and real and imaginary parts of the signal.
5. Write a program to perform convolution between signals and sequences.
6. Write a program to perform autocorrelation and cross correlation between signals and sequences.
7. Write a program for verification of linearity and time invariance properties of a given continuous/discrete system.
8. Write a program for computation of unit samples, unit step and sinusoidal response of the

given LTI system and verifying its physical realizability and stability properties.

9. Write a program to find trigonometric and exponential Fourier series coefficients of a rectangular periodic signal.
10. Write a program to find the Fourier transform of a given signal and plotting its magnitude andPhase spectrum.
11. Write a program for Sampling theorem and its verification.
12. Write a program for locating the zeros and poles and plotting the pole-zero maps in Z-plane for the given transfer function.

EC2109 DIGITAL CIRCUITS SIMULATION

Course Objectives: The objectives of this course are

- To Verify Logic gates
- To Verify Half adders and full adders
- To Design ripple counter and synchronous counter
- To simulate logic gates and flip flops, combinational and sequential circuits.

Course Outcomes: At the end of the course the student will be able to

- Implement logic gates through VHDL and VERILOG programming
- Implement combinational and sequential circuits through VHDL and VERILOG programming.
- Implement the logic gates, full Adder, Decoder, Encoder, MUX and DeMUX in VHDL and VERILOG programming.
- Simulate and Analyze Flip-Flops, Shift Register and Counters using VHDL and VERILOG programming.

SYLLABUS

List of Experiments:

SIMULATION OF EXPERIMENTS THROUGH VHDL AND VERILOG PROGRAMMING LANGUAGES

1. Simulation of Logic gates
2. Simulation of Half adder and Full adder
3. Simulation of Multiplexer
4. Simulation of De-Multiplexer
5. Simulation of Decoder
6. Simulaiton of Encoder
7. Simulation of Flip flops (SR & D)
8. Simulation of Up-down counter& Shift register

Reference Books for VHDL & Verilog :

1. M.Morris mano & michael D.ciletti Digital Design: With An Introduction To The Verilog HDL, VHDL And System Verilog
2. Peter J. Ashenden: "Digital Design - An Embedded Systems Approach Using VHDL"
3. VHDL: Programming by Example, Douglas L. Perry, Fourth Edition
4. John F.Wakerly “Digital Design Principles & Practices 4th Edition

5. SystemVerilog for Verification – Chris Spear
6. Verilog HDL: A Guide to Digital Design and Synthesis, Second Edition by Samir Palnitkar

Online Resources:

1.https://www.xilinx.com/products/design-tools/ise-design-suite.html

EC2110 PROFESSIONAL ETHICS AND UNIVERSAL HUMAN VALUES

Course Objectives:

- To recognize the moral values that should guide the Engineering profession.
- To resolve moral issues concerning one's profession.
- To develop and exhibit a set of moral beliefs and attitudes that engineers should inculcate.
- To inculcate social values and morality in one's life.
- To develop awareness about Professional/Engineering Ethics and Human Values.

Course Outcomes :

Students will be able to:

- Apply the conceptual understanding of ethics and values into everyday practice.
- Understand the importance of moral awareness and reasoning in life.
- Acquire professional and moral etiquette that an engineer requires.
- Develop the acumen for self-awareness and self-development.
- Develop cultural tolerance and integrity.
- Tackle real-life challenges with empathy.

SYLLABUS

Unit - I: HUMAN VALUES

Values - Respect - Caring - Sharing - Honesty- Courage - Self confidence - Communal Harmony Morals - Virtues

Unit –II PROFESSIONAL VALUES

Integrity - Discipline - Valuing time - Cooperation - Commitment - Code of conduct - Challenges in the workplace

Unit – III PROFESSIONAL ETHICS

Overview - Engineering ethics - Moral issues - Profession - Models of professional roles - Responsibility

Unit – IV RESPONSIBILITIES AND RIGHTS

Safety and risk - Collegiality and loyalty - Confidentiality - Occupational crime - Human rights - Employee rights - Intellectual property rights

Unit – V GLOBAL ISSUES

Globalization - Environmental ethics - Computer ethics - Code of ethics - Multinational corporations - Engineers as advisors in Planning and Policy making

Textbook:

1.R.S. Nagarazan. A Textbook on Professional Ethics and Human Values. New Age International Publishers. 2006.

Reference Books:

1. Premvir Kapoor. Professional Ethics and Human Values. Khanna Publishing House. 2019.
2. B.S. Raghavan. Human Values and Professional Ethics. S.Chand Publications. 2012.
3. R.R. Gaur & Others. A Foundation Course in Human Values and Proff. Ethics. Excel Books. 2009.
4. A. N. Tripathi. Human Values. New Age International (P) Limited. 2009
5. R. Subramanian. Professional Ethics. OUP India. 2013.

EC2111 NCC/NSS

EC2201 PROBABILITY THEORY AND RANDOM PROCESS

Course Objectives: The objectives of this course are

- To understand the concept of Bayes' theorem
- To learn about operations on single and multi-random variables.
- To find the cross correlation and autocorrelation of signals
- To learn about various types of oscillators

Course Outcomes: At the end of the course the student will be able to

- Compute probabilities and conditional probabilities of events defined on a sample space.
- Compute statistical averages of one random variable using probability density and distribution functions and also transform random variables from one density to another
- Identify different types of random variables and compute statistical averages of these random variables using probability density and distribution functions and also perform multiple transformations of multiple random variables.
- Determine stationarity and ergodicity and compute correlation and covariance of a random process.
- Compute and sketch the power spectrum of the response of a linear time-invariant system excited by a band pass/band-limited random process

SYLLABUS

Probability Theory: Sample spaces, Events, Probability definition and Axioms, Mathematical model of experiments, Probability as relative frequency, Joint and conditional probability, Properties of joint probability and conditional probability, Total probability, Bayes' theorem, independent events: Two events and multiple events, properties of independent events.

Random Variables and Operations on one random variable: Random variable concept, Distribution function, Density function, Gaussian random variable, Conditional distribution and density function, Expectation, Moments, Functions that give moment, Transformations of a random variable.

Multiple random variables: Vector random variables, Joint distribution and its properties, Joint density and its properties, Conditional distribution and density, statistical independence, Distribution and density of a sum of random variables, Central limit theorem.

Operations on multiple random variables: Expected values of a function of random variables: Joint moments about the Origin, joint central moments, Joint characteristic functions, Jointly Gaussian random variables: Two random variables, n-random variables, properties of Gaussian random variables, Transformations of multiple random variables: One function, Multiple functions, Inequalities of Chebyshev and Schwartz.

Random Processes: The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept of Stationarity and Statistical Independence, First-Order Stationary Processes, Second- Order and Wide-Sense Stationarity, (N-Order) and Strict-Sense Stationarity, Time Averages and Ergodicity, Mean-Ergodic Processes, Autocorrelation Function and Its Properties, Cross-Correlation Function and Its Properties, Covariance Function and their properties, Weiner-Kin chine Theorem ,Gaussian Random Processes, Poisson Random Process.

Linear Systems with Random Inputs: System Response – Convolution, Mean and Mean-squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output, Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output, Band pass, Band-Limited and Narrowband Processes.

Text Books:

1. Probability Theory and Random Signal Principles, Peyton Z. Peebles, 4th edition Tata McGrew Hill Publishers,2002.
2. Probability Theory and Random Processes, S. P. Eugene Xavier, S. Chand and Co. New Delhi, 1998 (2nd Edition).

Reference Books:

1. Fundamentals of Applied Probability and Radom processes, Oliver Crib, Elsevier Publications, 2007.
2. Probability, Random Variables and Stochastic Processes – Athanasios Papoulis and S. Unnikrishna Pillai, PHI, 4th Edition, 2002.
3. Probability theory and Stochastic Processes, B. PrabhakaraRao, T.S.R. Murthy, BS Publications, Hyderabad, 2012.

EC2202 ELECTROMAGNETIC FIELD THEORY AND TRANSMISSION LINES

Course Objectives: The objectives of this course are

- To Define the Basic Electrostatic and Magneto static Law Derive the Maxwell's Equation and apply to the basic electromagnetic problem.
- To Analyze the boundary conditions, at the interface of two different media and also time varying electric and magnetic fields.
- To Explain the wave propagation in different types of mediums and also transmission line fundamentals.
- To Demonstrate the smith chart-configuration.

Course Outcomes: At the end of the course the student will be able to

- To evaluate the design and problem-solving skills
- Able to define electrostatic and magneto static laws
- Able to derive the Maxwell's equations in static and dynamic fields
- Able to describe energy density on electric/magnetic fields' and poynting theorem.
- Able to analyze the EM wave propagation in different mediums
- Able to relate the wave propagation through transmission lines and compute the impedance using smith chart for matching the load impedance.

SYLLABUS

Electrostatics: Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Maxwell's Two Equations for Electrostatic Fields, Energy density, Convection and Conduction Currents, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations; Capacitance.

Magneto statics: Biota-Savart Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magneto static Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Inductances and Magnetic Energy.

Maxwell's Equations: Faraday's Law and Transformer emf, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Final Forms and Word Statements. Conditions at a Boundary Surface: Dielectric-Dielectric and Dielectric-Conductor Interfaces. Related Problems.

Electromagnetic Waves: Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves, Wave Propagation in Lossless and Conducting Media, Conductors &

Dielectrics – Characterization, Polarization, Reflection and Refraction of Plane Waves – Normal and Oblique Incidences for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance. Poynting Vector and Poynting Theorem

Transmission Lines: Introduction to Transmission line equations, Primary & Secondary constants Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Loss lessness /Low Loss Characterization, Distortion, Loading, SC and OC Lines, Reflection Coefficient, VSWR, λ/8, λ/4, λ/2-line impedance Transformations, Smith Chart – Configuration and Applications.

Waveguides: Introduction, Rectangular Waveguides, electric and magnetic field patterns in TE10 and TE11 mode configuration, modes of TE wave in rectangular waveguide, field equations, impossibility of TEM wave propagation in waveguides, cutoff frequency of rectangular waveguide, propagation constant, wave impedance, phase velocity, group velocity, dominant mode and degenerate modes, related problems.

Text Books:

1. Electromagnetic Field Theory and Transmission Lines, Gottapu Sasibhushana Rao, Wiley India Pvt. Ltd., New Delhi, 1st Ed.,2012.
2. Electromagnetics with Applications, Kraus and Flesch, McGraw Hill, 1999.
3. Electromagnetic Field Theory and Transmission Lines, G.S.N. Raju, Pearson Education (Pvt., Ltd., New Delhi, 2005.

Reference Books:

1.Elements of Electromagnetic – Matthew N.O. Sadiku, Oxford Univ. Press, 3rd ed., 2001.
2. Engineering Electromagnetics, W. H. Hayt Jr., McGraw Hill – New York.
3. EM Waves and Radiating Systems, E. C. Jordan, PHI, 1997.

EC2203 MICROPROCESSORS AND MICROCONTROLLERS

Course Objectives: The objectives of this course are

- To know the internal organization, addressing modes and instruction sets of 8086 processor.
- To master the assembly language programming using concepts like assembler directives, procedures, software interrupts etc.
- To familiarize with the 8051 Instruction sets and addressing modes.
- To know the various peripheral devices such as 8255, 8279, 8251 and 8259.

Course Outcomes: At the end of the course the student will be able to

- Realize the architecture and working of 16-bit microprocessor 8086.
- Apply assembly language programming skills to perform arithmetic, logical, string, stack and interrupt operations with 8086.
- Understand the interfacing of memory and different peripherals with 8086 microprocessors.
- Outline the architectural features of advanced microprocessors.
- Summarize the basic concepts of 8051 microcontroller.
- Comprehend the architecture and instruction set of PIC and ARM microcontroller.

SYLLABUS

8086/8088 Microprocessors: Register organization of 8086, Architecture, signal description of 8086, physical memory organization, general bus operation, I/O addressing capability, special purpose activities, Minimum mode, maximum mode of 8086 system and timings, the processor 8088, machine language instruction formats, addressing mode of 8086, instruction set off 8086, assembler directives and operators.

Programming With 8086 Microprocessors: Machine level programs, programming with an assembler, Assembly language programs, introduction to stack, stack structure of 8086/8088, interrupts and interrupt service routines, interrupt cycle of 8086, non-mask able interrupt and mask able interrupts, interrupt programming.

Basic And Special Purpose Programmable Peripherals And Their Interfacing With 8086/88: Semiconductor memory interfacing, dynamic RAM interfacing, interfacing i/o ports, PIO 8255 modes of operation of 8255, interfacing to D/A and A/D converters, stepper motor interfacing, control of high power devices using 8255.Programmable interrupt controller 8259A,

the keyboard /display controller8279, programmable communication interface 8251 USART, DMA Controller 8257.

Advanced Micro Processors: Salient features of 0386DX, architecture and signal description of 80386, register organization of 80386 and addressing modes, data types of 80386, real address mode of 80386, protected mode of 80386, segmentation and Paging, virtual 8086 mode and enhanced mode. Instruction set of 80386.The coprocessor 80387.

8051 Microcontrollers: Introduction to microcontrollers, 8051Microcontrollers, 8051pin description, connections, I/O ports and memory organization, MCS51addressing modes and instructions, assembly language programming tools.

PIC Microcontrollers and ARM 32-BIT Microcontroller: Overview and features, PIC16Cx/7X instructions, interrupts in PIC 16C61/71, PIC 16F8XX Flash controllers, I/O ports and timers. Introduction to 16/32 Bit processors, ARM architecture and organization, ARM / Thumb programming model, ARM / Thumb instruction set.

Text Books:

1. A.K. Ray, K.M. Bhurchandi," Advanced Microprocessors and Peripherals", Tata McGraw Hill Publications, 2000.

2. N. Sentil Kumar, M. Saravanan, S. Jeevananthan, "Microprocessors and Microcontrollers", OxfordUniversity Press, 2010.

Reference Books:

1. Ajay V Deshmukh," Microcontrollers", TATA McGraw Hill publications, 2012.

2. Krishna Kant, "Microprocessors and Microcontrollers", PHI Publications, 2010.

EC2204 LINEAR ICS & APPLICATIONS

Course Objectives: The objectives of this course are

- To understand & learn the measuring techniques of performance parameters of OP-AMP.
- To learn the linear and non-linear applications of operational amplifiers.
- To understand the analysis & design of different types of active filters using op-amps.
- To learn the internal structure, operation and applications of different analog ICs.
- To Acquire skills required for designing and testing integrated circuits.

Course Outcomes: At the end of the course the student will be able to

- Outline the fundamental concepts of an operational amplifier.
- Make use of an op-amp to design linear and non-linear circuits.
- Analyze and design Signal Conditioning Circuits using op-amp.
- Analyze and design active filters using op-amp.
- Develop timers and PLL's by making use of 555 and 565 linear IC's.
- Differentiate various types of DAC's and ADC's using op-amp.

SYLLABUS

Operational Amplifiers: Design Aspects of Monolithic Op-Amps, Ideal Characteristics, AC and DC Characteristics, Data sheet Specifications, Offset Voltages and Currents, Frequency Compensation Techniques, Measurement of Op-Amp Parameters.

Applications of Op-Amps: Inverting and Non-inverting Amplifiers, Integrator, Differentiator, Comparator, Logarithmic Amplifiers, Instrumentation Amplifiers, Op-Amp Phase Shift, Wein-bridge and Quadrature Oscillator, Voltage Controlled Oscillators, Voltage to Current and Current to Voltage Converters., Analog Multiplexers.

Signal Conditioning Circuits: Rectifiers, Peak Detection and, Wave form Generators, Sample and Hold Circuits, Multivibrators, Square Wave Generators, Schmitt trigger.

Active Filters: LPF, HPF, BPF, BEF, All-pass Filters, Higher Order Filters and their Comparison, Switched Capacitance Filters.

Special ICs: 555 Timers, 556 Function Generator ICs and their Applications, Three Terminal IC Regulators, IC 1496 (Balanced Modulator), IC 565 PLL and its Applications, Function Generators, Voltage to Frequency and Frequency to Voltage Converters.

Digital to Analog and Analog to Digital Converters: DAC techniques, Weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, Different types of ADCs-parallel Comparator

type ADC, Counter type ADC, Successive approximation ADC and dual type ADC, DAC and ADC specifications, Integrated ADC and DACs.

Text Books:

1. Ramakant A. Gayakwad, ―OP-AMP and Linear ICs‖, 4th Edition, Prentice Hall / Pearson Education, 2015.
2. Linear Integrated Circuits- D. Roy Chowdhury, New Age International(p) Ltd,2nd Edition, 2003.

Reference Books:

1. Integrated Circuits- Botkar, Khanna Publications, Edition 2008.
2. Applications of Linear ICs- Clayton, Publisher: Macmillan Education UK, Year: 1978.
3. S.Salivahanan & V.S. Kanchana Bhaskaran, ―Linear Integrated Circuits‖, TMH,2nd Edition, 4 th Reprint, 2016.
4. Operational Amplifiers & Linear Integrated Circuits: Theory and Application / 3E by James M. Fiore Version 3.2.6, 2021.

EC2205 PULSE AND DIGITAL CIRCUITS

Course Objectives: The objectives of this course are

- To understand the concept of wave shaping circuits, Switching Characteristics of diode and transistor.
- To study the design and analysis of various Multivibrators.
- To understand the functioning of different types of time-base Generators.
- To learn the working of logic families.

Course Outcomes: At the end of the course the student will be able to

- Outline the response of linear wave shaping circuits for the standard inputs.
- Extend the applications of diodes and transistors to non-linear wave shaping.
- Understand the operation, analysis and design of Bistable multivibrators using BJTs.
- Make use of basic electronic components to design monostable and astable multivibrators.
- Categorize the operation of various time base generators.
- Realization of logic gates using different logic families.

SYLLABUS

Linear Wave Shaping: High pass and Low pass RC circuits, Response of High pass and Low pass RC circuits to sinusoidal, step, pulse, square, exponential and Ramp inputs, High pass RC circuit as a differentiator, Low pass RC circuit as an integrator. Attenuators and its application as CRO probe, RL and RLC Circuits and their response for step input, Ringing Circuit.

Nonlinear Wave Shaping: Diode clippers, Transistor Clippers, clipping at two independent levels, Comparator, Applications of voltage Comparators, Diode Comparator, Clamping Operation, Clamping Circuits using Diode with Different Inputs, Clamping Circuit Theorem, Practical Clamping circuits, Effect of diode Characteristics on Clamping Voltage.

Bistable Multivibrators: Transistor as a switch, switching times of a transistor, Design and Analysis of Fixed-bias and self-bias transistor binary, commutating capacitors, Triggering schemes of Binary, Transistor Schmitt trigger and its applications.

Monostable and Astable Multivibrators: Design and analysis of Collector coupled Monostable Multivibrator, Expression for the gate width and its waveforms. Design and analysis of Collector coupled Astable Multivibrator, expression for the Time period and its waveforms, The Astable Multivibrator as a voltage to frequency convertor.

Time Base Generators: General features of a time-base signal, Methods of Generating time base waveform, Exponential voltage sweep circuit, Basic principles of Miller and Bootstrap time base generators, transistor Miller sweep generator, transistor Bootstrap sweep generator, Current Sweep circuit, Linearity correction through adjustment of driving Waveform.

Synchronization And Frequency Division: Principles of Synchronization, Frequency division in sweep circuit, Synchronization of A stable Multivibrators, Synchronization of a sweep circuit with symmetrical signals, Sine wave frequency division with a sweep circuit.
LOGIC GATES: Realization of gates using diodes and Transistors, RTL, DTL.

Text Books:

1. Pulse Digital and Switching Waveforms, J. Millman and H. Taub, McGraw-Hill, 2nd Edition 1991.
2. Pulse switching and digital circuits – David A. Bell, PHI ,5thEdn., oxford university press.

References Books:

1. Pulse and Digital Circuits, K. VenkatRao, Pearson Education India, 2nd Edition, 2010.
2. Pulse and Digital Circuits, A. Anand Kumar, PHI, second edition, 2005.

EC2206 MICROPROCESSORS AND MICROCONTROLLERS LAB

Course Objectives: The objectives of this course are

- To study programming based on 8086 microprocessor and 8051 microcontrollers.
- To study 8086 microprocessor-based ALP using arithmetic, logical and shift operations.
- To study modular and Dos/Bios programming using 8086 microprocessors.
- To study to interface 8086 with I/O and other devices.
- To study parallel and serial communication using 8051 microcontrollers.

Course Outcomes: At the end of the course the student will be able to

- Build basic assembly language programs based on arithmetic operations using 8086 microprocessors.
- Develop basic assembly language programs based on arithmetic, logical, shift and string operations using MASM32 assembler.
- Execution of DOS/BIOS interrupts with 8086 microprocessors using MASM32 assembler.
- Implementing basic assembly language programs of 8051 microcontroller using KEIL simulator.
- Construct standalone applications by Interfacing I/O peripheral devices with 8086 microprocessors.

SYLLABUS

List of Experiments:

8086 ESA-86/88 KIT PROGRAMMING

1. Write a Program to add two 16-bit numbers stored in two memory locations 2000h and 2002h and store the result in another memory location 2004h.
2. Write a Program to divide two 16-bit numbers stored in two memory locations 2000h and 2002h and store the result in another memory location 2004h.
3. Write a Program to multiply two 16-bit numbers stored in two memory locations 2000h and 2002h and store the result in another memory location 2004h.
4. Write a Program to add two 32-bit numbers stored in two memory locations 2000h and 2004h and store the result in another memory location 2008h.
5. Write a program to find factorial of a given number.

8086 PROGRAMMING USING MASM32 ASSEMBLER

6. Write a program to perform addition operation on two multi byte numbers.
7. Write a program to perform subtraction operation on two multi byte numbers.
8. Write a program to sort a given set of hexadecimal numbers.
9. Write a program to find whether the given string is a palindrome or not.
10. Write a program for inserting an element at a specified location in a given string.

11. Write a program to convert BCD numbers into equivalent binary value. Write a subroutine for the conversion.
12. Write a program to read a keyboard and display the characters on the PC screen using DOS/BIOS commands.

8051 PROGRAMMING USING KEIL SIMULATOR

13. Write a program to generate a square wave of 50% duty cycle at pin P2.1 using timer 0 in mode1.Assume XTAL=11.0592MHz.
14. Write a program to send a message "WELCOME" serially at 9600 baud rate continuously through serial port of 8051.

EC2207 LINEAR ICS & PULSE CIRCUITS LAB

Course Objectives: The objectives of this course are

- To apply operational amplifiers in linear and nonlinear applications.
- To acquire the basic knowledge of special function ICs.
- To Gain the practical hands-on experience on 555 Timer applications.
- To Gain the practical hands-on experience on 723 Voltage Regulator and Three terminal voltage regulators.

Course Outcomes:

- Design various linear & non-linear wave shaping circuits.
- Basic characteristics of op-amp parameters and its measurements, design compensating circuits.
- Develop applications using linear and nonlinear characterization of OPAMP.
- Understand the functionality of IC723 and determine the load and line regulations
- Design the Multivibrator circuits using IC555.

SYLLABUS

List of Experiments:

1. Linear wave shaping
2. Non-linear wave shaping
3. UJT as a Relaxation oscillator
4. Measurement of parameters of Op-amp
5. Schmitt trigger
6. Frequency response of Active filters
7. Op-amp as Wave form generator
8. IC-555 as an Astable Multi vibrator
9. Study of Instrumentation Amplifier
10. Voltage regulator using IC-723
11. Monostable Multi vibrator using IC-555.
12. Bistable Multi vibrator using transistors.

EC2208 ELECTRONIC CIRCUITS SIMULATION

Course Objectives: The objectives of this course are

- To Verify Electronic devices and Circuits experiments.
- To Verify Analog Electronics and Circuits experiments.
- To Verify Analog Communication experiments
- To Verify Digital Communication experiments.

Course Outcomes: At the end of the course the student will be able to

- Implement electronic circuits through Multisim.
- Implement Analog electronic circuits through Multisim.
- Implement Analog communication experiments through LABVIEW.
- Implement Digital communication experiments through LABVIEW

SYLLABUS

Electronic Devices and Circuits Experiments:

1. Study and plot VI Characteristics of a Zener Diode, using MULTISIM
2. Design, Construct and Test a Full Wave Rectifier using diode and to draw its performance characteristics, MULTISIM
3. Study and plot Input and output characteristics of a Bipolar Junction Transistor (BJT) in Common Emitter (CE) configuration, MULTISIM
4. Study and plot the Drain and Transfer characteristics of a Junction Field Effect Transistor, MULTISIM
5. Study and plot Input and output characteristics of a Bipolar Junction Transistor (BJT) in Common Emitter (CB) configuration, MULTISIM

Analog Electronics & Circuits Experiments:

1. Common emitter and common source Amplifier
2. Two stage RC coupled Amplifier
3. RC Phase shift oscillator using transistors
4. Class-B Push pull Amplifier
5. Construct and Test Clipper & Clamper using discrete components, MULTISIM

Analog communication and Digital communication Experiments:

1. Using Lab-View software simulates AM modulation and demodulation system
2. Using Lab-View software simulate FM modulation and demodulation system
3. Observe the process of Pulse Amplitude Modulation and Demodulation
4. Analyze the process of frequency division multiplexing and frequency division demultiplexing.
5. Study of quantization and PCM technique

EC2209 ENVIRONMENTAL SCIENCE

Course Objectives: The objectives of this course are

- To Familiarize the fundamental aspects of environment and the environmental management.
- To Provide information of some of the important international conventions which will be useful during the future endeavors after graduation.
- To Make realize the importance of natural resources management for the sustenance of the life and the society.
- To Apprise the impact of pollution getting generated through the anthropogenic activities on the environment.
- To Provide the concept of Sustainable Development, energy and environmental management.
- To Impart knowledge on the new generation waste like e-waste and plastic waste.

Course Outcomes: At the end of the course the student will be able to

- Knowledge on the fundamental aspects of environment and the environmental management.
- The knowledge on the salient features of the important international conventions.
- Understanding of the importance of natural resources management for the sustenance of the life and the society.
- Familiarity on various forms of pollution and its impact on the environment.
- Understand the elements of Sustainable Development, energy and environmental management.
- Knowledge on the new generation waste like e-waste and plastic waste.

SYLLABUS

Introduction: Structure and functions of Ecosystems-Ecosystems and its Dynamics-Value of Biodiversity-impact of loss of biodiversity, Conservation of bio-diversity. Environmental indicators - Global environmental issues and their impact on the ecosystems.
Salient features of international conventions on Environment: Montreal Protocol, Kyoto protocol, Ramsar Convention on Wetlands, Stockholm Convention on Persistent Organic Pollutants, United Nations Framework Convention on Climate Change (UNFCCC),

Natural Resources Management: Importance of natural resources management-Land as resource, Land degradation, Soil erosion and desertification, Effects of usage of fertilizer, herbicides and pesticide- watershed management.

Forest resources: Use and over-exploitation, Mining and dams – their effects on forest ecosystems and the living beings.
Water resources: Exploitation of surface and groundwater, Floods, droughts, Dams: benefits and costs.
Mineral Resources: Impact of mining on the environment and possible environmental management options in mining and processing of the minerals.
Sustainable resource management (land, water, and energy), and resilient design under the changing environment.

Environmental Pollution: Local and Global Issues. Causes, effects and control measures. Engineering aspects of environmental pollution control systems.
Air pollution: impacts of ambient and indoor air pollution on human health. Water pollution: impacts water pollution on human health and loss of fresh water resources. Soil pollution and its impact on environment. Marine pollution and its impact on blue economy. Noise pollution.

Solid waste management: Important elements in solid waste management- Waste to energy concepts. Air (prevention and control of pollution) Act, Water (prevention and control of pollution) Act and their amendments. Salient features of Environmental protection Act, 1986.
Sustainable Development: Fundamentals of Sustainable Development– Sustainability Strategies and Barriers – Industrialization and sustainable development. Circular economy concepts in waste (solid and fluid) management.

Energy and Environment: Environmental Benefits and challenges, Availability and need of conventional energy resources, major environmental problems related to the conventional energy resources, future possibilities of energy need and availability. Solar Energy: process of photovoltaic energy conversion, solar energy conversion technologies and devices, their principles, working and applications, disposal of solar panel after their usage. Biomass energy: Concept of biomass energy utilization, types of biomass energy, conversion processes, Wind Energy, energy conversion technologies, their principles, equipment and suitability in context of India.
Management of plastic waste and E-waste: Sources, generation and characteristics of various e- and plastic wastes generated from various industrial and commercial activities; Waste management practices including onsite handling, storage, collection and transfer. E-waste and plastic waste processing alternatives. E-Waste management rules and Plastic waste management rules, 2016 and their subsequent amendments.

Text Books:

1. Bharucha, Erach (2004). Textbook for Environmental Studies for Undergraduate Courses of all Branches of Higher Education, University Grants Commission, New Delhi.
2. Base, M., Xavier, S. (2016). Fundamentals of Environmental Studies, Cambridge University Press, India

3. Masters, G. M., &Ela, W. P. (1991). Introduction to environmental engineering and science. Englewood Cliffs, NJ: Prentice Hall.
4. Enger, E. and Smith, B., Environmental Science: A Study of Interrelationships, Publisher: McGraw-Hill Higher Education; 12th edition, 2010.

Reference Books:

1. Sharma, P. D., & Sharma, P. D. (2005). Ecology and environment. Rastogi Publications
2. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
3. Clark R.S. (2001). Marine Pollution, Clanderson Press Oxford (TB)
4. Jadhav, H & Bhosale, V.M. (1995). Environmental Protection and Laws. Himalaya Pub. House, Delhi 284 p.
5. MoEF&CC, Govt. of India, CPCB: E-waste management rules, 2016 and its amendments 2018.
6. MoEF&CC, Govt. of India, CPCB: Plastic waste management rules, 2016.

ANDHRA UNIVERSITY
DEPARTMENT OF ELECTRICAL ENGINEERING

SCHEME AND SYLLABI
(with effect from 2022-23)

B.Tech & B.Tech+M.Tech
I Year - I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
EE1101	BS	Mathematics – I	4	0	30	70	100	3
EE1102	BS	Physics	4	0	30	70	100	3
EE1103	ES	Introduction to Python	4	0	30	70	100	3
EE1104	ES	Fundamentals of Electrical Engineering.	4	0	30	70	100	3
EE1105	ES	Basic Electronics Engineering.	4	0	30	70	100	3
EE1106	ES	Python Programming Lab	0	3	50	50	100	1.5
EE1107	BS	Physics Lab	0	3	50	50	100	1.5
EE1108	ES	Electrical Engineering Workshop	0	3	50	50	100	1.5
							Total Credits	**19.5**

B.Tech & B.Tech+M.Tech
I Year - II Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
EE1201	BS	Mathematics – II	4	0	30	70	100	3
EE1202	BS	Green Chemistry	4	0	30	70	100	3
EE1203	HSS	English	4	0	30	70	100	3
EE1204	ES	Computer Programming and Numerical Methods	4	0	30	70	100	3
EE 1205	ES	Industry 4.O	4	0	30	70	100	3
EE 1206	HSS	English Language Lab	0	3	50	50	100	1.5
EE 1207	BS	Green Chemistry Lab	0	3	50	50	100	1.5
EE 1208	ES	Computer Programming and Numerical Methods Lab	0	3	50	50	100	1.5
							Total Credits	**19.5**

B.Tech & B.Tech+M.Tech
II Year - I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
EE2101	BS	Operations Research	4	0	30	70	100	3
EE2102	PC	Network Theory	4	0	30	70	100	3
EE2103	PC	Electronic Circuits	4	0	30	70	100	3
EE2104	PC	Electrical Machines - I	4	0	30	70	100	3
EE2105	HSS	Managerial Economics	4	0	30	70	100	3
EE2106	PC	Electrical Networks Lab	0	3	50	50	100	1.5
EE2107	PC	Electrical Machines – I lab	0	3	50	50	100	1.5
EE2108	PC	Electronic Circuits Lab	0	3	50	50	100	1.5
EE2109	SC	Matlab & Interfacing	1	2	50	50	100	2
EE2110	MC	Professional Ethics & Universal Human values	0	0	-	100	100	0
EE2111	MC	NCC/NSS	0	2	-	-	-	0
							Total credits	**21.5**

B.Tech & B.Tech+M.Tech
II Year - II Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
EE2201	ES	Signals & Systems	4	0	30	70	100	3
EE2202	BS/PC	Electrical Measurements	4	0	30	70	100	3
EE2203	PC	Electrical Machines – II	4	0	30	70	100	3
EE2204	PC	EMF Theory	4	0	30	70	100	3
EE2205	PC	Electrical Engineering Materials	4	0	30	70	100	3
EE2206	PC	Electrical Machines – II Lab	0	3	50	50	100	1.5
EE2207	PC	Electrical Measurements lab	0	3	50	50	100	1.5
EE2208	SC	Electrical CAD	1	2	50	50	100	2
EE2209	MC	Environmental Science	0	0	-	100	100	0
							Total credits	**20**
Internship I								

EE-1101 MATHEMATICS-I

Course Objectives

- To transmit the knowledge of Partial differentiation.
- To know of getting maxima and minima of function of two variables and finding errors and approximations.
- To evaluate double and triple integrals, volumes of solids and area of curved surfaces.
- To expand a periodical function as Fourier series and half-range Fourier series.

Course Outcomes

- Find the partial derivatives of functions of two or more variables.
- Evaluate maxima and minima, errors and approximations.
- Evaluate double and triple integrals, volumes of solids and area of curved surfaces.
- To expand a periodical function as Fourier series and half-range Fourier series.
- Have a fundamental understanding of Fourier series and be able to give Fourier expansions of a given function.

Syllabus

Partial Differentiation
Introduction - Functions of two or more variables - Partial derivatives - Homogeneous functions – Euler's theorem - Total derivative - Change of variables – Jacobins. Mean value Theorems (without proofs)

Applications of Partial Differentiation
Geometrical interpretation -Tangent plane and Normal to a surface -Taylor's theorem for functions of two variables - Errors and approximations -Total differential. Maxima and Minima of functions of two variables - Lagrange's method of undetermined multipliers - Differentiation under the integral Sign - Leibnitz's rule.

Multiple Integrals
Introduction - Double Integrals - Change of Order of Integration - Double Integrals in Polar Coordinates - Triple Integrals - Change of Variables.

Multiple Integrals-Applications
Area enclosed by plane curves - Volumes of solids - Area of a curved surface - Calculation of Mass - Center of gravity - Moment of inertia - product of inertia – principal axes- Beta Function - Gamma Function - Relation between Beta and Gamma Functions. Error Function or Probability Integral.

Fourier Series
Introduction - Euler's Formulae - Conditions for a Fourier Expansion - Functions having points of discontinuity - Change of Interval - Odd and Even Functions - Expansions of Odd or Even Periodic Functions, Half-Range Series - Parseval's Formula. Practical Harmonic analysis.

Text Book

1. Scope and Treatment as in "Higher Engineering Mathematics", by Dr. B.S. Grewal, 43rd Edition, Khanna publishers.

Reference Books

1. Graduate Engineering Mathematics by V B Kumar Vatti., I.K.International publishing house Pvt. Ltd.
2. Advanced Engineering Mathematics by Erwin Kreyszig.
3. A text book of Engineering Mathematics, by N.P. Bali and Dr. Manish Goyal, Lakshmi Publications.
4. Advanced Engineering Mathematics by H.K. Dass. S. Chand Company.
5. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Graw Hill Company.
6. Higher Engineering Mathematics by Dr. M.K.Venkataraman.

EE-1102 PHYSICS

Course Objectives

- To impart knowledge in basic concept of physics of Thermodynamics relevant to engineering applications.
- To grasp the concepts of physics for electromagnetism and its application to engineering. Learn production of Ultrasonics and their applications in engineering.
- To Develop understanding of interference, diffraction and polarization: connect it to a few engineering applications.
- To Learn basics of lasers and optical fibers and their use in some applications.
- To Understand concepts and principles in quantum mechanics and Nanopahse Materials. Relate them to some applications.

Course Outcomes

- Understand the fundamentals of Thermodynamics and Laws of thermodynamics. Understand the working of Carnot cycle and concept of entropy.
- Gain Knowledge on the basic concepts of electric and magnetic fields. Understand the concept of the nature of magnetic materials. Gain knowledge on electromagnetic induction and its applications.
- Understand the Theory of Superposition of waves. Understand the formation of Newton's rings and the working of Michelson's interferometer. Remember the basics of diffraction, Evaluate the path difference. Analysis of Fraunhofer Diffraction due to a single slit
- Understand the interaction of matter with radiation, Characteristics of Lasers, Principle, working schemes of Laser and Principle of Optical Fiber. Realize their role in optical fiber communication.
- Understand the intuitive ideas of the Quantum physics and understand dual nature of matter. Compute Eigen values, Eigen functions, momentum of Atomic and subatomic particles using Time independent one Dimensional Schrodinger's wave equation. Understand the fundamentals and synthesis processes of Nanophase materials.

Syllabus

Thermodynamics
Introduction Heat and Work, First law of thermodynamics and applications, Reversible and Irreversible process, Carnot cycle and Efficiency, Second law of thermodynamics, Carnot's Theorem, Entropy, Second law in terms of entropy, Entropy and disorder, Third law of thermodynamics (statement only).

Electromagnetism
Concept of electric flux, Gauss's law - some applications, Magnetic field - Magnetic force on current, torque on current loop, The Biot-Savart's Law, B near a long wire, B for a circular Current loop, Ampere's law, B for a solenoid, Hall effect, Faraday's law of induction, Lenz's law, Induced magnetic fields, Displacement current, Maxwell's equations (no derivation), Magnetic materials: Classification of magnetic materials and properties.

Ultrasonics
Introduction, Production of Ultrasonics – Piezoelectric and Magnetostriction methods, acoustic grating, applications of ultrasonics.

Optics
Interference: Principles of superposition – Young's Experiment – Coherence - Interference in thin films (reflected light), Newton's Rings, Michelson Interferometer and its applications.

Diffraction: Introduction, Differences between interference and diffraction, Fresnel and Fraunhofer diffraction, Fraunhofer diffraction at a single slit **(**Qualitative and quantitative treatment**)**.

Polarisation: Polarisation by reflection, refraction and double refraction in uniaxial crystals, Nicol prism, Quarter and Half wave plate, circular and elliptical polarization.

LASERS and Fibre Optics
Introduction, characteristics of a laser beam, spontaneous and stimulated emission of radiation, population inversion, Ruby laser, He-Ne laser, Semiconductor laser, applications of lasers

Introduction to optical fibers, principle of propagation of light in optical fibers, Acceptance Angle and cone of a fibre, Numerical aperture, Modes of propagations, classification of fibers, Fibre optics in communications, Application of optical fibers.

Modern Physics
Introduction, De Broglie concept of matter waves, Heisenberg uncertainty principle, Schrodinger time independent wave equation, application to a particle in a box. Free electron theory of metals, Kronig - Penney model (qualitative treatment), Origin of energy band formation in solids, Classification of materials into conductors, semi conductors and insulators.

Nanophase Materials
Introduction, properties, Top-down and bottom-up approaches, Synthesis - Ball milling, Chemical vapour deposition method, sol-gel methods, Applications of nano materials.

Text Books
1. Physics by David Halliday and Robert Resnick – Part I and Part II - Wiley.
2. A textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar - S. Chand
3. Engineering Physics by R.K. Gaur and S.L. Gupta –Dhanpat Rai

Reference Books
1. Modern Engineering Physics by A.S. Vadudeva
2. University Physics by Young and Freedman

EE1103 INTRODUCTION TO PYTHON

Course Objectives

- To develop skills on procedural oriented and object oriented programming in Python
- To understand and apply different data wrangling techniques using Python.
- To perform data analysis using python libraries like NumPy, Pandas and exploratory data analysis using Matplotlib

Course Outcomes

At the end of the course, a student should be able to:

- Acquire programming knowledge on Basics of Python
- Acquire programming knowledge on Text and File Handling
- Develop Python programs to Mean, Median, Mode, Correlation
- Acquire programming knowledge on thinker
- Acquire programming knowledge on NumPy, Pandas Library
- Acquire programming knowledge on Graph Visualizations in Python and Data Analysis using Python

Syllabus

Introduction to Python: Introduction to Python
What Is Python, History of Python, Unique Features of Python, Python Identifiers, Keywords, Python Core objects and Functions, Integral Types, Floating Point Types,Strings**,** Tuples, Lists, Sets, dictionaries, Iterating and copying collections

Python built in Functions and OOP
Python user defined functions, Python packages functions, Defining and calling Function, The anonymous Functions, Loops and statement in Python, Python Modules & Packages, Overview of Object oriented programming- Creating Classes and Objects Accessing attributes Built-In Class Attributes Destroying Objects, Writing and Reading Text Files, Writing and Parsing Text Files.

Thinker and GUI Programming

Tkinter ,wxPython, JPython, Tkinter Widgets-Tkinter Button, Tkinter Canvas, Tkinter Checkbutton, Tkinter Menubutton, Tkinter Menu, Tkinter Scrollbar, Tkinter PanedWindow, Tkinter Text, Tkinter Message, Tkinter Label, Tkinter Frame, Tkinter Listbox

NumPy Arrays and Vectorized Computation
NumPy arrays, Array creation, Indexing and slicing, Fancy indexing, Numerical operations on arrays, Array functions, Data processing using arrays, Loading and saving data, Saving an array, Loading an array, Linear algebra with NumPy, NumPy random numbers

Data Analysis with Pandas:
An overview of the Pandas package, The Pandas data structure-Series, The Data Frame, The

Essential Basic Functionality: Re-indexing and altering labels , Head and tail, Binary operations, Functional statistics , Function application Sorting, Indexing and selecting data, Computational tools, Working with Missing Data, Advanced Uses of Pandas for Data Analysis - Hierarchical indexing, The Panel data

Data Analysis and Visualization:
Data munging, Cleaning data, Filtering, Merging data, Reshaping data, Data aggregation, Grouping data, The Matplotlib API primer-Line properties, Figures and subplots, Exploring plot types-Scatter plots, Bar plots, Histogram plots, Legends and annotations, Plotting functions with Pandas

Text Books

1. Programming in Python 3: A Complete Introduction to Python Language, Mark Summerfield, Second Edition, Addison-Wesley Publications
2. Python: End-to-End Data Analysis Learning Path, Module 1: Getting Started with Python Data Analysis , Phuong VothiHong , Martin Czygan, , Packt Publishing Ltd

Reference Books

1. Learning Python, 5th Edition, Mark Lutz, Orielly Publications
2. Python for Data Analysis, Wes McKinney, Orielly Publications
3. How to Think Like a Computer Scientist: Learning with Python 3 Documentation 3rd Edition, Peter Wentworth, Jeffrey Elkner, Allen B. Downey, Chris Meyers
4. Core Python Programming, Second Edition, Wesley J. Chun, Prentice Hall
5. Python Cookbook – Recipes for Mastering Python 3,3rdEdition, David Beazley, Brian K. Jones, Oreilly

EE-1104 FUNDAMENTALS OF ELECTRICAL ENGINEERING

Course objectives

- To familiarize the basic laws in Electrical engineering.
- To brief the components of electrical engineering.
- To explain the principles of various measuring instruments.
- To illustrate fundamentals of AC and DC networks.
- A brief introduction to electrical wiring.
- To analyze the behavior of electrical circuits.

Course outcomes

- Demonstrate the basic principles of electrical components.
- Outline electric circuits using network laws and reduction techniques.
- Illustrate the behaviour of basic circuit elements for an AC excitation.
- Outline the working principle and construction of the measuring instruments.
- Choose appropriate wiring schemes.

Syllabus

Electrical Engineering Fundamentals

Electrical circuit elements and sources, Ohm's law, effect of temperature on resistance, resistance temperature coefficient, insulation resistance, Series-parallel connection of inductors, rise and decay of current in inductive circuit, Concepts of mutual inductance, Concept of Potential difference. Charging and discharging of capacitor, Concepts of induced emfs, comparison between electric and magnetic circuit, Kirchhoff's laws, star-delta conversion.

Fundamental Laws of Electrical Engineering

Coulombs law of Electrostatics (1^{st} law and 2^{nd}), Faradays laws of Electromagnetic induction, Fleming Left hand and Right hand rules, Lenz's law, Biot-Savart's law, Ampere circuital law, Maxwell's corkscrew rule.

Alternating Current Fundamentals

Sinusoidal voltage and currents, their mathematical and graphical representation, concept of cycle, period, frequency, instantaneous value, peak value, average value, RMS value, Peak factor and Form factor; Phase difference, lagging, leading and in phase quantities; and phasor representation, Rectangular and polar representation of phasors, study of A.C circuits (RL, RC and RLC series circuits), Phasor diagrams, voltage, current, powers and power factor, Introduction to poly-phase systems.

Fundamentals of Electrical Measurements (no need to explain errors and compensations)

Classification of instruments, various forces in indicating instruments (deflection, control and damping), construction and operation of MI and MC type instruments for voltage and current measurement, Construction and operation of dynamometer type wattmeter, Construction and operation of single-phase induction type energy meter.

Electrical Wiring

Symbols for various electrical equipment, Service mains, meter board and distribution board, Types of wirings and their Installations, Various types of conductors, conductor sizes and current ratings, Examples of house wiring (one lamp-one switch, Stair case, Corridor wiring, Power wiring), Elementary discussion on Circuit protective devices: fuse and Miniature Circuit Breaker (MCB's), significance of various parameters on name plates of equipment.

Note: The syllabus is prepared to give basic concepts of Electrical Engineering to First year students. Hence, in the evaluation, problems need to be avoided.

Text Books

1. Basic Electrical Engineering D. C. Kulshreshtha TMH 1st Edition.
2. S L Uppal and G C Garg, "Electrical Wiring, Estimating & Costing", Khanna Publishers, 2015.

Reference Books

1. Fundamentals of Electrical Engineering Rajendra Prasad PHI Third Edition 2014.
2. V. N. Mittal and Arvind Mittal, " Basic Electrical Engineering" McGraw Hill.
3. A.K.Sawhney, A Course in Electrical and Electronics Measurements and Instruments- DhanpatRai and Sons,Delhi, 2005.

EE-1105 BASIC ELECTRONICS ENGINEERING

Course objectives

- To brief evolution and impact of electronics.
- To illustrate principles and characteristics of semiconductor devices.
- To familiarize about various applications of electronic devices.
- To expose basic concepts and applications of op-amps.

Course outcomes

- Imparts the basic idea about types, specifications and common attributes of electronic components
- Familiarity in working with diodes, transistors, MOSFETs etc.,

Syllabus

Introduction
Evolution and Impact of Electronics in industries and in society, Familiarization of Resistors, Capacitors, Inductors, Transformers and Electro mechanical components

Semiconductor Diodes
Semiconductor materials- intrinsic and extrinsic types, Ideal Diode, Terminal characteristics of diodes: p-n junction under open circuit condition p-n junction under forward bias and reverse bias conditions p-n junction in breakdown region, Diode small signal model, Zener diode and applications, Rectifier Circuits, Clipping and Clamping circuits.

Bipolar Junction Transistors (BJTs)
Physical structure and operation modes, Active region operation of transistor, D.C. analysis of transistor circuits, Transistor as an amplifier, Biasing the BJT: fixed bias, emitter feedback bias, collector feedback bias and voltage divider bias, Basic BJT amplifier configuration: common emitter, common base and common collector amplifiers, Transistor as a switch: cut-off and saturation modes, High frequency model of BJT amplifier.

Field Effect Transistor (FET)
Enhancement-type MOSFET: structure and physical operation, current-voltage characteristics, Depletion-type MOSFET, D.C. operation of MOSFET circuits, MOSFET as an amplifier, Biasing in MOSFET amplifiers, Basic MOSFET amplifier configuration: common source, common gate and common drain types, High frequency model of MOSFET amplifier, Junction Field-Effect Transistor (JFET).

Operation Amplifier (Op-amps)
Ideal Op-amp, Differential amplifier: differential and common mode operation common mode rejection ratio (CMRR), Practical op-amp circuits: inverting amplifier, non -inverting amplifier, weighted summer, integrator, differentiator, other applications of op-amps: instrumentation circuits, active filters, controlled sources.

Text Books

1. Bell, D. A., Electronic Devices and Circuits, Oxford University Press
2. Principles of Electronics, V.K.Mehta, S.Chand Publications.

References Books

1. Boylested, R. L. and Nashelsky, L., Electronic Devices and Circuit Theory, Pearson Education

EE1106 PYTHON PROGRAMMING LAB

Course Objectives

- To impart writing skill of Python programming to the students and solving problems.
- To write and execute programs in Python to solve problems such as modularize the problems into small modules and then convert them into programs.
- To write and execute programs in Python to solve problems such as arrays, files, strings, structures and different numerical methods.
- This reference has been prepared for the beginners to help them understand the basic to advanced concepts related to Python Programming languages.

Course Outcomes

- Understand various computer components, Installation of software. Python programming development environment, compiling, debugging, and linking and executing a program using the development environment.
- Analysing the complexity of problems, modularize the problems into small modules and then convert them into programs.
- Construct programs that demonstrate effective use of Python features including arrays, strings, structures and files.
- Apply and practice logical ability to solve the real-world problems.

List of Experiments

1) Write a python program to add two numbers.
2) Write a python program to print a number is positive/negative using if-else.
3) Write a python program to find largest number among three numbers.
4) Write a python Program to read a number and display corresponding day using if_elif_else?
5) Write a program to create a menu with the following options
   To Perform Addititon 2. To Perform Subtraction 3. To Perform Multipication 4. To Perform Division Accepts users input and perform the operation accordingly. Use functions with arguments.
6) Write a python program to check whether the given string is palindrome or not.
7) Write a python program to find factorial of a given number using functions.
8) Write a Python function that takes two lists and returns True if they are equal otherwise false
9) Write a program to double a given number and add two numbers using lambda ()?
10) Write a program for filter() to filter only even numbers from a given list
11) Write a program to design calculator using thinker library which can perform addition , subtractions, square root, division, multiplication, modulus

EE-1107 PHYSICS LAB

Course Objectives

- To enable the students to acquire skill, technique and utilization of the Instruments
- Draw the relevance between the theoretical knowledge and to imply it in a practical manner with respect to analyze various electronic circuits and its components.
- To impart the practical knowledge in basic concepts of Wave optics, Lasers and Fiber optics.
- To familiarize the handling of basic physical apparatus like Vernier callipers, screw gauge,
- spectrometers, travelling microscope, laser device, optical fibre, etc.

Course Outcomes

- Ability to design and conduct experiments as well as to analyze and interpret
- Ability to apply experimental skills to determine the physical quantities related to Heat, Electromagnetism and Optics
- The student will learn to draw the relevance between theoretical knowledge and the means to imply it in a practical manner by performing various relative experiments.

List of Experiments

1. Determination of Radius of Curvature of a given Convex Lens by forming Newton's Rings.
2. Determination of Wavelength of Spectral Lines in the Mercury Spectrum by Normal Incidence method.
3. Study the Intensity Variation of the Magnetic Field along axis of Current Carrying Circular Coil.
4. Determination of Cauchy's Constants of a Given Material of the Prism using Spectrometer.
5. Determination of Refractive Index of Ordinary ray μ_o and Extraordinary μ_e ray.
6. Determination of Thickness Given Paper Strip by Wedge Method.
7. Calibration of Low Range Voltmeter.
8. Calibration of Low Range Ammeter.
9. Determination of Magnetic Moment and Horizontal Component of Earth's Magnetic Field.
10. Lees Method - Coefficient of thermal Conductivity of a Bad Conductor.
11. Carey Foster's Bridge – Verification of laws of Resistance and determination of Specific Resistance.
12. Melde's Apparatus – Frequency of electrically maintained Tuning Fork.
13. Photoelectric cell-Characteristics.
14. Planks Constants.
15. Laser- Diffraction.

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EE-1108 **Electrical Engineering Workshop**

Course objectives

- To familiarize with different types of basic electrical circuits.
- To learn how to work with common electrical wiring components.
- To get hands on experience with house hold wiring.
- To familiarize with the working skills of electrical house hold items.

Course outcomes

- Can be able to work with electrical wiring components in real time applications.
- Can be able to build various parts with electrical wiring in day-to-day life.

List of Experiments

Ten experiments on electrical wiring of domestic and industrial applications, electrical testing of cables, earth resistance testing etc.

EE-1201 MATHEMATICS – II

Course Objectives

- The way of obtaining rank, eigen values and eigen vectors of a matrix.
- To know the importance of Cayley-Hamilton theorem and getting canonical form from a given quadratic form.
- To solve the system of equations by using direct and indirect methods.
- To solve first order and higher order differential equations by various methods.
- To obtain the Laplace transforms and inverse Laplace transforms for a given functions and their applications.

Course Outcomes

- Find rank, eigen values and eigen vectors of a matrix and understand the importance of Cayley-Hamilton theorem.
- Reduce quadratic form to canonical forms and solving linear systems by direct and indirect methods.
- Demonstrate solutions to first order differential equations by various methods and solve basic applications problems related to electrical circuits, orthogonal trajectories and Newton's law of cooling
- Discriminate among the structure and procedure of solving higher order differential equations with constant and variable coefficients.
- Understand Laplace transforms and its properties and finding the solution of ordinary differential equations.

Syllabus

Linear Algebra
Rank of a matrix- Echelon form, Normal Form - Solution of Linear System of Equations - Consistency of Linear System of Equations - Direct & Indirect Methods: Gauss elimination method, LU Factorization method, Gauss Seidal Method. Complex Matrices: Hermitian, Skew-Hermitian and Unitary Matrices and their Properties.

Eigen Values and Eigen Vectors
Eigen Values and Eigen Vectors of a Matrix - Cayley-Hamilton theorem - Inverse and Powers of a Matrix using Cayley-Hamilton's theorem and its applications. Diagonalization of a Matrix - Quadratic Forms - Reduction of Quadratic Form to Canonical Form - Nature of a Quadratic Form.

Ordinary Differential Equations of First Order and its Applications
Formation of ordinary differential equations (ODEs) - Solution of an ordinary differential equation - Equations of the first order and first degree - Linear differential equation - Bernoulli's equation - Exact differential equations - Equations reducible to exact equations - Orthogonal Trajectories - Simple Electric (LR & CR) Circuits - Newton's Law of Cooling - Law of Natural growth and decay.

Differential Equations of Higher Order
Solutions of Linear Ordinary Differential Equations with Constant Coefficients - Rules for finding the complimentary function - Rules for finding the particular integral - Method of variation of

parameters - Cauchy's linear equation - Legendre's linear equation - Simultaneous linear differential equations.

Laplace Transforms

Introduction - Existence Conditions - Transforms of Elementary Functions - Properties of Laplace Transforms - Transforms of Derivatives - Transforms of Integrals - Multiplication by t^n - Division by t – Evaluation of integrals by Laplace Transforms - Inverse Laplace Transform - Applications of Laplace Transforms to Ordinary Differential Equations - Simultaneous Linear Differential Equations with Constant Coefficients - Second Shifting Theorem - Laplace Transforms of Unit Step Function, Unit Impulse Function and Laplace Transforms of Periodic Functions.

Text Book

1. Scope and Treatment as in "Higher Engineering Mathematics", by Dr. B.S. Grewal, $43r^d$ edition, Khanna publishers.

Reference Books

1. Graduate Engineering Mathematics by V B Kumar Vatti., I.K. International publishing house Pvt. Ltd.
2. Advanced Engineering Mathematics by Erwin Kreyszig.
3. A text book of Engineering Mathematics, by N.P. Bali and Dr. Manish Goyal. Lakshmi Publications.
4. Advanced Engineering Mathematics by H.K. Dass. S. Chand Company.
5. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Graw Hill Company.

EE1202 GREEN CHEMISTRY

Course Objectives

- To know the sources of water, impurities and treatment methods of water.
- To know the types of batteries, their uses and batteries for Electrical Vehicles.
- To know about fuel cells, its working, different types and their applications.
- To know about the corrosion, types and methods to reduce corrosion.
- To identify the goals of Green Chemistry and application of Green Chemistry.

Course Outcomes

The student is able

- To know the Treatment methods of water and different water softening methods.
- To understand the construction of different types of batteries.
- To understand different types of Fuel Cells.
- To differentiate the types of corrosion and its eradication.
- To understand the concept of Green Chemistry and its importance.

Syllabus

Water Technology
Sources of Water – Impurities and their influence of living systems – WHO Limits – Hardness and its Determination – Boiler Troubles and their removal – Water Softening Methods – Lime-Soda, Zeolite and Ion Exchange - Municipal Water Treatment-Break Point Chlorination – Desalination of Sea Water – Reverse Osmosis Method, Electro-dialysis.

Batteries
Primary batteries: The chemistry - Types: Zinc-carbon (Leclanche type), zinc alkaline (Duracell), zinc/air batteries; Lithium primary cells – liquid cathode, solid cathode and lithium-ferrous sulphide cells. Secondary batteries: Lead acid and VRLA (valve regulated (sealed) lead acid), nickel-cadmium, nickel-zinc, nickel-metal hydride batteries, lithium ion batteries, ultrathin lithium polymer cells. Advanced Batteries for electric vehicles, requirements of the battery – sodium-beta and redox batteries.

Fuel Cells
Fuel Cells: Description, working principle, anodic, cathodic and cell reactions, fabrication of electrodes and other components, applications, advantages, disadvantages and environmental aspects of the following types of fuel cells: Proton Exchange Membrane Fuel Cells, alkaline fuel cells, phosphoric acid, solid oxide, molten carbonate, direct methanol fuel cells- Membranes and Fuels

Corrosion
Origin and Theory – Types of Corrosion: Chemical and Electrochemical; Pitting, Inter granular, Waterline, Stress – Galvanic Series – Factors Effecting Corrosion. Corrosion Controlling Methods, Protective Coatings, Metallic Coatings, Electroplating and Electroless Plating.

Green Chemistry and Technology

Introduction and significance of green chemistry, Goals of green chemistry, 12 principles of green chemistry, toxicity of chemicals, material safety data sheet (MSDS), concept of zero pollution technologies, atom economy, functional toxicity vs non-functional toxicity, functional group approaches to green chemistry, Elimination of toxic functional group, optimization of frameworks for the design of greener synthetic pathways, Applications of green chemistry - Green solvents, green fuels and propellants, biocatalysis.

Text Book

1. Engineering Chemistry – PC Jain and M. Jain – Dhanpath Rai and Sons, New Delhi.
2. A Text book of Engineering Chemistry – S. S. Dara – S. Chand & Co. New Delhi.
3. Hand Book of Green Chemistry and Technology; by James Clarke and Duncan Macquarrie; Blakwell Publishing.

EE-1203 ENGLISH

Course Objectives

- To make students understand the explicit and implicit meanings of a text/topic;
- To give exposure to new words and phrases, and aid to use them in different contexts;
- To apply relevant writing formats to draft essays, letters, emails and presentations; and
- To adapt oneself to a given situation and develop a functional approach to finding solutions: adaptability and problem solving.

Course Outcomes

- Students will be able to analyze a given text and discover the various aspects related to language and literature;
- Learn the various language structures, parts of speech and figures of speech;
- Develop one's reading and writing abilities for enhanced communication; and
- Learn to apply the topics in real-life situations for creative and critical use.

Syllabus

On the conduct of life: William Hazlitt
Life skills: Values and Ethics
If: Rudyard Kipling

The Brook: Alfred Tennyson
Life skills: Self-Improvement
How I Became a Public Speaker: George Bernard Shaw

The Death Trap: Saki
Life skills: Time Management
On saving Time: Seneca

Chindu Yellama
Life skills: Innovation
Muhammad Yunus

Politics and the English Language: George Orwell
Life skills: Motivation
Dancer with a White Parasol: Ranjana Dave

Grammar
Prepositions – Articles – Noun-Pronoun Agreement, Subject-Verb Agreement – Misplaced Modifiers – Clichés, Redundancies.

Vocabulary
Introduction to Word Formation – Root Words from other Languages – Prefixes and Suffixes – Synonyms, Antonyms – Common Abbreviations

Writing
Clauses and Sentences – Punctuation – Principals of Good Writing – Essay Writing – Writing a Summary
Writing: Essay Writing
Life skills: Innovation
Muhammad Yunus

Textbook

1. Language and Life: A Skills Approach Board of Editors, Orient Blackswan Publishers, India. 2018.

References

1. Practical English Usage, Michael Swan. OUP. 1995.
2. Remedial English Grammar, F.T. Wood. Macmillan.2007
3. On Writing Well, William Zinsser. Harper Resource Book. 2001
4. Study Writing, Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
5. Communication Skills, Sanjay Kumar and PushpLata. Oxford University Press. 2011.
6. Exercises in Spoken English, Parts. I-III. CIEFL, Hyderabad. Oxford University Press.

EE-1204 COMPUTER PROGRAMMING AND NUMERICAL METHODS

Course Objectives

- The course is designed to provide complete knowledge of C language.
- To provide students with understanding of code organization and functional hierarchical decomposition with using complex data types.
- To provide knowledge to the students to develop logics which will help them to create programs, applications in C.
- This course aims to identify tasks in which the numerical techniques learned are applicable and apply them to write programs, and hence use computers effectively to solve the task.
- This course provides the fundamental knowledge which is useful in understanding the other programming languages.

Course Outcomes

- Identify basic elements of C programming structures like data types, expressions, control statements, various simple functions and Apply them in problem solving.
- Apply various operations on derived data types like arrays and strings in problem solving.
- Design and Implement of modular Programming and memory management using Functions, pointers.
- Apply Structure, Unions and File handling techniques to Design and Solve different engineering programs with minimal complexity.
- Apply Numerical methods to Solve the complex Engineering problems.

Syllabus

Introduction to C
Basic structure of C program, Constants, Variables and data types, Operators and Expressions, Arithmetic Precedence and associativity, Type Conversions. Managing Input and Output Operations Formatted Input, Formatted Output.

Decision Making, Branching, Looping, Arrays & Strings
Decision making with if statement, Simple if statement, The if…else statement, Nesting of if…else statement, the else..if ladder, switch statement, the (?:) operator, the GOTO statement., The while statement, the do statement, The for statement, Jumps in Loops ,One, Two-dimensional Arrays, Character Arrays. Declaration and initialization of Strings, reading and writing of strings, String handling functions, Table of strings.

Functions
Definition of Functions, Return Values and their Types, Function Calls, Function Declaration, Category of Functions: No Arguments and no Return Values, Arguments but no Return Values, Arguments with Return Values, No Argument but Returns a Value, Functions that Return Multiple Values. Nesting of functions, recursion, passing arrays to functions, passing strings to functions, the scope, visibility and lifetime of variables.

Pointers
Accessing the address of a variable, declaring pointer variables, initializing of pointer variables, accessing variables using pointers, chain of pointers, pointer expressions, pointers and arrays,

pointers and character strings, array of pointes, pointers as function arguments, functions returning pointers, pointers to functions, pointers to structures-Program Applications

Structure and Unions

Defining a structure, declaring structure variables, accessing structure members, structure initialization, copying and comparing structure variables, arrays of structures, arrays within structures, structures within structures, structures and functions and unions, size of structures and bit-fields- Program applications.

File handling

Defining and opening a file, closing a file, Input/ Output operations on files, Error handling during I/O operations, random access to files and Command Line Arguments- Program Applications

Numerical Methods

Solutions of Algebraic and Transcendental Equations, Bisection Method, Newton Raphson Method. Newton's forward and backward Interpolation, Lagrange's Interpolation in unequal intervals. Numerical Integration: Trapezoidal rule, Simpson's 1/3 rules. Solutions of Ordinary First Order Differential Equations: Euler's Method, Modified Euler's Method and Runge-Kutta Method.

Text Book

1. Programming in ANSI C, E Balagurusamy, 6th Edition. McGraw Hill Education (India) Private Limited.
2. Introduction to Numerical Methods, SS Sastry, Prentice Hall.

Reference Books

1. Let Us C,YashwantKanetkar, BPB Publications, 5th Edition.
2. Computer Science, A structured programming approach using C", B.A.Forouzan and R.F.Gilberg, " 3rd Edition, Thomson, 2007.
3. The C –Programming Language' B.W. Kernighan, Dennis M. Ritchie, PHI.
4. Scientific Programming: C-Language, Algorithms and Models in Science, Luciano M. Barone (Author), Enzo Marinari (Author), Giovanni Organtini, World Scientific.

EE1205 INDUSTRY 4.0

Course Objective

- This course provides students with an introduction to Industry 4.0, its buildingblocks, its applications and advantages compared to conventional production techniques.
- Learners get a deep insight into components and technologies of industry 4.0 canbe used to build up the production of the future.
- It is also important that the theory is deepened by means of roadmap technologies with phase wise developments.
- To expand Robotic technology with Augmented reality for Industry 4.0 and obstacle with framework conditions for Industry 4.0

Course Outcomes
Students will be able to:

- Describe Industry 4.0 and scope for Indian Industry
- Demonstrate conceptual framework and road map of Industry 4.0
- Describe Robotic technology and Augmented reality for Industry 4.0
- Demonstrate obstacle and framework conditions for Industry 4.0

Syllabus

Introduction to Industry 4.0
Introduction, Idea of Industry 4.0, Various Industrial Revolutions, Origin concept of Industry 4.0,Industry 4.0 Production system, How is India preparing for Industry 4.0, Comparison of Industry 4.0 Factory and Today's Factory.

Trends in Industry 4.0
Introduction, Main Concepts and Components of Industry 4.0, State of Art Technologies, Proposed Framework for Industry 4.0, Trends of Industrial Big Data and Smart Business Transformation.

Roadmap for Industry 4.0
Introduction, Proposed Framework for Technology Roadmap: Strategy Phase, Development Phase, Smart Manufacturing, Types of Smart Devices, Smart Logistics, Smart Cities, Predictive Analytics.

Advances in the Era of Industry 4.0
Introduction, Recent Technological Components of Robots- Advanced Sensor Technologies, Internet of Things, Industrial Robotic Applications- Manufacturing, Maintenance and Assembly, IIoT- Industrial IoT.

The Role of Industry 4.0 and Future Aspects
Introduction, Challenges & Future of Works and Skills for Workers in the Industry 4.0 Era, Strategies for competing in an Industry 4.0 world.

Reference Books:

1. Alp Ustundag and Emre Cevikcan,"Industry 4.0: Managing the Digital Transformation".
2. Bartodziej, Christoph Jan,"The Concept Industry 4.0".
3. Klaus Schwab,"The Fourth Industrial Revolution".
4. Christian Schröder ,"The Challenges of Industry 4.0 for Small and Medium-sized Enterprises".

List of Open Source Software/learning website:

1. www.nptel.ac.in/

(Material Is Readily Available On Internet)

EE-1206 ENGLISH LANGUAGE LAB

Course Objectives

- To make students recognize the sounds of English through Audio-Visual aids;
- To help students build their confidence and help them to overcome their inhibitions and self consciousness while speaking in English;
- To familiarize the students with stress and intonation and enable them to speak English effectively; and
- To give learners exposure to and practice in speaking in both formal and informal contexts.

Course Outcomes

- Students will be sensitized towards recognition of English sound patterns and the fluency in their speech will be enhanced;
- A study of the communicative items in the laboratory will help students become successful in the competitive world;
- Students will be able to participate in group activities like roleplays, group discussions and debates; and
- Students will be able to express themselves fluently and accurately in social as well professional context.

Syllabus

Introduction to Phonetics
The Sounds of English (Speech sound – vowels and consonants) - Stress and Intonation - Accent and Rhythm.

Listening Skills
Listening for gist and specific information - listening for Note taking, summarizing and for opinions - Listening to the speeches of eminent personalities.

Speaking Skills
Self-introduction - Conversation Skills (Introducing and taking leave) - Giving and asking for information - Role Play - Just A Minute (JAM) session - Telephone etiquette.

Reading and Writing skills
Reading Comprehension – Précis Writing - E-Mail writing - Punctuation.

Presentation skills
Verbal and non-verbal communication - Body Language - Making a Presentation.

Reference Books

1. Ashraf Rizvi. *Effective Technical Communication*. Tata McGraw Hill Education Private Limited, New Delhi.
2. *Speak Well*. Orient Blackswan Publishers, Hyderabad.
3. Allan Pease. *Body Language*. Manjul Publishing House, New Delhi.

EE-1207 GREEN CHEMISTRY LAB

Course Objectives:

- To develop the fine skills of quantitative determination of various chemical components through titrimetric analysis
- To prepare ion exchange/ zeolite column for removal of hardness
- To develop the skill of green synthesis through the preparation of a polymer/ drug

Course Outcomes

- The students are able to determine the amount of various chemical species in solutions by titrations quantitatively with accuracy
- The students are able to develop novel materials to be used as zeolite and prepare columns for removal of hardness of water
- The students develop skills to synthesise a polymer or a drug

SYLLABUS

1. Determination of Sodium Hydroxide with HCl (Na_2CO_3 Primary Standard)
2. Determination of Alkalinity (Carbonate and Hydroxide) of water sample
3. Determination of Chromium (VI) by Mohr's Salt Solution
4. Determination of Hardness of Water sample by EDTA method
5. Ion exchange/ Zeolite column for removal of hardness of water
6. Green Synthesis of Polymer/ drug

Text Books:

1. Vogel's Quantitative Chemical Analysis – V – Edition – Longman.

2. Experiments in Applied Chemistry (For Engineering Students) – Sirita Rattan – S. K. Kataria & Sons, New Delhi

EE-1208 COMPUTER PROGRAMMING AND NUMERICAL METHODS LAB

Course Objectives

- To impart writing skill of C programming to the students and solving problems.
- To write and execute programs in C to solve problems such as Modularize the problems into small modules and then convert them into programs.,
- To write and execute programs in C to solve problems such as arrays, files, strings, structures and different numerical methods.
- This reference has been prepared for the beginners to help them understand the basic to advanced concepts related to Objective-C Programming languages.

Course Outcomes

- Understand various computer components, Installation of software. C programming development environment, compiling, debugging, and linking and executing a program using the development environment.
- Analyzing the complexity of problems, Modularize the problems into small modules and then convert them into programs.
- Construct programs that demonstrate effective use of C features including arrays, strings, structures, pointers and files.
- Apply and practice logical ability to solve the real-world problems.
- Apply Numerical methods to Solve the complex Engineering problems.

List of Experiments

1. Write a program to read x, y coordinates of 3 points and then calculate the area of a triangle formed by them and print the coordinates of the three points and the area of the triangle. What will be the output from your program if the three given points are in a straight line?
2. Write a program, which generates 100 random integers in the range of 1 to 100. Store them in an array and then print the arrays. Write 3 versions of the program using different loop constructs. (e.g. for, while, and do while).
3. Write a set of string manipulation functions e.g. for getting a sub-string from a given position, Copying one string to another, Reversing a string, adding one string to another.
4. Write a program which determines the largest and the smallest number that can be stored in different data types like short, int, long, float, and double. What happens when you add 1 to the largest possible integer number that can be stored?
5. Write a program, which generates 100 random real numbers in the range of 10.0 to 20.0, and sort them in descending order.
6. Write a function for transposing a square matrix in place (in place means that you are not allowed to have full temporary matrix).
7. First use an editor to create a file with some integer numbers. Now write a program, which reads these numbers and determines their mean and standard deviation.
8. Given two points on the surface of the sphere, write a program to determine the smallest arc length between them.
9. Implement bisection method to find the square root of a given number to a given accuracy.
10. Implement Newton Raphson method to det. a root of polynomial equation.
11. Given table of x and corresponding f(x) values, Write a program which will determine f(x) value at an intermediate x value by using Lagrange's interpolation/

12. Write a function which will invert a matrix.
13. Implement Simpson's rule for numerical integration.
14. Write a program to solve a set of linear algebraic equations.

EE2101 OPERATIONS RESEARCH

Course Objectives

- To introduce optimization techniques to students.
- To explain linear programming, transportation problem, assignment problem, pert network with few computations.
- To discuss few inventory models.

Course Outcomes

At the end of this course, students will demonstrate the ability to

- Analyze any real-life system with limited constraints and depict it in a model form.
- Convert the problem into a mathematical model.
- Understand variety of problems such as assignment, transportation, travelling salesman etc.

Syllabus

Introduction to Optimization

Engineering Applications of Optimization, Statement of Problem, Classification of Optimization Problem Techniques.

Linear Programming

Introduction, Requirements for a LP Problem, Examples on The Application of LP, Graphical Solution of 2-Variable LP Problems, Some Exceptional Cases, General Mathematical Formulation For LPP, Canonical and Standard Forms of LP Problem, Simplex Method, Examples on The Application of Simplex Techniques.

Artificial Variable Techniques

Big-M Method and Two-Phase Techniques.

Transportation Problem

Matrix Terminology, Definition and Mathematical Representation of Transportation Model, Formulation and Solution of Transportation Models (Basic Feasible Solution by North-West Corner Method, Inspection Method. Vogell's Approximation Method).

Assignment Problem

Matrix Terminology, Definition of Assignment Model, Comparison with Transportation Model, Mathematical Representation of Assignment Model, Formulation and Solution of Assignment Models.

Pert Network

Introduction, Phases of Project Scheduling, Network Logic, Numbering the Events (Fulkerson's Rule), Measure of Activity.

Pert Network Computations

Forward Pass and Backward Pass Computations, Slack Critical Path, and Probability of Meeting the Scheduled Dates.

Inventory Models

Introduction, Necessity for Maintaining Inventory, Classification of Inventory Models, Inventory Models with Deterministic Demand, Demand Rate Uniform Production Rate Infinite, Demand Rate Non-Uniform Production Rate Finite, Demand Rate Uniform-Production Rate Finite.

Game Theory: Useful Terminology, Rules for Game Theory, Saddle Point, Pure Strategy, Reduce Game by Dominance, Mixed Strategies, 2x2 Games Without Saddle Point.

Text Books

1. "Operations Research-An Introduction' By H.Taha, Prentice Hall Of India Pvt. Ltd.
2. "Engineering Optimization-Theory & Practice" By S.S. Rao, New Age International (P) Ltd.

Reference Books

1. "Operations Research – An Introduction" By P.K.Gupta& D.S.Hira, S. Chand & Co. Ltd

EE2102 NETWORK THEORY

Course Objectives

- To enrich the students to acquire knowledge about the basics of circuit analysis, network theorems, concepts of AC circuits, coupled & three phase circuits, transient analysis.
- Explain the basic laws and theorems of DC circuits.
- Discuss the DC transients for RL, RC & RLC circuits and explain about Magnetic Circuits.
- Explain different types of Laplace Transforms of different signals and their response when applied to simple circuits.

Course Outcomes

At the end of this course, a student

- Will be able to articulate in working of various components of a circuit.
- Will be familiar with ac and dc circuits solving.
- Will be ready with the most important concepts like mesh and nodal analysis.
- Ability to measure three phase voltages and current, active, reactive powers
- Ability to convert Three phase Star to Three phase Delta circuits and Vice-Versa.
- Ability to Express given Electrical Circuit in terms of A,B,C,D and Z,Y Parameter Model and Solve the circuits.

Syllabus

Introduction of Network Elements

Basic definition of the unit of Charge, Voltage, Current, Power and Energy, Circuit concept, Active and Passive circuit elements; Ideal, Practical and dependent sources and their V-I characteristics, Reference Directions for current and voltage, Energy stored in Inductors and Capacitors ,Kirchhoff's Laws, Voltage and Current Division Nodal Analysis, Mesh Analysis, Star-Delta transformation, Source Transformation.

Network Theorems

Linearity and Superposition, Thevenin's and Norton's Theorem, Reciprocity, Compensation, Maximum power transfer theorems, Tellegan's and Millman's theorems, Application of theorems to DC circuits.

DC Transients

Inductor, Capacitor, Source free RL, RC and RLC Response, Evaluation of Initial conditions, application of Unit-step Function to RL, RC and RLC Circuits, Concepts of Natural, Forced and Complete Response.

Introduction of Alternating Circuits

The Sinusoidal Forcing Function Instantaneous, Peak, Average and RMS values of Voltage and Current; Crest factor, Form factor; Concept of phase and phase difference in sinusoidal waveforms; Phase relation in pure resistor, Inductor and capacitor; Impedance diagram, phasor diagram, series and parallel circuits, compound Circuits, Instantaneous and Average Power, Complex Power Computation of active, reactive and complex powers; power triangle, power factor.

Sinusoidal Steady State Analysis

Steady State Analysis Using Mesh and Nodal Analysis, Application of Network Theorems to AC Circuits, Series resonance, Impedance and phase angle, voltages and currents, bandwidth and Q factor and its effect on bandwidth, parallel resonance, resonant frequency, variation of impedance with frequency, Q factor and its effect on bandwidth, Balanced 3-phase circuits, Resonance, Concept of Duality. Magnetically Coupled Circuits, Dot Convention, Y, Z, H, A,B,C,D – Parameters of Two – Port Networks.

Laplace Transform Techniques

Transforms of Typical Signals, Response of Simple Circuits to Unit – Step, Ramp and Impulse Functions, Initial and Final Value Theorem, Convolution Integral, Time Shift and Periodic Functions, Transfer Function.

Text Books

1. Engineering Circuit Analysis, Willam H. Hayt Jr., and Jack E. Kemmerly, 5th Edition, McGraw Hill.
2. Electric circuits by J.A Edminister (Schaum outline series)

Reference Books

1. Franklin F. Kuo, Network Analysis and Synthesis, 2nd Edition, John Wiley & Sons
2. Network Analysis, M. E. Vanvalkenburg, 3rd Edition, PHI**.**

EE2103 ELECTRONIC CIRCUITS

Course Objectives

- To familiarize the students with theory of various kinds of amplifiers and oscillators.
- To explain concepts of gain, band-width and gain band-width product.
- To analyze all kinds of feedback amplifiers.
- To deal with various aspects of power amplifiers and tuned voltage amplifiers.
- To introduce operational amplifiers and their applications

Course Outcomes

At the end of this course, students will demonstrate the ability to

- Understand the characteristics of transistors.
- Design and analyze various rectifier and amplifier circuits.
- Design sinusoidal and non-sinusoidal oscillators.
- Understand the functioning of OP-AMP and design OP-AMP based circuits.

Syllabus

Multistage Amplifiers

BJT and FET RC Coupled Amplifiers – Frequency Response. Cascaded Amplifiers. Calculation of Band Width of Single and Multistage Amplifiers. Concept of Gain Bandwidth Product.

Feedback Amplifiers

Concept of Feedback Amplifiers – Effect of Negative feedback on the amplifier Characteristics. Four Feedback Amplifier Topologies. Method of Analysis of Voltage Series, Current Series, Voltage Shunt and Current Shunt feedback Amplifiers.

Sinusoidal Oscillators

Condition for oscillations –LC Oscillators – Hartley, Colpitts, Clapp and Tuned Collector Oscillators – Frequency and amplitude Stability of Oscillators – Crystal Oscillators – RC Oscillators -- RC Phase Shift and Wein bridge Oscillators.

Power Amplifiers

Classification of Power Amplifiers – Class A, Class B and Class AB power Amplifiers. Series Fed, Single Ended Transformer Coupled and Push Pull Class A and Class B Power Amplifiers. Cross-over Distortion in Pure Class B Power Amplifier, Class AB Power Amplifier – Complementary Push Pull Amplifier, Derating Factor – Heat Sinks.

Tuned Voltage Amplifiers

Single Tuned and Stagger Tuned Amplifiers – Analysis – Double Tuned Amplifier – Bandwidth Calculation.

Operational Amplifiers

Concept of Direct coupled amplifiers, Ideal Characteristics, Differential amplifier, normalized transfer characteristics, Measurement of Op-Amp Parameters.

Applications of Op-Amps: Inverting and Non-inverting Amplifiers, Integrator, Differentiator, Comparator, Logarithmic Amplifiers, Instrumentation Amplifiers.

Text Books

1. Integrated Electronics, Analog Digital Circuits and systems, Jacob Millman and D. Halkias, McGrawHill, 1972
2. Electronic Devices & Circuits, K VenkataRao and K Rama Sudha, McGraw Hill Education, 1986.

Reference Books

1. Linear Integrated Circuits, D Choudhury Roy, New Age International Pvt Ltd, publishers, New Delhi,2004
2. Electronic Devices and Circuits – G.K.Mithal, Khanna Publishers, 23rd Edition, 2004.
3. OP-Amps and Linear Integrated Circuits, Gayakwad, 4th ed. PHI publications, 1993.

EE2104 ELECTRICAL MACHINES – I

Course Objectives

- To familiarize the concepts of electro-mechanical energy conversion principles.
- To know the concept of dc machines.
- To know about different testing methods of a dc machine.
- To find out the efficiency and regulation characteristics of a dc machine
- To know the principle of operation of a Transformer
- To draw the phasor diagrams of transformer under no-load and also different load conditions to represent the primary and secondary quantities.
- To explain the single and three phase transformers and their testing

Course Outcomes

At the end of this course, students will demonstrate the ability to

- Understand the operating principle of DCmotor and DC generator
- Able to find the efficiency of a dc motors and dc generator when the specifications are given.
- Able to find the efficiency of a transformer .
- Able to know different testing methods of a transformer
- To know about construction features of single and three-phase transformers.

Electro-mechanical Energy Conversion:
Principles, Forces and Torques inMagnetic Field Systems, Energy Balance, Energy and Force in Singly Excited Magnetic Field System, Co-energy, Multiply Excited Magnetic Field Systems.

D.C. Generators:
Principle of Operation, Constructional Features, EMF Equation of a D.C. Generator, Collection and Flow of Current from Armature, Armature Reaction, Methods to Reduce Effects of Armature Reaction and Commutation Process, Armature Winding Diagram (Lap and Wave), Methods of Excitation, Generator Characteristics, Parallel Operation, Losses in DC Generator, Power Stages in D.C. Generator, Efficiency, Condition for Maximum Efficiency of a dc generator and Applications.

D.C. Motors:
Principle of operation, Types of DC Motors, Significance of Back Emf, condition for maximum power, Torque and Speed Equations, Starting and necessity of Starters, Types of Starters, DC Motor characteristics, Speed Control Methods of a D.C. Motors, Losses occur in DC Motors, Power Stages in D.C. Motor, Condition for Maximum Efficiency and Applications. Brake Test, Swinburne's Test, Hopkinson's Test, Retardation Test, Field's Test and Separation of Losses.

Transformers:

Principle of operation, Constructional features, Types of Transformers, emf equation of a Transformer, Ideal Transformer, Practical Transformer on No-Load and Load and its vector diagrams, Equivalent Circuit of a Transformers, Losses in a Transformer, Voltage Regulation and Efficiency, Testing of a Transformers, All Day Efficiency, Condition for Maximum Efficiency of a Transformer, auto transformers, tap changers on transformers, Parallel Operation of single phase transformers.Concepts of Three-phase Connections-Y/Y, Delta-Delta, Wye/Delta, Delta/Wye, Open-Delta Connections, Three-phase to Two-Phase conversion and vice-versa.

TEXT BOOKS:

1. DR.P.S.BIMBHRA, Electrical Machinery, KHANNA PUBLISHERS, New Delhi, 7th edition, 1995.
2. D P KOTHARI and I J NAGRATH, Electrical Machines, Mc Graw Hill Education Private Limited, New Delhi, 4th edition, 2010.

Reference Books:

1. A E Fitzgerald, Charles Kingsley Jr. and Stephen d. Umans, Electric Machinery, McGraw Hill, New Delhi, 6th edition, 2003.
2. A E Clayton and N N Hancock, The performance and Design of Direct Current Machines, CBS Publishers & Distributors Pvt. Ltd., 2004.
3. M G Say, The performance and Design of Alternating Current Machines, CBS Publishers & Distributors Pvt. Ltd., 2002.

EE2105 MANAGERIAL ECONOMICS

Course Objectives:

1. To bring about an awareness about the nature of Managerial Economics and its linkages with other disciplines.
2. To understand the Micro and Macro Environment of Business.
3. To familiarize the prospective engineers with the concepts and tools of Managerial Economics with an objective to understand the real world of business.

Course Outcomes:

After completion of the course, student will be able to:

1. Understand the various economic activities in business and industry.
2. Analyse the real world business problems.
3. Make optimal business decisions for the effective and efficient management of Organisations.

Significance of Economics and Managerial Economics:

Economics: Definitions of Economics- Wealth, Welfare and Scarcity definitions Classification of Economics- Micro and Micro Economics.

Managerial Economics: Definition, Nature and Scope of Managerial Economics, Differences between Economics and Managerial Economics, Main areas of Managerial Economics, Managerial Economics with other disciplines.

Demand and Utility Analysis:

Demand - Definition, Meaning, Nature and types of demand, Demand function, Law of demand - Assumptions and limitations. Exceptional demand curve.

Elasticity of demand - Definition, Measurement of elasticity, Types of Elasticity (Price, Income, Cross and Advertisement), Practical importance of Price elasticity of demand, Role of income elasticity in business decisions, Factors governing Price Elasticity of demand.

Utility Analysis: Utility- Meaning, Types of Economic Utilities, Cardinal and Ordinal Utility, Total Utility, Marginal Utility, The law of Diminishing Marginal Utility and its Limitations**.**

Theory of Production and Cost analysis:

Production - Meaning, Production function and its assumptions, use of production function in decision making;

Cost analysis - Nature of cost, Classification of costs - Fixed vs. Variable costs, Marginal cost, Controllable vs. Non - Controllable costs, Opportunity cost, Incremental vs. Sunk costs, Explicit vs. Implicit costs, Replacement costs, Historical costs, Urgent vs. Postponable costs, Escapable vs. Unavoidable costs, Economies and Diseconomies of scale.

Market Structures : Definition of Market, Classification of markets; Salient features or conditions of different markets - Perfect Competition, Monopoly, Duopoly , Oligopoly, Importance of kinked demand curve ;Monopolistic Competition.

Pricing and Business Cycles:

Pricing Analysis : Pricing – Significance; Different Pricing methods- Cost plus pricing, Target pricing, Marginal cost pricing, Going -rate pricing, Average cost pricing, Peak load pricing , Pricing of joint Products, Pricing over the life cycle of a Product, Skimming pricing Penetration pricing, Mark- up and Mark- down pricing of retailers.

Business cycles - Definition, Characteristics, Phases, Causes and Consequences; Measures to solve problems arising from Business cycles.

Text Books:

1. Sankaran,S., **Managerial Economics,** Marghan Publications, 2015, Chennai.
2. Aryasri, A.R., **Managerial Economics and Financial Analysis,** MC Graw Hill Education, New Delhi,2015.

Reference Books:

1. Dwivedi, D.N., **Managerial Economics,** Vikhas Publishing House Pvt. Ltd. 6th Edition, New Delhi,2004.
2. Dewett, K.K., **Modern Economic Theory**, S.Chand & Company Ltd., New Delhi, 2005.

EE2106 ELECTRICAL NETWORKS LAB

Course Objectives

- To enhance student learning by applying knowledge and skills to provide solutions to Electrical and Electronics Engineering problems in industry and governmental organizations
- To identify, formulate, design and investigate complex engineering problems of electric circuits.
- Work as a team with a sense of ethics and professionalism, and communicate effectively with a practical orientation.

Course Outcomes

After completion of this course, a student will be

- Able to analyze and design DC and AC circuits.
- Able to apply concepts of electrical circuits throughout engineering.
- Able to evaluate response in any given network using theorems
- Able to analyze a given network by applying various Network Theorems

List of Experiments

1. Verification of ohm's law and to measure filament lamp resistance.
2. Verification of Kirchhoff's law
3. Verification of Thevenin's theorem
4. Verification of Norton's theorem
5. Verification of superposition theorem.
6. Verification of Maximum Power Transfer theorem.
7. Verification of Reciprocity theorem.
8. Two Port Network Parameters
9. Time response of first order RC / RL network for periodic non – sinusoidal inputs – Time constant and Steady state error determination
10. Series and Parallel Resonance
11. Measurement of Active Power for Star and Delta connected balanced loads
12. Measurement of reactive Power for Star and Delta connected balanced loads

EE2107 ELECTRICAL MACHINES – I LAB

Course Objectives

- To understand design and each part of dc electrical machines.
- To gain expertise in controlling dc electrical machines.
- Also to perform tests on dc electrical machines and determine their characteristics.

Course Outcomes

After completion of course, a student will be able to

- Analyze DC electrical machines.
- To define characteristics of dc machines.
- To test them in various methods.

List of Experiments

1. Magnetization characteristics of DC shunt generator.
2. Load characteristics of DC shunt generator.
3. Load characteristics of DC compound generator (cumulative & differential) (long shunt)
4. Load characteristics of DC compound generator (cumulative & differential) (short shunt)
5. Swinburne‘s test and Pre-determination of efficiencies as Generator and Motor.
6. Brake test on DC shunt motor. Draw the performance characteristics
7. Load test on DC Series motor.
8. Hopkinson‘s test on DC shunt machines. Pre-determination of efficiency.
9. Speed control of DC shunt motor by Field and Armature Control.
10. Separation of losses in DC shunt motor.
11. O.C. & S.C. Tests on Single phase Transformer
12. Sumpner’s test on single phase transformers
13. Scott connection of transformers

Any other Experiments can be drafted basing on the theory course#

EE2108 ELECTRONIC CIRCUITS LAB

Course Objectives

- To study various feedback Amplifiers, oscillators practically
- To study various feedback Amplifiers, oscillators through software simulations.

Course Outcomes

- To understand the concepts of variousfeedback Amplifier, oscillators practically
- To understand the concepts of various feedback Amplifier, oscillators through software simulations.

LIST OF EXPERIMENTS

1. Current series feedback Amplifier
2. Colpitts oscillator
3. RC-Phase shift oscillator
4. Two stage RC-Coupled Amplifier
5. Wein bridge oscillator
6. Hartley Oscillator
7. Class-B Push pull Amplifier
8. Voltage series feedback Amplifier
9. Common source FET Amplifier
10. Tuned Voltage Amplifier

Any other Experiments can be drafted basing on the theory course#

EE2109 MATLAB & INTERFACING

Course Objectives

- To understand the MATLAB software
- To write program for electrical applications
- To simulate an electric and electronic circuit.

Course Outcomes

- After successful completion of the course the students should be able to
- They become familiar with the basic circuit components and know how to connect them to make a real electrical circuit.
- They become familiar with basic electrical measurement instruments and know how to use them to make different types of measurements.
- Be able to verify the laws and principles of electrical circuits, understand the relationships and differences between theory and practice.
- Be able to gain practical experience related to electrical circuits, prompt more interest and motivation for further studies of electrical circuits.
- Be able to carefully and thoroughly document and analyse experimental work.

. **List of Experiments**

1. Introduction to MATLAB, MATLAB help system, Simulink Tools.
2. Verification of network theorems using MATLAB/Simulink. Those are
    a) Verification of ohm's law.
    b) Verification of KVL&KCL.
    c) Verification of Thevenin's Theorem.
    d) Verification of Norton's Theorem.
    e) Verification of Maximum Power Transfer Theorem.
    f) Verification of Superposition Theorem.
    g) Verification of Reciprocity Theorem.
3. Verification of Two-port Network Parameters using MATLAB/Simulink.
4. Verification of Half-wave Rectifier, observe the waveforms and calculate average value, RMS value, form factor and ripple factor using MATLAB/Simulink.
5. Verification of Full-wave Centre Tapped Rectifier, observe the waveforms and calculate average value, RMS value, form factor and ripple factor using MATLAB/Simulink.
6. Verification of Full-wave Bridge Rectifier, observe the waveforms and calculate average value, RMS value, form factor and ripple factor using MATLAB/Simulink.
7. To study initial conditionsand External Characteristics of DC Shunt motor using MATLAB/Simulink
8. To study Speed Control of DC Shunt motor using MATLAB/Simulink.

#The programs/experiments can be drafted to make the student acquainted with the latest concepts Related to Electrical Engineering#

Textbooks

1. MATLAB and Simulation Books NI Engineering Signals and Systems, 2nd edition
2. Introduction to MATLAB for Engineers William J. Palm III.

Internal resources

1. MATLAB Programming for Numerical Computation, NPTEL, SWAYAM Portal.

EE2110 PROFESSIONAL ETHICS AND UNIVERSAL HUMAN VALUES

Course Objectives:

- To recognize the moral values that should guide the Engineering profession.
- To resolve moral issues concerning one's profession.
- To develop and exhibit a set of moral beliefs and attitudes that engineers should inculcate.
- To inculcate social values and morality in one's life.
- To develop awareness about Professional/Engineering Ethics and Human Values.

Course Outcomes:

Students will be able to:

- Apply the conceptual understanding of ethics and values into everyday practice.
- Understand the importance of moral awareness and reasoning in life.
- Acquire professional and moral etiquette that an engineer requires.
- Develop the acumen for self-awareness and self-development.
- Develop cultural tolerance and integrity.
- Tackle real-life challenges with empathy.

Syllabus

HUMAN VALUES

Values - Respect - Caring - Sharing - Honesty- Courage - Self confidence - Communal Harmony
Morals - Virtues

PROFESSIONAL VALUES

Integrity - Discipline - Valuing time - Cooperation - Commitment - Code of conduct - Challenges in the workplace

PROFESSIONAL ETHICS

Overview - Engineering ethics - Moral issues - Profession - Models of professional roles - Responsibility

RESPONSIBILITIES AND RIGHTS

Safety and risk - Collegiality and loyalty - Confidentiality - Occupational crime - Human rights - Employee rights - Intellectual property rights

GLOBAL ISSUES

Globalization - Environmental ethics - Computer ethics - Code of ethics - Multinational corporations - Engineers as advisors in Planning and Policy making

Textbook:

R.S. Nagarazan. *A Textbook on Professional Ethics and Human Values.* New Age International Publishers. 2006.

Reference Books:

Premvir Kapoor. *Professional Ethics and Human Values.* Khanna Publishing House. 2019.
B.S. Raghavan. *Human Values and Professional Ethics*. S.Chand Publications. 2012.
R.R. Gaur & Others. *A Foundation Course in Human Values and Proff. Ethics*. Excel Books. 2009.
A. N. Tripathi. *Human Values*. New Age International (P) Limited. 2009
R. Subramanian. *Professional Ethics*. OUP India. 2013.

EE2111 NCC/NSS

Course Objectives

1. To evoke social consciousness among students through various activities.
2. To develop youth leadership in the students
3. To create awareness of the students in Attention, saluting, etc.
4. To create the awareness of all kinds of discipline to the students

Course Outcomes

After completion of this course, student will be able to:-

1. Maintain his physical fitness and health.
2. Maintain disciplines of all kinds.
3. Create self interest in various sports.
4. Take leadership

NCC/ NSS training is compulsory for all the Undergraduate students. A student will be required to participate in an activity during the first or second semesters of second year.

1. The activities will include Practical / field / Extension /outreach activities.
2. The activities shall be carried out outside class hours.
3. The student participation shall be for a minimum period of 24 hours per semester during the first or second semesters of second year.
4. The activities will be monitored by the respective faculty in charge and HOD
5. Grades will be awarded on the basis of participation, attendance, performance and behavior. Grades shall be entered in the mark statement as given below:
   a.SATISFACTORY or UNSATISFACTORY
6. If a student gets an unsatisfactory Grade, he/she has to repeat the above activity in the subsequent years, along with the preceding year students**.**

E2201 SIGNALS & SYSTEMS

Course Objectives

- To understand the fundamental properties of linear systems
- Use linear systems tools, especially transform analysis and convolution, to analyze and predict the behavior of linear systems
- Apply properties of the Fourier Transforms and Z-transforms.

Course Outcomes

After completion of this course, a student

- Able to describe signals mathematically and to perform mathematical operations on signals to classify the signals.
- Able to compute the output of an LTI system for a given input.
- Able to find Fourier series coefficients of a periodic signal.
- Able to find Z transform of a discrete-time signal.

Syllabus

Size of a Signal, Signal Energy, Signal Power, Some Useful Signal Operations, Time Shifting, Time Scaling, Time Reversal, Combined Operations.

Classification of Signals
Continuous-Time and Discrete-Time Signals, Analog and Digital Signals, Periodic and Aperiodic Signals, Energy and Power Signals, Deterministic and Random Signals.

Some Useful Signal Models
Unit Step Function u(t), The Unit Impulse Function, The Exponential Function, Even and Odd Functions, Some Properties of Even and Odd Functions, Even and Odd Components of a Signal.

Systems, Classification of Systems
Linear and Nonlinear Systems, Time-Invariant and Time-Varying Systems, Instantaneous and Dynamic Systems, Causal and Non-causal Systems, Continuous-Time and Discrete-Time Systems, Analog and Digital Systems, Invertible and Noninvertible Systems, Stable and Unstable Systems.

Properties of Systems
Linear Time – invariant Systems. Continuous Time and Discrete time.

Fourier series
Convergence of Fourier series, Fourier Transform. Periodic Signals and Continuous and discrete Fourier Transform. Z-transform of a Discrete Sequence, Region of Convergence for the Z transform. Inverse Z-transform, Properties of Z-transform, Relation Between Z and Fourier Transform.

Linear Time – Invariant (LTI) Systems
Representation of Signals in terms of Impulses, Discrete Time LTI Systems, the Convolution Sum, Continuous Time LTI Systems, the Convolution Integral. Properties of LTI Systems, Systems

described by Differential and Difference Equations. Block Diagram Representation of LTI Systems described by Differential Equations and, Singularity Functions.

Frequency Response
Characterized by Linear Constant Coefficient Differential Equations. First-order and Second-order Systems. Representation of DTFT, First-order and Second-order Systems.

Sampling Theorem, Reconstruction of a Signal from Samples, the Effect of under sampling, Discrete Time Processing of Continuous Time Signals. Sampling in Frequency Domain, Sampling of Discrete Time Signals.

Text Books

1. V. Oppenheim et al., (1997) Signals & Systems (2nd Edition), Prentice Hall.,
2. Principles Of Linear Systems and Signals, B.P. Lathi, Oxford University Press
3. Signals and Systems, Ramakrishna Rao, Shankar Prakriya, Mc Graw Hill Education India

Reference Books

1. Theory and Problems of Signals and Systems, Hwei P. Hsu, Schaums Outline Series.
2. Open Course Ware Material Signals and Systems, Massachusetts Institute of Technology.

EE2202 ELECTRICAL MEASUREMENTS

Course objectives:

- Gain knowledge between different types analog and digital measurements.
- Study the characteristics of moving element measurements
- Study the concepts of measuring various electrical parameters/quantities
- Knowledge regarding the magnetic measurement & devices.
- To study various bridges and their applications.
- To study various potentiometers configurations.

Course Outcome:

Upon successful completion of the course, the students will be able to

- Describe operation of electrical measuring instruments.
- Select suitable instrument for measuring power and energy of electrical systems.
- Determine the parameters of electrical circuits using suitable measuring instruments.

Basic Concepts: Methods of measurements, Classification of instruments,Analog versus Digital Measurements, Elements of a generalized measurement system, Operating forces, Static characteristics of instruments, Standard Cell and Standard Resistance.

Principles of instruments: Construction and principles of operation of Moving Coil type instruments, Moving Iron type instruments, Dynamometer type instruments, Induction type instruments &Electrostatic Instruments.

Measuring Instruments: Ammeters and extension of range, Voltmeters and extension of range, Torque equation of Wattmeters, Single phase and poly-phase power measurement, errors in dynamometer type wattmeters and its compensation, LPF wattmeters, Reactive Power Measurement using wattmeter,Energy Meters for Single Phase and Poly Phase, Errors and Compensation in energy meters, Power Factor Meters, Frequency Meters (electrical resonance type and mechanical resonance type)and Weston Type of Synchro-Scope.

Bridge Methods: Types of detectors,Measurement of Resistance using Wheatstone bridge, Kelvin's double bridge, loss of charge method and Meggar, Measurement of inductance using Maxwell's Inductance bridge and inductance & capacitance bridge, Anderson's bridge, Measurement of mutual inductance using Heaviside mutual inductance bridge, Heaviside-Campbell equal ratio bridge, Measurement of capacitance using De Sauty's bridge, Schering bridges (for high voltage also), Measurement of frequency using Wien's bridge, Wagner's Earthing Device.

Magnetic Measurements: Ballistic Galvanometer, Calibration of Hibbert's Magnetic Standard, Flux Meter, Lloyd& Fischer Square for Measuring Iron Loss. Testing of Ring and Bar Specimens, Determination of B-H Curve and Hysteresis Loop Using CRO, Determination of Leakage Factor.

Potentiometers & Instrument Transformers: Crompton's D.C. Potentiometer, A.C. Polar and Co-Ordinate Type Potentiometers,Applications - measurement of Impedance, Calibration of Ammeters, Voltmeters and Wattmeters, measurement of resistance, use of Oscilloscope in Frequency, Phase and Amplitude Measurements, Instrument Transformers –Ration and Phase Angle Errors and Their Reduction.

Text Book:

1. Electric and Electronic Instrumentation by A.K. Sawhney, DhanpatRai& Sons, Delhi, 11th Edition, 1995.

References:

1. Electrical & Electronic Instrumentation by UmeshSinha, SatyaPrakashan, Newdelhi,1998
2. Electrical Measurements byE.W.Golding. &Widdis, 5thEdition, Wheeler Publishing.

EE2203 ELECTRIC MACHINES – II

Course Objectives

- To introduce the concepts about three phase induction motor and its testing
- To learn the basic concepts of synchronous generator and different voltage regulation methods
- To introduce concepts of synchronous motors
- To study various special machines

Course Outcomes

At the end of this course, students will demonstrate the ability to

- Analyze three phase induction motor.
- Able to predict the performance characteristics of synchronous generator
- Analyze the operation of synchronous machines
- Will learn about special mahines

Syllabus

Induction Motors - I

Principle of operation, Constructional details, Rotating Magnetic field, Types of rotors, Slip, Stator and Rotor current frequencies, Development of torque and torque calculations, Torque-Speed Characteristics, Power flow and performance calculations, Equivalent circuit, Calculation of equivalent circuit parameters from No-load and Rotor-blocked tests.

Induction Motors - II

Predetermination of performance characteristics using circle diagram and load test, Starting of Induction motors using Rheostat/reactor starter, Auto-transformer starter, Star-Delta starter, and Rotor Resistance starter, Crawling and cogging, Brief description of the induction motor speed control using Voltage control, frequency control, pole changing, rotor resistance control, cascading, and rotor emf injection, Induction generator and principle of operation, Double-cage rotors.

Synchronous Generators

Basic requirements, Constructional details, EMF equation, Effect of chording and distribution of winding, Armature reaction, Phasor diagram, Regulation of Synchronous Generators using EMF, MMF and ZPF methods, Synchronization of alternators, Parallel operation of two-alternators, Parallel operation of Synchronous Generator to infinite bus, Sharing of real and reactive powers, Capability curve, Salient-pole synchronous machine, Two-reaction theory, Determination of direct axis reactance and quadrature axis reactance of salient-pole machines, Power-Angle characteristics of cylindrical and salient-pole machines.

Synchronous Motors

Principle of operation, starting methods, phasor diagram, effect of changing load and changing excitation on machine performance, V and Inverter ‘V’ curves, Hunting, Damper winding, power developed by synchronous motor.

Special Machines

Single phase Induction motors: Double-field revolving theory, Principle of operation of Split-phase, capacitor start, capacitor start and run, shaded pole machines.

Principle of operation of hysteresis motor, Reluctance motor, BLDC motor and Doubly-fed Induction generator.

Text books

1. M G Say, The performance and Design of Alternating Current Machines, 3rd edition, CBS Publishers & Distributors, New Delhi, 2002.
2. P S Bimbhra, Electrical Machinery, Khanna Publishers, New Delhi, 7th edition, 1995.
3. D P Kothari and I J Nagrath, Electrical Machines, Tata McGraw Hill Educaiton Private Ltd., New Delhi, 4th edition, 2010.

Reference books

1. A E Fitzferald, Chrles Kingsley, Jr., and Stephen D Umans, Electric Machinery, 6th edition, Mc. Graw-Hill, New Delhi, 2003.
2. B L Theraja, and A K Theraja, A textbook of Electrical Technology, Vol. 2, AC & DC Machines, S Chand Publications.
3. Gonzalo Abad, *et al*, Doubly Fed Induction Machine: Modelling and Control for Wind Energy Generation, John. Wiley & Sons, Inc., USA, 2011.

EE2204 EMF THEORY

Course Objectives

- To familiarize the students with different coordinate systems.
- To impart knowledge on the concepts of electrostatics, electric potential, energy density and their applications.
- To impart knowledge on the concepts of magnetostatics, magnetic flux density, scalar and vector potential and its applications.
- To impart knowledge on the concepts of Faraday‘s law, induced emf and Maxwell‘s equations.

Course Outcomes

At the end of the course, the student could able to

- Understand the basic mathematical concepts related to electric and magnetic vector fields.
- Apply the principles of electrostatics to the problems relating to electric field and electric potential, boundary conditions and electric energy density.
- Apply the principles of magnetostatics to the problems relating to magnetic field and magnetic potential, boundary conditions and magnetic energy density.

Syllabus

Electrostatics

Coulomb’s Law, Electric Field of Different Charge Configurations using Coulomb’s Law, Electric Flux, Field Lines, Gauss’s Law in terms of E (Integral Form and Point Form), Applications of Gauss’s Law, Curl of the Electric Field, Electric Potential, Calculation of Electric Field Through Electric Potential for given Charge Configuration, Potential Gradient, The Dipole, Energy density in the Electric field.

Conductors, Dielectrics, and Capacitance

Current and Current Density, Continuity of current, Metallic conductors, Conductor properties and Boundary Conditions, The Method of Images, Semiconductors , The Nature of Dielectric materials, Boundary conditions for Perfect Dielectric Materials, Capacitance, Several Capacitance Examples, Continuity Equation, Basic Properties of Conductors in Electrostatic Fields, Capacitance, Poisson’s and Laplace’s Equations, Examples of the Solution of Laplace’s Equations, Uniqueness Theorem, Examples Of The Solution Of Poisson’s equations.

The Steady Magnetic Field

Biot-Savart’s Law, Amperes Circuital Law, Curl, Stokes Theorem, Magnetic Flux and Magnetic Flux Density, The Scalar and Vector Magnetic Potentials, Derivation of Steady Magnetic Field Laws.

Magnetic Forces, Materials and Inductance

Force on Moving Charge, Force on a Differential Current Element, Force Between Differential Current Elements, Force and Torque on a Closed Circuit, The Nature of Magnetic Materials, Magnetization and Permeability, Magnetic Boundary Conditions, The Magnetic Circuit, Potential Energy and Forces On Magnetic Materials.Self-Inductance, Internal Inductance and Mutual

Inductance, Magnetic circuits , BH Curve , Cores with Air Gaps, Parallel Magnetic Circuits (Chapter 11 Joseph. A. Edminster)

Time Varying Fields and Maxwell's Equations

Faraday's Law, Transformer and Motional EMFs, Displacement Current, Maxwell's Equations in Point Form, Maxwell's Equations in Integral Form, Time -Varying Potentials Time-Harmonic Fields.

Text Books

1. Elements of Electromagnetics by Matthew N.O. Sadiku, Oxford University Press.
2. 2. Engineering Electromagnetics by William H. Hayt Jr. and John A. Buck, Sixth Edition, McGraw Hill, New Delhi, 2001.
3. Electromagnetics, Joseph A. Edminister, Schaum's Outline Series, McGraw-Hill International Editions.

Reference Books

1. Introduction to Electrodynamics by David J. Griffiths, 3rd Edition, Prentice Hall, New Jersey, 1999.
2. Electromagnetics by John D Kraus, Mc Graw-Hill International Edition, 1999.
3. Engineering Electromagnetics by J. P. Tewari, Khanna Publishers, 2nd edition.

EE2205 ELECTRICAL ENGINEERING MATERIALS

Course Objectives

- To explain students about dielectric materials and their properties.
- To detail about magnetic materials and their properties.
- To familiarize with semiconductor materials and their applications.
- To introduce various kinds of special purpose materials.

Course Outcomes

After completion of this course, the student will be able to

- Understand various types of dielectric materials, their properties in various conditions.
- Evaluate magnetic materials and their behavior.
- Evaluate semiconductor materials and technologies.
- Acquire Knowledge on Materials used in electrical engineering and applications.

Syllabus

Dielectric Materials

Dielectric as Electric Field Medium, leakage currents, dielectric loss, dielectric strength, breakdown voltage, breakdown in solid dielectrics, flashover, liquid dielectrics, electric conductivity in solid, liquid and gaseous dielectrics, Ferromagnetic materials, properties of ferromagnetic materials in static fields, spontaneous, polarization, curie point, anti-ferromagnetic materials, piezoelectric materials, pyroelectric materials.

Magnetic Materials

Classification of magnetic materials, spontaneous magnetization in ferromagnetic materials, magnetic Anisotropy, Magneto-striction, diamagnetism, magnetically soft and hard materials, special purpose materials, feebly magnetic materials, Ferrites, cast and cermet permanent magnets, ageing of magnets. Factors effecting permeability and hysteresis.

Semiconductor Materials

Properties of semiconductors, Silicon wafers, integration techniques, Large and very large scale integration techniques (VLSI) Materials for Electrical Applications: Materials used for Resistors, rheostats, heaters, transmission line structures, stranded conductors, bimetals fuses, soft and hard solders, electric contact materials, electric carbon materials, thermocouple materials. Solid, Liquid and Gaseous insulating materials, Effect of moisture on insulation.

Special Purpose Materials

Refractory Materials, Structural Materials, Radioactive Materials, Galvanization and Impregnation of materials, Processing of electronic materials, Insulating varnishes and coolants, Properties and applications of mineral oils, Testing of Transformer oil as per ISI.

Text Books

1. “R K Rajput”, “ A course in Electrical Engineering Materials”, Laxmi Publications, 2009
2. “T K Basak”, “ A course in Electrical Engineering Materials”, New Age Science Publications 2009

Reference Books

1. TTTI Madras, “Electrical Engineering Materials”, McGraw Hill Education, 2004.
2. “AdrianusJ.Dekker”, Electrical Engineering Materials, PHI Publication, 2006.
3. P. Seth, P. V. Gupta “A course in Electrical Engineering Materials”, Dhanpat Rai & Sons,2011.

EE2206 ELECTRICAL MACHINES – II LAB

Course Objectives

- To understand design and each part of AC electrical machines.
- Also to perform tests on AC electrical machines and transformers and determine their characteristics.

Course Outcomes

After completion of course, a student will be able to

- To define characteristics of ac machines.
- To test them in various methods.

List of Experiments

1. Parallel operation of two Single phase Transformers
2. Load test on three phase Induction Motor
3. No-load & Blocked rotor tests on three phase Induction motor
4. Regulation of a three –phase alternator by synchronous impedance & MMF methods
5. Regulation of three-phase alternator by Z.P.F. method
6. V and Inverted V curves of a three—phase synchronous motor.
7. Equivalent Circuit of a single phase induction motor
8. Determination of Xd and Xq of a salient pole synchronous machine
9. Separation of core losses of a single-phase transformer
10. Measurement of sequence impedance of a three-phase alternator.

#Experiments can be drafted basing on the theory course#

EE2207 ELECTRICAL MEASUREMENTS LAB

Course Objectives

- To gain practical knowledge on measuring electrical quantities.
- To understand the functioning of measuring devices
- To understand the circuits of electrical measuring devices.
- To develop team spirit.

Course Outcomes

After completion of this course, a student will be able to

- Analyze various measured electrical quantities.
- Developing circuits for small applications.

List of Experiments

1. Calibration of Voltmeter and Ammeter.
2. Calibration of UPF Dynamometer type Wattmeter by direct loading method.
3. Calibration of UPF Dynamometer type Wattmeter by phantom loading method (AC & DC).
4. Calibration of single-phase energy meter by phantom loading and direct loading.
5. Measurement of power and power factor by using three Ammeter method.
6. Measurement of power and power factor by using three Voltmeter method.
7. Measurement of Three-phase power using one-wattmeter and two-wattmeters method.
8. Kelvin's Double Bridge
9. Wheatstone Bridge
10. Wein's Bridge
11. Anderson Bridge
12. Schering Bridge
13. Experiment on Crompton’s DC potentiometer.

Experiments can be drafted basing on the theory course#

EE2208 ELECTRICAL CAD

Course Objectives

- To introduce the students with the associated features of ECAD using standard-based drafting and drawing skills.
- To familiarize with standard 2D and 3D drawing, modifying, dimension and view commands.
- To introduce the drafting tools, PLC I/O tools, report generation and ways of organising files and projects.
- To provide the animation, gripping visuals, layouts and electrical panel and wiring diagrams and their modules.

Course Outcomes

- Student will know the symbol naming conventions, usage of symbol libraries and generate layout modules.
- Acquire the knowledge of drawing reports, create drawings and wire numbering and component tagging in electrical circuits.
- Students will be able to bring components in to panel for layout, to generate and update customizable reports and use folders to organise drawings.

List of Experiments

1. Introduction and overview of ECAD
2. Starting with Electrical CAD and basic drawing commands
3. Creation of simple project and inserting and interconnecting components
4. Use with PLC modules
5. Schematic reports
6. Bill of material reports
7. Star-Delta Starter Control Circuit
8. Forward-Reverse Control Circuit
9. Electrical motor connections
10. 2D, 3D drawings and animations

#Experiments can be drafted for preparing the electrical drawings using CAD software manual. #

EE2209 ENVIRONMENTAL STUDIES

Course Objectives

The objectives of the Environmental Science course are to

- Familiarize the fundamental aspects of environment and the environmental management'
- Provide information of some of the important international conventions which will be useful during the future endeavors after graduation.
- Make realize the importance of natural resources management for the sustenance of the life and the society.
- Apprise the impact of pollution getting generated through the anthropogenic activities on the environment
- Provide the concept of Sustainable Development, energy and environmental management
- Impart knowledge on the new generation waste like e-waste and plastic waste.

Course Outcomes:

- Knowledge on the fundamental aspects of environment and the environmental management
- The knowledge on the salient features of the important international conventions
- Understanding of the importance of natural resources management for the sustenance of the life and the society.
- Familiarity on various forms of pollution and its impact on the environment.
- Understand the elements of Sustainable Development, energy and environmental management
- Knowledge on the new generation waste like e-waste and plastic waste.

Syllabus

Introduction

Structure and functions of Ecosystems-Ecosystems and its Dynamics-Value of Biodiversity impact of loss of biodiversity, Conservation of bio-diversity. Environmental indicators – Global environmental issues and their impact on the ecosystems.

Salient features of international conventions on Environment

Montreal Protocol, Kyoto protocol, Ramsar Convention on Wetlands, Stockholm Convention on Persistent Organic Pollutants, United Nations Framework Convention on Climate Change (UNFCCC),

Natural Resources Management: Importance of natural resources management-Land as resource, Land degradation, Soil erosion and desertification, Effects of usage of fertilizer, herbicides and pesticide watershed management.

Forest resources

Use and over-exploitation, Mining and dams – their effects on forest ecosystems and the living beings.

Water resources

Exploitation of surface and groundwater, Floods, droughts, Dams: benefits and costs.

Mineral Resources
Impact of mining on the environment and possible environmental management options in mining and processing of the minerals. Sustainable resource management (land, water, and energy), and resilient design under the changing environment.

Environmental Pollution
Local and Global Issues. Causes, effects and control measures. Engineering aspects of environmental pollution control systems.

Air pollution
Impacts of ambient and indoor air pollution on human health. Water pollution: impacts water pollution on human health and loss of fresh water resources. Soil pollution and its impact on environment. Marine pollution and its impact on blue economy. Noise pollution.
Solid waste management: Important elements in solid waste management- Waste to energy concepts. Air (prevention and control of pollution) Act, Water (prevention and control of pollution) Act and their amendments. Salient features of Environmental protection Act, 1986.

Sustainable Development
Fundamentals of Sustainable Development– Sustainability Strategies and Barriers – Industrialization and sustainable development. Circular economy concepts in waste (solid and fluid) management.

Energy and Environment
Environmental Benefits and challenges, Availability and need of conventional energy resources, major environmental problems related to the conventional energy resources, future possibilities of energy need and availability.

Solar Energy
Process of photovoltaic energy conversion, solar energy conversion technologies and devices, their principles, working and applications, disposal of solar panel after their usage.

Biomass energy
Concept of biomass energy utilization, types of biomass energy, conversion processes, Wind Energy, energy conversion technologies, their principles, equipment and suitability in context of India.

Management of plastic waste and E-waste
Sources, generation and characteristics of various e- and plastic wastes generated from various industrial and commercial activities; Waste management practices including onsite handling, storage, collection and transfer. E-waste and plastic waste processing alternatives. E-Waste management rules and Plastic waste management rules, 2016 and their subsequent amendments.

Text Books

1. Bharucha, Erach (2004). Textbook for Environmental Studies for Undergraduate Courses of all Branches of Higher Education, University Grants Commission, New Delhi.
2. Basu, M., Xavier, S. (2016). Fundamentals of Environmental Studies, Cambridge University Press, India
3. Masters, G. M., & Ela, W. P. (1991). Introduction to environmental engineering and science. Englewood Cliffs, NJ: Prentice Hall.

4. Enger, E. and Smith, B., Environmental Science: A Study of Interrelationships, Publisher: McGraw-Hill Higher Education; 12th edition, 2010.

Reference Books

1. Sharma, P. D., & Sharma, P. D. (2005). Ecology and environment. Rastogi Publications
2. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
3. Clark R.S. (2001). Marine Pollution, Clanderson Press Oxford (TB)
4. Jadhav, H & Bhosale, V.M. (1995). Environmental Protection and Laws. Himalaya Pub. House, Delhi 284 p.
5. MoEF& CC, Govt. of India, CPCB: E-waste management rules, 2016 and its amendments 2018.
6. MoEF& CC, Govt. of India, CPCB: Plastic waste management rules, 2016.

SCHEME AND SYLLABUS FOR FIRST & SECOND YEARS OF FOUR YEAR UNDER GRADUATE DEGREE COURSE B. TECH (INFORMATION TECHNOLOGY) [W.E.F. 2022 - 2023 ADMITTED BATCH]

DEPARTMENT OF INFORMATION TECHNOLOGY AND COMPUTER APPLICATIONS
ANDHRA UNIVERSITY COLLEGE OF ENGINEERING
ANDHRA UNIVERSITY
VISAKHAPATNAM-530 003

ANDHRA UNIVERSITY

DEPARTMENT OF INFORMATION TECHNOLOGY AND COMPUTER APPLICATIONS

SCHEME AND SYLLABI

(With effect from 2022-23 admitted batch)

Common for IT & CSE

B.Tech (Information Technology)

I Year –I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
IT1101	BS	Engineering Mathematics –I	4	0	30	70	100	3
IT1102	BS	Green Chemistry	4	0	30	70	100	3
IT1103	HSS	English	4	0	30	70	100	3
IT1104	ES	Computer Programming Using C	4	0	30	70	100	3
IT1105	ES	IT Essentials	4	0	30	70	100	3
IT1106	HSS	Communication skills Lab	0	3	50	50	100	1.5
IT1107	ES	Computer Engineering Workshop Lab	0	3	50	50	100	1.5
IT1108	ES	Computer Programming using C lab	0	3	50	50	100	1.5
Total Credits								**19.5**

B.Tech (Information Technology)

I Year-II Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
IT1201	BS	Engineering Mathematics–II	4	0	30	70	100	3
IT1202	BS	Engineering Physics	4	0	30	70	100	3
IT1203	ES	Elements of Electronics Engineering	4	0	30	70	100	3
IT1204	ES	Data Structures Using C	4	0	30	70	100	3
IT1205	ES	Digital Logic Design	4	0	30	70	100	3
IT1206	ES	LINUX Administration Lab	0	3	50	50	100	1.5
IT1207	BS	Engineering Physics Lab	0	3	50	50	100	1.5
IT1208	ES	Data Structures Lab	0	3	50	50	100	1.5
Total Credits								**19.5**

B.Tech (Information Technology)
II Year - I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
IT2101	ES	Discrete Mathematical Structures	4	0	30	70	100	3
IT2102	PC	Computer Organization and Architecture	4	0	30	70	100	3
IT2103	BS	Probability, Statistics and Queuing theory	4	0	30	70	100	3
IT2104	PC	Operating Systems	4	0	30	70	100	3
IT2105	PC	Object Oriented Programming Through Java	4	0	30	70	100	3
IT2106	PC	Computer Organization & Architecture Lab	0	3	30	70	100	1.5
IT2107	PC	Object Oriented Programming Through Java Lab	0	3	50	50	100	1.5
IT2108	PC	Operating Systems Lab	0	3	50	50	100	1.5
IT2109	SC	Intellectual Property Rights (Internal)	1	2	100	0	100	2
IT2110	MC	Environmental Science	0	0	-	100	100	0
Total credits								**21.5**

B.Tech (Information Technology)
II Year - II Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
IT2201	ES	Microprocessors	4	0	30	70	100	3
IT2202	PC	Design and Analysis of Algorithms	4	0	30	70	100	3
IT2203	PC	Database Management Systems	4	0	30	70	100	3
IT2204	PC	Formal Languages & Automata Theory	4	0	30	70	100	3
IT2205	HSS	Managerial Economics	4	0	30	70	100	3
IT2206	PC	Algorithms Lab through C++.	0	3	50	50	100	1.5
IT2207	PC	Database Management Systems Lab	0	3	50	50	100	1.5
IT2208	SC	Web Technologies	1	2	50	50	100	2
IT2209	MC	Professional Ethics & Universal Human Values	0	0	0	100	100	0
IT2210	MC	NCC/NSS	0	2	-	-	-	0
Total credits								**20**
Internship-I								

B.Tech (Information Technology)

I Year –I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
IT1101	BS	Engineering Mathematics –I	4	0	30	70	100	3
IT1102	BS	Green Chemistry	4	0	30	70	100	3
IT1103	HSS	English	4	0	30	70	100	3
IT1104	ES	Computer Programming Using C	4	0	30	70	100	3
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IT1107	ES	Computer Engineering Workshop Lab	0	3	50	50	100	1.5
IT1108	ES	Computer Programming using C lab	0	3	50	50	100	1.5
Total Credits								**19.5**

IT1101 ENGINEERING MATHEMATICS-I

Course Objectives

- To transmit the knowledge of Partial differentiation.
- To know of getting maxima and minima of function of two variables and finding errors and approximations.
- To evaluate double and triple integrals, volumes of solids and area of curved surfaces.
- To expand a periodical function as Fourier series and half-range Fourier series

Course Outcomes

- Find the partial derivatives of functions of two or more variables.
- Evaluate maxima and minima, errors and approximations.
- Evaluate double and triple integrals, volumes of solids and area of curved surfaces.
- To expand a periodical function as Fourier series and half-range Fourier series.
- Have a fundamental understanding of Fourier series and be able to give Fourier expansions of a given function.

SYLLABUS

Partial Differentiation: Introduction - Functions of two or more variables - Partial derivatives - Homogeneous functions – Euler's theorem - Total derivative - Change of variables – Jacobins. Mean value Theorems (without proofs)

Applications of Partial Differentiation: Geometrical interpretation -Tangent plane and Normal to a surface -Taylor's theorem for functions of two variables - Errors and approximations -Total differential. Maxima and Minima of functions of two variables - Lagrange's method of undetermined multipliers - Differentiation under the integral Sign - Leibnitz's rule.

Multiple Integrals: Introduction - Double Integrals - Change of Order of Integration - Double Integrals in Polar Coordinates - Triple Integrals - Change of Variables.

Multiple Integrals-Applications: Area enclosed by plane curves - Volumes of solids - Area of a curved surface - Calculation of Mass - Centre of gravity - Moment of inertia - product of

inertia – principal axes- Beta Function - Gamma Function - Relation between Beta and Gamma Functions. Error Function or Probability Integral.

Fourier Series: Introduction - Euler's Formulae - Conditions for a Fourier Expansion - Functions having points of discontinuity - Change of Interval - Odd and Even Functions - Expansions of Odd or Even Periodic Functions, Half-Range Series - Parseval's Formula. Practical Harmonic analysis

Text Book

1. Scope and Treatment as in "Higher Engineering Mathematics", by Dr. B.S. Grewal, 43rd Edition, Khanna publishers.

Reference Books

1. Graduate Engineering Mathematics by V B Kumar Vatti., I.K.International publishing house Pvt. Ltd.
2. Advanced Engineering Mathematics by Erwin Kreyszig.
3. A text book of Engineering Mathematics, by N.P. Bali and Dr. Manish Goyal, Lakshmi Publications.
4. Advanced Engineering Mathematics by H.K. Dass. S. Chand Company
5. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Graw Hill Company. 6.
6. Higher Engineering Mathematics by Dr. M.K.Venkataraman.

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IT1102 GREEN CHEMISTRY

Course Objectives:

- To apply the basic knowledge of Chemistry to the Engineering Discipline.
- To develop knowledge about water and its treatment for industrial and potable purposes.
- To develop understanding in the areas of Batteries, Fuels Mechanism of Corrosion of Metals and Corrosion Control Methods, Green Chemistry andTechnology and Processes involving Green Chemistry and apply the knowledge for solving existing challenges faced in various engineering and societal areas.

Learning outcome:

- The students are able to apply the basic concepts and principles studied in Chemistry to the field of Engineering.
- The students are able to apply chemistry to different branches of engineering
- The students are able to acquire the knowledge in the areas of Water Chemistry, Mechanism of Corrosion of Metals and Corrosion Control Methods, Batteries, Fuel Cells, Green Chemistry and Technology and Processes involving Green Chemistry and suggest innovative solutions for existing challenges in these areas.

SYLLABUS

Water Technology
Sources of Water – Impurities and their influence of living systems – WHO Limits – Hardness and its Determination – Boiler Troubles and their removal – Water Softening Methods – Lime-Soda, Zeolite and Ion Exchange - Municipal Water Treatment-Break Point Chlorination – Desalination of Sea Water – Reverse Osmosis Method, Electro-dialysis.

Batteries
Primary batteries: The chemistry - Types: Zinc-carbon (Leclanche type), zinc alkaline (Duracell), zinc/air batteries; Lithium primary cells – liquid cathode, solid cathode and lithium-ferrous sulphide cells. Secondary batteries: Lead acid and VRLA (valve regulated (sealed) lead acid), nickel-cadmium, nickel-zinc, nickel-metal hydride batteries, lithium ion batteries, ultrathin lithium polymer cells. Advanced Batteries for electric vehicles, requirements of the battery – sodium-beta and redox batteries.

Fuel Cells
Fuel Cells: Description, working principle, anodic, cathodic and cell reactions, fabrication of electrodes and other components, applications, advantages, disadvantages and environmental aspects of the following types of fuel cells: Proton Exchange Membrane Fuel Cells, alkaline fuel cells, phosphoric acid, solid oxide, molten carbonate, direct methanol fuel cells-Membranes and Fuels

Corrosion
Corrosion: Origin and Theory – Types of Corrosion: Chemical and Electrochemical; Pitting, Inter granular, Waterline, Stress – Galvanic Series – Factors Effecting Corrosion. Corrosion

Controlling Methods, Protective Coatings, Metallic Coatings, Electroplating and Electroless Plating.

Green Chemistry and Technology

Introduction and significance of green chemistry, Goals of green chemistry, 12 principles of green chemistry, toxicity of chemicals, material safety data sheet (MSDS), concept of zero pollution technologies, atom economy, functional toxicity vs non-functional toxicity, functional group approaches to green chemistry, Elimination of toxic functional group, optimization of frameworks for the design of greener synthetic pathways, Applications of green chemistry - Green solvents, green fuels and propellants, biocatalysis.

Text Books

1. Engineering Chemistry – PC Jain and M. Jain – Dhanpath Rai and Sons, New Delhi.
2. A Text book of Engineering Chemistry – S. S. Dara – S. Chand & Co. New Delhi.
3. Hand Book of Green Chemistry and Technology; by James Clarke and Duncan Macquarrie; Blakwell Publishing.

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IT1103 ENGLISH

Course Objectives

- To make students understand the explicit and implicit meanings of a text/topic;
- To give exposure to new words and phrases, and aid to use them in different contexts;
- To apply relevant writing formats to draft essays, letters, emails and presentations; and
- To adapt oneself to a given situation and develop a functional approach to finding solutions: adaptability and problem solving.

Course Outcomes

- Students will be able to analyse a given text and discover the various aspects related to language and literature;
- Learn the various language structures, parts of speech and figures of speech;
- Develop one's reading and writing abilities for enhanced communication; and
- Learn to apply the topics in real-life situations for creative and critical use.

SYLLABUS

On the conduct of life: William Hazlitt

Life skills: Values and Ethics

If: Rudyard Kipling

The Brook: Alfred Tennyson

Life skills: Self-Improvement

How I Became a Public Speaker: George Bernard Shaw

The Death Trap: Saki

Life skills: Time Management

On saving Time: Seneca

Chindu Yellama

Life skills: Innovation

Muhammad Yunus

Politics and the English Language: George Orwell

Life skills: Motivation

Dancer with a White Parasol: Ranjana Dave

Grammar: Prepositions – Articles – Noun-Pronoun Agreement, Subject-Verb Agreement – Misplaced Modifiers–Clichés, Redundancies.

Vocabulary: Introduction to Word Formation – Root Words from other Languages –Prefixes and Suffixes–Synonyms, Antonyms– Common Abbreviations

Writing: Clauses and Sentences – Punctuation – Principals of Good Writing – Essay Writing – Writing a Summary

Writing: Essay Writing

Life skills: Innovation

Muhammad Yunus

Textbook

1. Language and Life: A Skills Approach Board of Editors, Orient Blackswan Publishers, India.2018.

References

1. Practical English Usage, Michael Swan. OUP. 1995.
2. Remedial English Grammar, F.T. Wood. Macmillan.2007
3. On Writing Well, William Zinsser. Harper Resource Book. 2001
4. Study Writing, Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
5. Communication Skills, Sanjay Kumar and Pushp Lata. Oxford University Press. 2011.
6. Exercises in Spoken English, Parts. I-III. CIEFL, Hyderabad. Oxford University Press.

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IT1104 COMPUTER PROGRAMMING USING C

Course Objectives

- The course is designed to provide complete knowledge of C language.
- To provide students with understanding of code organization and functional hierarchical decomposition with using complex data types.
- To provide knowledge to the students to develop logics which will help them to create programs, applications in C.
- This course aims to identify tasks in which the numerical techniques learned are applicable and apply them to write programs, and hence use computers effectively to solve the task.
- This course provides the fundamental knowledge which is useful in understanding the other programming languages.

Course Outcomes

- Identify basic elements of C programming structures like data types, expressions, control statements, various simple functions and apply them in problem solving.
- Apply various operations on derived data types like arrays and strings in problem solving.
- Design and implement of modular Programming and memory management using Functions, pointers.
- Apply Structure, Unions and File handling techniques to Design and Solve different engineering programs with minimal complexity.
- Apply Numerical methods to Solve the complex Engineering problems.

SYLLABUS

Introduction to C: Basic structure of C program, Constants, Variables and data types, Operators and Expressions, Arithmetic Precedence and associativity, Type Conversions. Managing Input and Output Operations Formatted Input, Formatted Output.

Decision Making, Branching, Looping: Decision making with if statement, Simple if statement, The if…else statement, Nesting of if…else statement, the else.. if ladder, switch statement, the (?:) operator, the GOTO statement., The while statement, the do statement, The for statement, Jumps in Loops.

Arrays & Strings: One, Two-dimensional Arrays, Character Arrays. Declaration and initialization of Strings, reading and writing of strings, String handling functions, Table of strings.

Functions: Definition of Functions, Return Values and their Types, Function Calls, Function Declaration, Category of Functions: No Arguments and no Return Values, Arguments but no Return Values, Arguments with Return Values, No Argument but Returns a Value, Functions that Return Multiple Values. Nesting of functions, recursion, passing arrays to functions, passing strings to functions, the scope, visibility and lifetime of variables.

Pointers: Accessing the address of a variable, declaring pointer variables, initializing of pointer variables, accessing variables using pointers, chain of pointers, pointer expressions, pointers and arrays, pointers and character strings, array of pointes, pointers as function arguments, functions returning pointers, pointers to functions, pointers to structures-Program Applications.

Structure and Unions: Defining a structure, declaring structure variables, accessing structure members, structure initialization, copying and comparing structure variables, arrays of structures, arrays within structures, structures within structures, structures and functions and unions, size of structures and bit-fields- Program applications.

File handling: Defining and opening a file, closing a file, Input/ Output operations on files, Error handling during I/O operations, random access to files and Command Line Arguments-Program Applications.

Text Books

1. Programming in ANSI C, E Balagurusamy, 6th Edition. McGraw Hill Education (India) Private Limited.

Reference Books

1. Let Us C ,Yashwant Kanetkar, BPB Publications, 5th Edition.
2. Computer Science, A structured programming approach using C", B.A.Forouzan and R.F.Gilberg, " 3rd Edition, Thomson, 2007.
3. The C –Programming Language' B.W. Kernighan, Dennis M. Ritchie, PHI.
4. Scientific Programming: C-Language, Algorithms and Models in Science, Luciano M. Barone (Author), EnzoMarinari (Author), Giovanni Organtini, World Scientific.

IT1105 IT ESSENTIALS

Course Objectives

- Select the appropriate computer components to build, repair, or upgrade personal computers.
- Explain how to correctly use tools and safely work in a lab.
- Install components to build, repair, or upgrade personal computers.
- Configure computers to communicate on a network
- Configure devices to connect to the Internet and Cloud services
- Explain how to use, configure, and manage laptops and mobile devices

Course Outcomes

- Understands the roles and responsibilities of the IT professional
- Able to Troubleshoot advanced hardware and software problems
- Provides an experience-oriented course that employs industry-relevant instructional approaches to prepare students for entry-level jobs in the industry.

Syllabus

Introduction to the Personal Computer Describe a Computer System, Identify the Names, Purposes, and Characteristics of Cases and Power Supplies, Identify the Names, Purposes, and Characteristics of Internal Components, Identify the Names, Purposes, and Characteristics of Ports and Cables, Identify the Names, Purposes, and Characteristics of Input Devices, Identify the Names, Purposes, and Characteristics of Output Devices, Explain System Resources and Their Purposes.

Safe Lab Procedures and Tool Use Explain the Purpose of Safe Working Conditions and Procedures, Identify Tools and Software Used with Personal Computer Components and Their Purposes, Implement Proper Tool Use.

Computer Assembly Attach the Components to the Motherboard and Install the Motherboard, Install Internal Drives, Install Drives in External Bays, Install Adapter Cards, Connect the Power Cables Reattach the Side Panels to the Case, Boot the Computer for the First Time. **Basics of Preventive Maintenance and Troubleshooting** Explain the Purpose of Preventive Maintenance, Identify the Steps of the Troubleshooting Process.

Fundamental Laptops and Portable Devices Identify Common Preventive Maintenance Techniques for Laptops and Portable Devices, Describe How to Troubleshoot Laptops and Portable Devices.

Fundamental Operating Systems Explain the Purpose of an Operating System, Describe and Compare Operating Systems to Include Purpose, Limitations, and Compatibilities, Determine Operating System Based on Customer Needs, Install an Operating System, Identify and Apply Common Preventive Maintenance Techniques for Operating Systems, Troubleshoot Operating Systems.

Fundamental Networks Explain the Principles of Networking, Describe Types of Networks, Describe Basic Networking Concepts and Technologies, Describe the Physical Components of a Network, Describe LAN Topologies and Architectures.

Fundamental Security: Explain Why Security Is Important, Describe Security Threats, Identify Security Procedures, Identify Common Preventive Maintenance Techniques for Security, Troubleshoot Security.

Text books:

1. IT Essentials: PC Hardware and Software Companion Guide Fourth Edition, Cisco Networking Academy.

References:

1. Network security essentials application and standrads, by William stallings, 4th edition, prentice hall.
2. Mike Meyers' CompTIA A+ Guide to Managing and Troubleshooting PCs, Sixth Edition 6th Edition

IT1106 COMMUNICATION SKILLS LAB

Course Objectives

- To make students recognize the sounds of English through Audio-Visual aids;
- To help students build their confidence and help them to overcome their inhibitions and self- consciousness while speaking in English;
- To familiarize the students with stress and intonation and enable them to speak English effectively; and
- To give learners exposure to and practice in speaking in both formal and informal contexts.

Course Outcomes

- Students will be sensitized towards recognition of English sound patterns and the fluency in their speech will be enhanced;
- A study of the communicative items in the laboratory will help students become successful in the competitive world;
- Students will be able to participate in group activities like roleplays, group discussions and debates; and
- Students will be able to express themselves fluently and accurately in social as well professional context.

SYLLABUS

Introduction to Phonetics: The Sounds of English (Speech sound – vowels and consonants) - Stress and Intonation - Accent and Rhythm.

Listening Skills: Listening for gist and specific information - listening for Note taking, summarizing and for opinions - Listening to the speeches of eminent personalities.

Speaking Skills: Self-introduction - Conversation Skills (Introducing and taking leave) - Giving and asking for information - Role Play - Just A Minute (JAM) session - Telephone etiquette.

Reading and Writing skills: Reading Comprehension – Précis Writing - E-Mail writing - Punctuation.

Presentation skills: Verbal and non-verbal communication - Body Language - Making a Presentation

Reference Books

1. Ashraf Rizvi. Effective Technical Communication. Tata McGraw Hill Education Private Limited, New Delhi.
2. Speak Well. Orient Blackswan Publishers, Hyderabad.
3. Allan Pease. Body Language. Manjul Publishing House, New Delhi.

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IT1107 COMPUTER ENGINEERING WORKSHOP LAB

Course Objectives

- Explain the internal parts of a computer, peripherals, I/O ports, connecting cables
- Demonstrate basic command line interface commands on LINUX
- Teach the usage of Internet for productivity and self-paced lifelong learning
- Describe about Compression, Multimedia and Antivirus tools
- Demonstrate Office Tools such as Word processors, Spreadsheets and Presentation tools

Course Outcomes

- Assemble and disassemble components of a PC
- Construct a fully functional virtual machine, Summarize various LINUX operating system commands.
- Able to Troubleshoot hardware and software problems.

Syllabus

Module I – Hardware Concepts

1. Every student should identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor. Every student should disassemble and assemble the PC back to working condition.

Module II – Software Installations

1. Every student should individually install operating system like LINUX or MS windows on the personal computer. The system should be configured as dual boot with both windows and LINUX.
2. Hardware Troubleshooting: Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition.
3. Software Troubleshooting: Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition.
4. Cyber Hygiene: Students should learn about viruses on the internet and install antivirus software. Student should learn to customize the browsers to block pop ups, block active x downloads to avoid viruses and/or worms.
5. Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and popup blockers.

Module III – MS-Office

1. MS Word - Features to be covered: Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colours, Inserting Header and Footer, Using Date.
2. Creating project abstract Features to be covered: Formatting Styles, inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.
3. Creating a Newsletter: Features to be covered: Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs in word.
4. Spreadsheet Orientation: Accessing, overview of toolbars, saving spreadsheet files, Using help and resources. Creating a Scheduler: Gridlines, Format Cells, Summation, auto fill, Formatting Text.
5. Calculating GPA - Features to be covered: Cell Referencing, Formulae in spreadsheet – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, Sorting, Conditional formatting.
6. Creating Power Point: Student should work on basic power point utilities and tools in Latex and Ms Office/equivalent (FOSS) which help them create basic power point presentation. PPT Orientation, Slide Layouts, Inserting Text, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows, Hyperlinks, Inserting Images, Tables and charts.

IT1108 Computer Programming Using C Lab

Course Objectives

- To impart writing skill of C programming to the students and solving problems.
- To write and execute programs in C to solve problems such as Modularize the problems into small modules and then convert them into programs.,
- To write and execute programs in C to solve problems such as arrays, files, strings, structures and different numerical methods.
- This reference has been prepared for the beginners to help them understand the basic to advanced concepts related to Objective-C Programming languages.

Course Outcomes

- Understand various computer components, Installation of software. C programming development environment, compiling, debugging, and linking and executing a program using the development environment.
- Analysing the complexity of problems, Modularize the problems into small modules and then convert them into programs.
- Construct programs that demonstrate effective use of C features including arrays, strings, structures, pointers and files.
- Apply and practice logical ability to solve the real-world problems.
- Apply Numerical methods to Solve the complex Engineering problems.

Syllabus

Practice the following concepts with algorithm, flow chart and implementation.

1. C – Tokens, Data Types - Format Specifiers, I/O Statements, Structure of C Program, Sample C Programs
2. Operators in C, their Precedence and Associativity, Arithmetic Expressions/Instructions, Type casting, Math.h functions, Sample C Programs
3. Control Statements (Conditional): If and its Variants, Switch (Break), Sample C Programs.
4. Goto Statement, Control Statements (Looping): While, Do..While, For Loop, Continue & Break (Unconditional), Nested Loops, Sample C Programs
5. Arrays, One Dimensional Array: Declaration and Initialization, Accessing Array Elements, Sample C Programs

6. Two Dimensional Array: Declaration and Initialization, Accessing Array Elements, Sample C Programs
7. Strings: Read & Write, “String.h” Predefined Functions, Sample C Programs.
8. Pointers: Declarations, Types, Pointers to Arrays, Pointers to Character Strings, Pointers to Pointers, Array of Pointers
9. Structures: Definition, Syntax, Nested Structures, Pointers to Structures, Unions: Definition, Syntax
10. Functions: Definition, Syntax, Terminology, Function Declaration, Classification (Arguments and Return Type), Storage Classes, Sample C Programs
11. Parameter Passing Techniques, Passing Parameters Types, Recursion 166-176
12. Files: Definition, Opening, Closing of Files, Reading and Writing of Files, Sample C Programs
13. Binary Files, Random Accessing of Files, Enum, Typedef, Preprocessor Commands, Sample C Programs
14. Numerical methods: Bisection method, Newton Raphson method, Lagrange’s interpolation, Simpson’s rule for numerical integration.

References:

1. Programming in ANSI C, E Balagurusamy, 6th Edition. McGraw Hill Education (India) Private Limited.
2. Introduction to Numerical Methods, SS Sastry, Prentice Hall

B.Tech (Information Technology)

I Year-II Semester

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IT1203	ES	Elements of Electronics Engineering	4	0	30	70	100	3
IT1204	ES	Data Structures Using C	4	0	30	70	100	3
IT1205	ES	Digital Logic Design	4	0	30	70	100	3
IT1206	ES	LINUX Administration Lab	0	3	50	50	100	1.5
IT1207	BS	Engineering Physics Lab	0	3	50	50	100	1.5
IT1208	ES	Data Structures Lab	0	3	50	50	100	1.5
							Total Credits	**19.5**

IT1201 ENGINEERING MATHEMATICS – II

Course Objectives

- The way of obtaining rank, eigen values and eigen vectors of a matrix.
- To know the importance of Cayley-Hamilton theorem and getting canonical form from a given quadratic form.
- To solve the system of equations by using direct and indirect methods.
- To solve first order and higher order differential equations by various methods.
- To obtain the Laplace transforms and inverse Laplace transforms for a given functions and their applications.

Course Outcomes

- Find rank, eigen values and eigen vectors of a matrix and understand the importance of Cayley- Hamilton theorem.
- Reduce quadratic form to canonical forms and solving linear systems by direct and indirect methods.
- Demonstrate solutions to first order differential equations by various methods and solve basic applications problems related to electrical circuits, orthogonal trajectories and Newton's law of cooling
- Discriminate among the structure and procedure of solving higher order differential equations with constant and variable coefficients.
- Understand Laplace transforms and its properties and finding the solution of ordinary differential equations.

SYLLABUS

Linear Algebra: Rank of a matrix- Echelon form, Normal Form - Solution of Linear System of Equations - Consistency of Linear System of Equations - Direct & Indirect Methods: Gauss elimination method, LU Factorization method, Gauss Seidal Method. Complex Matrices: Hermitian, Skew-Hermitian and Unitary Matrices and their Properties.

Eigen Values and Eigen Vectors: Eigen Values and Eigen Vectors of a Matrix - Cayley-Hamilton theorem - Inverse and Powers of a Matrix using Cayley-Hamilton's theorem and its applications. Diagonalization of a Matrix - Quadratic Forms - Reduction of Quadratic Form to Canonical Form - Nature of a Quadratic Form.

Ordinary Differential Equations of First Order and its Applications: Formation of ordinary differential equations (ODEs) - Solution of an ordinary differential equation - Equations of the first order and first degree - Linear differential equation - Bernoulli's equation - Exact differential equations - Equations reducible to exact equations - Orthogonal Trajectories - Simple Electric (LR & CR) Circuits - Newton's Law of Cooling - Law of Natural growth and decay.

Differential Equations of Higher Order: Solutions of Linear Ordinary Differential Equations with Constant Coefficients - Rules for finding the complimentary function - Rules for finding the particular integral - Method of variation of parameters - Cauchy's linear equation - Legendre's linear equation - Simultaneous linear differential equations.

Laplace Transforms: Introduction - Existence Conditions - Transforms of Elementary Functions - Properties of Laplace Transforms - Transforms of Derivatives - Transforms of Integrals - Multiplication by tn - Division by t – Evaluation of integrals by Laplace Transforms - Inverse Laplace Transform - Applications of Laplace Transforms to Ordinary Differential Equations - Simultaneous Linear Differential Equations with Constant Coefficients - Second Shifting Theorem - Laplace Transforms of Unit Step Function, Unit Impulse Function and Laplace Transforms of Periodic Functions.

Text Book

1. Scope and Treatment as in "Higher Engineering Mathematics", by Dr. B.S. Grewal, 43rd edition, Khanna publishers.

Reference Books

1. Graduate Engineering Mathematics by V B Kumar Vatti., I.K. International publishing house Pvt. Ltd.
2. Advanced Engineering Mathematics by Erwin Kreyszig.
3. A text book of Engineering Mathematics, by N.P. Bali and Dr. Manish Goyal. Lakshmi Publications.
4. Advanced Engineering Mathematics by H.K. Dass. S. Chand Company.
5. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Graw Hill Company.

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IT1202 ENGINERING PHYSICS

Course Objectives

- To impart knowledge in basic concept of physics of Thermodynamics relevant to engineering applications.
- To grasp the concepts of physics for electromagnetism and its application to engineering. Learn production of Ultrasonics and their applications in engineering.
- To Develop understanding of interference, diffraction and polarization: connect it to a few engineering applications.
- To Learn basics of lasers and optical fibres and their use in some applications.
- To Understand concepts and principles in quantum mechanics and Nanophase Materials. Relate them to some applications.

Course Outcomes

- Understand the fundamentals of Thermodynamics and Laws of thermodynamics. Understand the working of Carnot cycle and concept of entropy.
- Gain Knowledge on the basic concepts of electric and magnetic fields. Understand the concept of the nature of magnetic materials. Gain knowledge on electromagnetic induction and its applications.
- Understand the Theory of Superposition of waves. Understand the formation of Newton's rings and the working of Michelson's interferometer. Remember the basics of diffraction, Evaluate the path difference. Analysis of Fraunhofer Diffraction due to a single slit
- Understand the interaction of matter with radiation, Characteristics of Lasers, Principle, working schemes of Laser and Principle of Optical Fibre. Realize their role in optical fibre communication.
- Understand the intuitive ideas of the Quantum physics and understand dual nature of matter. Compute Eigen values, Eigen functions, momentum of Atomic and subatomic particles using Time independent one-Dimensional Schrodinger's wave equation. Understand the fundamentals and synthesis processes of Nanophase materials.

SYLLABUS

Thermodynamics: Introduction, Heat and Work, First law of thermodynamics and applications, Reversible and Irreversible process, Carnot cycle and Efficiency, Second law of

thermodynamics, Carnot's Theorem, Entropy, Second law in terms of entropy, Entropy and disorder, Third law of thermodynamics (statement only).

Electromagnetism: Concept of electric flux, Gauss's law - some applications, Magnetic field - Magnetic force on current, torque on current loop, The Biot-Savart's Law, B near a long wire, B for a circular Current loop, Ampere's law, B for a solenoid, Hall effect, Faraday's law of induction, Lenz's law, Induced magnetic fields, Displacement current, Maxwell's equations (no derivation), Magnetic materials: Classification of magnetic materials and properties.

Ultrasonics: Introduction, Production of Ultrasonics – Piezoelectric and Magnetostriction methods, acoustic grating, applications of ultrasonics.

Optics-

Interference: Principles of superposition – Young's Experiment – Coherence - Interference in thin films (reflected light), Newton's Rings, Michelson Interferometer and its applications.

Diffraction: Introduction, Differences between interference and diffraction, Fresnel and Fraunhofer diffraction, Fraunhofer diffraction at a single slit (Qualitative and quantitative treatment).

Polarisation: Polarisation by reflection, refraction and double refraction in uniaxial crystals, Nicol prism, Quarter and Half wave plate, circular and elliptical polarization.

Lasers And Fibre Optics: Introduction, characteristics of a laser beam, spontaneous and stimulated emission of radiation, population inversion, Ruby laser, He-Ne laser, Semiconductor laser, applications of lasers Introduction to optical fibres, principle of propagation of light in optical fibres, Acceptance Angle and cone of a fibre, Numerical aperture, Modes of propagations, classification of fibres, Fibre optics in communications, Application of optical fibres.

Modern Physics-

Introduction, De Broglie concept of matter waves, Heisenberg uncertainty principle, Schrodinger time independent wave equation, application to a particle in a box. Free electron theory of metals, Kronig - Penney model (qualitative treatment), Origin of energy band formation in solids, Classification of materials into conductors, semi-conductors and insulators.

Nanophase Materials: Introduction, properties, Top-down and bottom-up approaches, Synthesis - Ball milling, Chemical vapour deposition method, sol-gel methods, Applications of nano materials.

Text Books

1. Physics by David Halliday and Robert Resnick – Part I and Part II - Wiley.
2. A textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar - S. Chand
3. Engineering Physics by R.K. Gaurand S.L. Gupta–Dhanpat Rai

Reference Books

1. Modern Engineering Physics by A.S. Vadudeva
2. University Physics by Young and Freedman

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IT1203 ELEMENTS OF ELECTRONICS ENGINEERING

Course Objectives

- Introduce students to basics of semiconductors, their classification and properties
- To provide theory of PN junction diode, its characteristics and applications
- To introduce basics of rectifying circuits and bipolar junction transistor
- To provide basics of transistor biasing, transistor amplifiers and field effect transistors

Course Outcomes

By the end of the course, the student should be able to:

- Explain the basics of semiconductors and their classification
- Understand the theory of PN junction diode, rectifying circuits and bipolar junction transistor
- Explain the concepts of transistor biasing, transistor amplifiers and field effect transistors

SYLLABUS

Introduction to Electronics and Semiconductors: Energy band theory, Conduction in Insulators, Semiconductors and metals, Electron emission from metals, Classification of semiconductors, Carrier concentration in an intrinsic semiconductor, Properties of intrinsic semiconductor, Drift and diffusion currents.

Semi-Conductor Diode: Theory of PN junction diode, Open circuited PN junction, V-I characteristics of a PN diode, Diode current equation, Transition and diffusion capacitances, Break down in PN diode, Applications of PN diodes. Zener diode, Zener regulator, Tunnel diode, Schottky diode.

Rectifying circuits: Half wave and full wave rectifiers, Bridge rectifiers, Efficiency, Ripple and regulation of each rectifier, Capacitor filters.

Bipolar Junction Transistor: Introduction, construction, Operation of PNP and NPN Transistors – Transistor Circuit configurations- Characteristics of a CE configurations – h parameters, low frequency small signal equivalent circuit of a Transistor.

Transistor Biasing and thermal stabilization: Transistor Biasing, Stabilization, Different methods of transistor biasing – Fixed bias, Collector feedback bias – self bias – Bias compensation.

Transistor Amplifiers: CE, CB, CC amplifier configurations –Multistage amplifier – A Two Stage RC coupled amplifier – frequency response curve and bandwidth.

Field Effect Transistors: Junction Field Effect Transistors (JFET) – JFET characteristics, JFET Parameters, Small signal equivalent circuit – MOSFETS – Depletion and Enhancement MOSFETS.

Text Books:

1. Electronic Device and Circuits by Sanjeev Guptha.

Reference Books:

1. Electronic Device and Circuits Theory by Robert L. Boylested Electronic Device and Circuits by David. A. Bell

IT1204 DATA STRUCTURES USING C

Course objectives

- Assess how the choice of data structures and algorithm design methods impacts the performance of programs.
- Choose the appropriate data structure and algorithm design method for a specified application.
- Solve problems using data structures such as linear lists, stacks, queues, binary trees, heaps binary search trees, and graphs and writing programs for these solutions.

Course outcomes

- Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithm.
- Demonstrate different methods for traversing trees.
- Compare alternative implementations of data structures with respect to performance.
- Discuss the computational efficiency of the principal algorithms for sorting and searching

SYLLABUS

Introduction to Data Structures: Review of C Programming, Recursive Definition and Processes, Recursion in C, Simulation of Recursion, Efficiency of Recursion, Abstract Data Types, Meaning and Definition of Data Structures, Arrays.

Stacks: Stack as an Abstract Data Type, Primitive Operations, Implementing Stack Operations using Arrays, Infix, Postfix and Prefix: Definitions, Evaluation and Conversions.

Queues: Queue as an Abstract Data Type, Sequential Representation, Types of Queues, Operations, Implementation using Arrays.

Linked List: Operations, Implementation of Stacks, Queues and priority Queues using Linked Lists+, Circular Lists: Insertion, Deletion and Concatenation Operations, Stacks and Queues as Circular Lists, Doubly Linked Lists.

Trees: Binary Trees - Definitions and Operations, Binary Tree Representation: Node Representation, Implicit array Representation, Binary Tree Traversal, Threaded Binary Trees and their Traversal, Trees and their Applications; Tree Searching: Insertion and Deletion of a node from a Binary Search Tree, Efficiency of Binary Search Tree operations.

Searching: Basic Searching Techniques: Dictionary as an Abstract Data Type, Algorithmic Notation, Sequential Searching and its Efficiency, Binary Search, Interpolation Search.

Sorting: General Background: Efficiency, Asymptotic Notations, Efficiency of Sorting, Bubble Sort and Quick Sort and their Efficiency, Selection Sorting, Binary Tree Sort, Heap Sort, Insertion Sorts, Shell Sort, Address calculation Sort, Merge and Radix Sorts.

Graphs and Their Application: Definition of Graphs, Representation of Graphs, Transitive closure, Linked Representation of Graphs, Topological Ordering of nodes, Graph Traversal and Spanning Forests, Undirected Graphs and their Traversals, Applications of Graphs, Minimal Spanning Trees.

Textbooks

1. Data Structures Using C and C++ Yddish Langsam, Moshe J. Augenstein and Aaron M.Tanenbaum, Prentice Hall Of India (2nd Edition)
2. Data Structures, Algorithms and Applications with C++, Sahani Mc-Graw Hill.

IT1205 DIGITAL LOGIC DESIGN

Course objectives

- To introduce the basic principles for design of combinational circuit and sequential circuits.
- To learn simple digital circuits in preparation for computer engineering.

Course Outcomes

A student who successfully fulfils the course requirements will have demonstrated:

- An ability to define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.
- An ability to understand the different Boolean algebra theorems and apply them for logic functions.
- An ability to define the Karnaugh map for a few variables and perform an algorithmic reduction of logic functions.
- An ability to define the following combinational circuits: multiplexer, de-multiplexers encoders/decoders, comparators, arithmetic-logic units; and to be able to build simple circuits.
- An ability to understand asynchronous and synchronous sequential circuits, like counters and shift registers.
- An ability to understand memories like RAM and ROM, Programmable Logic Array and Programmable Array Logic.

SYLLABUS

Binary Systems: Digital Systems. Binary Numbers. Number Base Conversions. Octal and Hexadecimal Numbers. Complements. Signed Binary Numbers. Binary Codes. Binary Storage and Registers. Binary Logic

Boolean Algebra and Logic Gates: Basic Definitions. Axiomatic Definition of Boolean Algebra. Basic Theorems and Properties of Boolean Algebra. Boolean Functions. Canonical and Standard Forms. Other Logic Operations. Digital Logic Gates. Integrated Circuits.

Combinational Logic Design, Gate-Level Minimization: The Map Method. Four Variable Map. Five-Variable Map. Product of Sums Simplification. Don't-Care Conditions. NAND

and NOR Implementation. Other Two- Level Implementations. Exclusive-OR Function. Hardware Description Language (HDL).

Combinational Logic: Combinational Circuits. Analysis Procedure. Design Procedure. Binary Adder Subtractor. Decimal Adder. Binary Multiplier. Magnitude Comparator. Decoders. Encoders. Multiplexers. HDL For Combinational Circuits.

Sequential Logic Design, Synchronous Sequential Logic: Sequential Circuits. Latches Flipflops. Analysis of Clocked Sequential Circuits. HDL For Sequential Circuits. State Reduction and Assignment. Design Procedure.

Registers ad Counters: Registers. Shift Registers. Ripple Counters. Synchronous Counters. Other Counters. HDL for Registers and Counters.

Memory and Programmable Logic: Introduction. Random-Access Memory. Memory Decoding, Error Detection and Correction. Read-Only Memory. Programmable Logic Array. Programmable Array Logic. Sequential Programmable Devices.

Text Book

1. DigitalDesign,3rdEdition, M. Morris Mano, Pearson Education.

Reference Books

1. Digital Logic Design Principles, Norman Balabanian & Bradley Carlson, John Wiley &Sons (Asia) Pvt.Ltd.,2002
2. Fundamentals of Digital Logic with VHDL Design, Stephen Brown and ZvonkoVranesic, TataMcGraw-HillEdition,2002.

IT1206 LINUX ADMINISTRATION LAB

Course Objectives

- To understand LINUX operating system and its internals.
- To understand LINUX file system structure and its operations.
- To understand LINUX shell environment and its programming.
- To understand communication in LINUX and the corresponding primitives.

Course Outcomes

- The student learns about LINUX features for multiuser, multitasking capabilities.
- The student learns about file system organization, file and directory manipulation, setting file permissions, and disk free space administration.
- The student learns about writing shell scripts for different applications.
- The student learns about how users communicate with each other in LINUX environment.

SYLLABUS

1) Study and practice on file system / handling files with commands, syntax, usage, application.
2) Practice on vi editor.
3) Study and practice on redirection operators with relevant commands, syntax, usage, application.
4) Study and practice on filters with relevant commands, syntax, usage, application.
5) Study and practice on Backup with relevant commands, syntax, usage, application.
6) Study and practice on internet related commands, syntax, usage, application.
7) Study and practice on shells/shell programming with relevant programming constructs, syntax, usage, application.
8) Study and practice on awk with relevant commands, syntax, usage, application.
9) Study and practice on regular expressions and the grep family with relevant commands, syntax, usage, application.
10) Study and practice on compilation process of C programs under UNIX.

References:

1. Unix concepts and applications by Sumitabha Das, TMH Publications.
2. Shell programming by Yashwanth Kanetkar.

IT1207 ENGINNERING PHYSICS LAB

Course Objectives

- To enable the students to acquire skill, technique and utilization of the Instruments
- Draw the relevance between the theoretical knowledge and to imply it in a practical manner with respect to analyse various electronic circuits and its components.
- To impart the practical knowledge in basic concepts of Wave optics, Lasers and fibre optics.
- To familiarize the handling of basic physical apparatus like Vernier callipers, screw gauge, spectrometers, travelling microscope, laser device, optical fibre, etc.

Course Outcomes

- Ability to design and conduct experiments as well as to analyse and interpret
- Ability to apply experimental skills to determine the physical quantities related to Heat, Electromagnetism and Optics
- The student will learn to draw the relevance between theoretical knowledge and the means to imply it in a practical manner by performing various relative experiments.

SYLLABUS

1. Determination of Radius of Curvature of a given Convex Lens By forming Newton's Rings.
2. Determination of Wavelength of Spectral Lines in the Mercury Spectrum by Normal Incidence method.
3. Study the Intensity Variation of the Magnetic Field along axis of Current Carrying Circular Coil.
4. Determination of Cauchy's Constants of a Given Material of the Prism using Spectrometer.
5. Determination of Refractive Index of Ordinary ray □o and Extraordinary □e ray.
6. Determination of Thickness Given Paper Strip by Wedge Method.
7. Calibration of Low Range Voltmeter.
8. Calibration of Low Range Ammeter.
9. Determination of Magnetic Moment and Horizontal Component of Earth's Magnetic Field.

10. Lees Method - Coefficient of thermal Conductivity of a Bad Conductor.

11. Carey Foster's Bridge – Verification of laws of Resistance and Determination of Specific Resistance.

12. Melde's Apparatus – Frequency of electrically maintained Tuning Fork.

13. Photoelectric cell-Characteristics.

14. Planks Constants.

15. Laser- Diffraction.

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IT1208 DATA STRUCTURES LAB

Course Objectives

- To implement stacks and queues using arrays and linked lists.
- To develop programs for searching and sorting algorithms.
- To write programs using concepts of various trees.
- To implement programs using graphs.

Course Outcomes

- Student will be able to write programs to implement stacks and queues.
- Ability to implement various searching and sorting techniques.
- Ability to implement programs using trees and graphs.

SYLLABUS

List of Programs:

1. Write a C program for sorting a list using Bubble sort and then apply binary search.
2. Write a C program for implementing the operations of a queue.
3. Write a C program to implement the operations on priority queues.
4. Write a C to implement the operations on circular queues.
5. Write a C program to implement the operations on stacks.
6. Write a C program for evaluating a given postfix expression using stack.
7. Write a C program for converting a given infix expression to postfix form using stack.
8. Write a C program to implement the operations on single linked list.
9. Write a C program for demonstrate operations on double linked list.
10. Write a C program for the representation of polynomials using circular linked list and for the addition of two such polynomials
11. Write a C program to create a binary search tree and for implementing the in order, Pre order, post order traversal using recursion
12. a) Write a C program for finding the transitive closure of a digraph
    b) Write a C program for finding the shortest path from a given source to any vertex
    in a digraph using Dijkstra's algorithm.
13. a) Write a C program for finding the Depth First Search of a graph.
    b) Write a C program for finding the Breadth First Search of a graph

References:

1. Data Structures Using C and C++ Yddish Langsam, Moshe J. Augenstein and Aaron M.Tanenbaum, Prentice Hall Of India (2nd Edition)

2. Data Structures, Algorithms and Applications with C++, Sahani Mc-Graw Hill.

B.Tech (Information Technology)
II Year - I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
IT2101	ES	Discrete Mathematical Structures	4	0	30	70	100	3
IT2102	PC	Computer Organization and Architecture	4	0	30	70	100	3
IT2103	BS	Probability, Statistics and Queuing theory	4	0	30	70	100	3
IT2104	PC	Operating Systems	4	0	30	70	100	3
IT2105	PC	Object Oriented Programming Through Java	4	0	30	70	100	3
IT2106	PC	Computer Organization & Architecture Lab	0	3	30	70	100	1.5
IT2107	PC	Object Oriented Programming Through Java Lab	0	3	50	50	100	1.5
IT2108	PC	Operating Systems Lab	0	3	50	50	100	1.5
IT2109	SC	Intellectual Property Rights (Internal)	1	2	100	0	100	2
IT2110	MC	Environmental Science	0	0	-	100	100	0
Total credits								**21.5**

IT2101 DISCRETE MATHEMATICAL STRUCTURES

Course Objectives

- To understand mathematical arguments using logical connectives and quantifiers and verify the validity of logical flow of arguments using propositional, predicate logic and truth tables.
- To understand about permutations and combinations.
- To understand various types of relations and discuss various properties of the relations.
- To study the graphs, graph isomorphism and spanning trees.
- To study about Boolean algebra and Finite State Machines.

Course Outcomes

At the end of the course student will be able to

- Rewrite mathematical arguments using logical connectives and quantifiers and verify the validity of logical flow of arguments using propositional, predicate logic.
- Identify and give examples of various types of relations and describe various properties of the relations.
- Ability to solve problems using permutations and combinations.
- Determine isomorphism of graphs and spanning tree of a given graph using BFS/DFS algorithms. Also determine minimal spanning tree of a given graph.

SYLLABUS

The Foundations-Logic and Proofs: Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers Rules of Inference, Introduction to Proofs, Proof Methods and Strategy, Basic Structures-Sets, Functions, Sequences and Sums: Sets, Set Operations, Functions, Sequences and Summations.

The Fundamentals-Algorithms, the Integers and Matrices: Algorithms, The Growth of Functions, Complexity of Algorithms, The Integers and Division, Primes and Greatest Common Devisors, Integers and Algorithms, Applications of Number Theory, Matrices.

Induction and Recursion: Mathematical Induction, Strong Induction and Well-Ordering, Recursive Definitions and Structural Induction, Recursive Algorithms, Program Correctness. Counting: The Basics of Counting, The Pigeonhole Principle, Permutations and Combinations, Binomial Coefficients, Generalized Permutations and Combinations, Generating Permutations and Combinations.

Advanced Counting Techniques: Recurrence Relations, Solving Linear Recurrence Relations, Divide-and-Conquer Algorithms and Recursion Relations, Generating Functions, Inclusion-Exclusion, and Applications of Inclusion-Exclusion.

Relations: Relations and their properties, n-ary relations, applications, Representation, closure, equivalence relations, Partial orderings.

Graphs: Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Colouring.

Trees: Introduction to Trees, Applications of Trees, Tree Traversal, Spanning Trees, Minimum Spanning Trees,

Boolean Algebra: Boolean Functions, Representing Boolean Functions, Logic Gates, Minimization of Circuits

Modelling Computation: Languages and Grammars, Finite-State Machines with Output, Finite-State Machines with No Output, Language Recognition, Turing Machines.

Text Book

1. Discrete Mathematics & Its Applications with Combinatorics and Graph Theory by Kenneth H Rosen, Tata McGraw-Hill Publishing Company Ltd., New Delhi.

Reference Books

1. Discrete Mathematics for Computer Scientists & Mathematicians by Joe L. Mott, Abraham Kandel, Theodore P. Baker, Prentice-Hall, India.
2. Discrete Mathematics by Richard Johnson Baug, Pearson Education, New Delhi.
3. Discrete and Combinatorial Mathematics by Ralph. G. Grimaldi, Pearson Education, New Delhi.

IT2102 COMPUTER ORGANIZATION AND ARCHITECTURE

Course Objectives

- To study about structure and functional components of a computer.
- Understanding the hierarchical organization of a computer system which consists of instruction set of commands.
- Learn about the architecture of a computer from a programming view.
- To design a balance system that minimizes performance and utilization of all elements.

Course Outcomes

By the end of the course, the student should be able to:

- Demonstrate knowledge about major components of a computer such as processor, memory and I/O modules along with their interconnections internally with outside world.
- have detailed idea about architecture of central processing unit, functions of control unit, memory, I/O devices and their issues.
- Understand simple and multiple processor organization and their issues.

SYLLABUS

Register Transfer and Micro operations: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations, Arithmetic Logic Shift Unit.

Basic Computer Organization and Design: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input- Output and Interrupt, Complete Computer Description, Design of Basic Computer, Design of Accumulator Logic.

Micro programmed Control: Control Memory, Address Sequencing, Micro program Example, Design of Control Unit.

Central Processing Unit: Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer (RISC), Architecture and Programming of 8085 Microprocessor

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISK Pipeline, Vector Processing, Array Processors.

Input/output Organization: Peripheral Devices, I/O interface, Asynchronous data transfer, Modes of transfer, priority Interrupt, Direct memory access, Input-Output Processor (IOP), Serial Communication.

Memory Organization: Memory Hierarchy, Main memory, Auxiliary memory, Associate Memory, Cache Memory, and Virtual memory, Memory Management Hardware.

Text Books

1. Computer System Architecture, M. Morris Mano, Prentice Hall of India Pvt. Ltd., Third Edition, Sept.2008.
2. Computer Architecture and Organization, P.Chakraborty.
3. Microprocessor Architecture, Programming and Applications with the 8085by Ramesh S Gaonkar

Reference Books

1. Computer Architecture and Organization, William Stallings, PHI Pvt. Ltd., Eastern Economy Edition, Sixth Edition, 2003.
2. Computer Organization and Architecture, Linda Null, Julia Lobur, Narosa Publications ISBN81- 7319-609-5
3. Computer System Architecture", John. P.Hayes.

IT2103 PROBABILITY, STATISTICS AND QUEUING THEORY

Course objectives

- To provide foundations of probabilistic and statistical analysis
- To provide an understanding on concepts of probability, random variables, probability distributions, sampling, estimation, hypothesis testing, regression, correlation, multiple regression, hypothesis testing, sample test, queuing methods
- To explore applications of probabilistic and statistical tools to solve real world problems.

Course outcomes

After completion of the course the student should be able to:

- Define and explain basic concepts in probability theory and how to translate real-world problems into probability models
- Solve standard problems that include random variables, discrete and continuous probability distributions
- Perform Test of Hypothesis and construct a confidence interval to estimate population parameters
- Compute and interpret the results of Correlation Analysis, Multivariate Regression, Chi-Square test for Independence and Goodness of Fit
- Explain basic concepts in Markov processes, M/M/1 and M/M/C queueing systems.

SYLLABUS

Probability: Definitions of probability, Addition theorem, Conditional probability, Multiplication theorem, Bayes Theorem of Probability and Geometric Probability.

Random variables and their properties: Discrete Random Variable, Continuous Random Variable, Probability Distribution, Joint Probability Distributions their Properties, Transformation Variables, Mathematical Expectations, Probability Generating Functions.

Probability Distributions: Discrete Distributions: Binomial, Poisson Negative Binominal Distributions and Their Properties; **Continuous Distributions:** Uniform, Normal, Exponential Distributions And Their Properties.

Multivariate Analysis: Correlation, Correlation Coefficient, Rank Correlation, Regression Analysis, Multiple Regression, Attributes, Coefficient Of Association, Chi Square Test For Goodness Of Fit, Test For Independence.

Estimation: Sample, Populations, Statistic, Parameter, Sampling Distribution, Standard Error, Un- biasedness, Efficiency, Maximum Likelihood Estimator, Notion & Interval Estimation.

Testing of Hypothesis: Formulation of Null hypothesis, critic al region, level of significance, power of the test;

Sample Tests: Small Sample Tests: Testing equality of means, testing equality of variances, test of correlation coefficient, test for Regression Coefficient; Large Sample tests: Tests based on normal distribution

Queuing Theory: Queue description, characteristics of a queuing model, study state solutions of M/M/1: Model, M/M/1; N Model, M/M/C: Model, M/M/C: N Model, Case studies.

Text Books

1. Probability & Statistics for Engineers and Scientists, Walpole, Myers, Myers, Ye. Pearson Education.
2. Probability, Statistics and Random Processes T.Veerarajan Tata McGraw – Hill

Reference Book

1. Probability & Statistics with Reliability, Queuing and Computer Applications, Kishor S. Trivedi, Prentice Hall of India ,1999

IT2104 OPERATING SYSTEMS

Course objectives:

- To understand evolution of Operating System.
- To understand operating system as a layer of abstraction above physical hardware that facilitates usage convenience and efficient resource management of computer system resources.
- To learn design and implementation of policies and mechanisms for OS subsystem.
- To investigate case studies to understand the design philosophies / paradigm for popular multiuser or single user operating system.

Course Outcomes:

- The student understands OS evolution, its structure and services provided by it.
- Learn process life cycle, process scheduling objectives, policies and mechanisms, process synchronization, inter process communication, deadlocks and other process subsystem related concepts.
- Learn memory hierarchy, allocation and deallocation policies and mechanism for main and auxiliary memory, file system design and implementation issues.
- investigate UNIX/ LINUX and Windows OS platforms w.r.t similarities and differences in design philosophies.

SYLLABUS

Introduction to Operating Systems: Over View of Operating Systems, Types of Operating Systems, Operating System Structures, Operating System Services, System Calls, Virtual Machines, Operating System Design and Implementation.

Process Management: Process Concepts, Operations on Processes, Cooperating Processes, Threads, Inter Process Communication, Process Scheduling, Scheduling Algorithms, Multiple- Processor Scheduling, Thread Scheduling.

Process Synchronization: The Critical Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classical Problems of Synchronization, Critical Regions, Monitors.

Deadlocks: System Model, Deadlock Characterization, Methods For Handling Deadlocks, Deadlock Prevention, Avoidance, Deadlock Detection, Recovery from Deadlocks.

Memory Management: Logical versus Physical Address, Swapping, contiguous memory allocation, paging, structure of the page table, segmentation, Virtual Memory, Demand Paging, Page Replacement, Allocation of Frames, Thrashing, Memory-Mapped files.

File Systems, Implementation, and Secondary-storage Structure: Concept of a file, Access Methods, Directory Structure, Protection, File System Structure, Allocation Methods, Free Space Management, Directory Management, Device Drivers, overview of Mass-storage structure, Disk structure, disk attachment, disk scheduling, swap-space management.

Case study: Overview of LINUX, Windows Operating systems.

Text Book:

1. Operating Systems, Abraham Silberschatz, Peter Baer Galvin, and Greg Gagne, John Wiley Publ., Seventh Edition.
2. Operating Systems; A Practical Approach. Rajiv Chopra.

Reference Books:

1. Modern Operating Systems, Andrew S. Tanenbaum, ,2nd edition, 1995, PHI.
2. Operating Systems, William Stallings 5th Edition -PHI
3. Operating Systems: A Design-Oriented Approach', Charles Crowley, 'Tata Hill Co.,1998 edition.

IT2105 OBJECT ORIENTED PROGRAMMING THROUGH JAVA

Course Objectives:

- This subject will help to improve the analytical skills of object-oriented programming
- Overall development of problem solving and critical analysis
- Formal introduction to Java programming language

Course Outcome:

On successful completion of this course, the student should be able to:

- Show competence in the use of the Java programming language in the development of small to medium-sized application programs that demonstrate professionally acceptable coding and performance standard
- Understand the basic principles of the object-oriented programming
- Demonstrate an introductory understanding of graphical user interfaces, multi-threaded programming, and event-driven programming.

SYLLABUS

Introduction to Java: Basics of Java programming, Data types, Variables, Operators, Control structures including selection, Looping, Java methods, Overloading, Math class, Arrays in java.

Objects and Classes: Basics of objects and classes in java, Constructors, Finalizer, Visibility modifiers, Methods and objects, Inbuilt classes like String, Character, StringBuffer, File, this reference

Inheritance and Polymorphism: Inheritance in java, Super and sub class, Overriding, Object class, Polymorphism, Dynamic binding, Generic programming, Casting objects, Instance of operator, Abstract class, Interface in java, Package in java, UTIL package.

Event and GUI programming: Event handling in java, Event types, Mouse and key events, GUI Basics, Panels, Frames, Layout Managers: Flow Layout, Border Layout, Grid Layout, GUI components like Buttons, Check Boxes, Radio Buttons, Labels, Text Fields, Text Areas, Combo Boxes, Lists, Scroll Bars, Sliders, Windows, Menus, Dialog Box, Applet and its life cycle, Introduction to swing

I/O programming: Text and Binary I/O, Binary I/O classes, Object I/O, Random Access Files.

Multithreading in java: Thread life cycle and methods, Runnable interface, Thread synchronization, Exception handling with try-catch-finally, Collections in java, Introduction to JavaBeans and Network Programming.

Java Database Connectivity (JDBC): JDBC Product, Types of Drivers, Two-Tier Client/Server Model, Three-Tier Client/Server Model, Basic Steps of JDBC, Creating and Executing SQL Statement, The Result Set Object, Working with Database MetaData Interface

Reference Books:

1 Introduction to Java Programming (Comprehensive Version), Daniel Liang, Seventh Edition, Pearson.

2 Programming in Java, Sachin Malhotra & Saurabh Chaudhary, Oxford University Press.

3 Murach's Beginning Java 2, Doug Lowe, Joel Murach and Andrea Steelman, SPD.

4 Core Java Volume-I Fundamentals, Eight Edition, Horstmann & Cornell, Pearson Education.

5 The Complete Reference, Java 2 (Fourth Edition), Herbert Schild, TMH.

6 Java Programming, D. S. Malik, Cengage Learning.

IT2106 COMPUTER ORGANIZATION & ARCHITECTURE LAB

Course Objectives

- to design and analyse the operational behaviour of IC gates, multiplexers, decoders, flip-flops, counters, shift registers, binary adders and subtractors and ALU.
- to implement assembly language programming using various trainers.
- to make students familiar with Pentium class PC architecture.

Course Outcomes

After completion of the course the student should be able to:

- analyse the operational behaviour of various digital logic units such as multiplexers, decoders, flip-flops, counters, shift registers, binary adders and subtractors and ALU.
- write assembly language code using various trainers.
- understand Pentium class PC architecture.

SYLLABUS

I - Cycle: Digital Logic Design Experiments

TTL Characteristics and TTL IC Gates

Multiplexers & Decoders

Flip-Flops

Counters

Shift Registers

Binary Adders & Subtractors

A L U

II - CYCLE: 8085 Assembly Language Programming

8085 Assembly Language Programming according to theory course microprocessors-I using the following trainers:

Keyboard Monitor of 8085µP Trainer

Serial Monitor of 8085µP Trainer with Terminal

8085 Line Assembler of 8085μP Trainer with PC as Terminal

8085 Cross Assembler using In-Circuit Emulator (ICE) with 8085μP Trainer and PC as Terminal

Graded Problems are to be used according to the syllabus of computer organization Pentium class pc architecture familiarization hardware & software parts demonstration

Reference Books

1. Computer System Architecture, M. Morris Mano, Prentice Hall of India Pvt. Ltd., Third
   Edition, Sept.2008
2. Microprocessor Architecture, Programming and Applications with the 8085 by Ramesh S
   Gaonkar.

IT2107 OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB

Course Objectives:

- To develop programs using basic OOPS concepts such as classes and objects.
- To implement programs using Inheritance concepts.
- To implement programs using Exception handling.
- To develop programs using operator overloading concepts.

Course Outcomes:

- Student will be able to use OOPs concepts.
- Ability to apply Inheritance concepts to several problems.
- Ability to use Exception Handling concepts.

List of Programs:

1. Program to define a structure of a basic JAVA program
2. Program to define the data types, variable, operators, arrays and control structures.
3. Program to define class and constructors. Demonstrate constructors.
4. Program to define class, methods Pand objects. Demonstrate method overloading.
5. Program to define inheritance and show method overriding.
6. Program to demonstrate Packages.
7. Program to demonstrate Exception Handling.
8. Program to demonstrate Multithreading.
9. Program to demonstrate I/O operations.
10. Program to demonstrate Network Programming.
11. Program to demonstrate Applet structure and event handling.
12. Program to demonstrate Layout managers.

IT2108 OPERATING SYSTEMS LAB

Course Objectives:

- To learn about UNIX/LINUX operating system environment.
- To learn about system calls for UNIX/LINUX Operating System.
- To understand resource management policies and mechanisms and their performance evaluation.

Course Outcomes:

- The student learns about multiprogramming, and multitasking capabilities of UNIX/LINUX.
- The student develops skill in writing C programs using system calls for process management, inter process communication and other aspects.
- The student learns to simulate OS resource management aspects like process scheduling, page replacement, disk scheduling, free space management and others to evaluate performance.

Syllabus

Module I

1. OS lab familiarization, Home Assignment on Unix commands, Vi editor
2. Simple shell programming exercises
3. Shell programming using decision making constructs, loop constructs, file and directory manipulation
4. Simple C programs using command line arguments, system calls, library function calls, make utility
5. C programs using system call to create processes and study parent, child process mechanism
6. C programs to create process chaining, spawning
7. C programs to error handling using errno(), perror() function
8. C programs to use pipe system call for inter process communication

Module II

1. C programs to study process scheduling implementing FCFS, Shortest Job First, and Round Robin algorithms
2. C programs to study page replacement implementing FIFO, Optimal, and LRU page replacement algorithms
3. C programs to study deadlock avoidance and detection
4. C Programs to simulate free space management (first fit, best fit, worst fit).
5. C programs to study disk scheduling algorithms (i.e., SCAN, SSTF, LOOK, etc.,)

References:

1. Unix concepts and applications by Sumitabha Das, TMH Publications.
2. Unix programming by Stevens, Pearson Education.
3. Shell programming by Yashwanth Kanetkar.
4. Operating System Concepts by Silberschatz, and Peter Galvin.

IT2109 INTELLECTUAL PROPERTY RIGHTS

Course Objective:

- To introduce the students to Intellectual Property Rights (IPR) which is a key component in modern knowledge management processes
- To create consciousness on IPR in students at an early stage of their education so that they develop an appreciation for ethical and rightful use of existing knowledge
- To make them understand how to take ownership of knowledge they may develop as a result of their creative innovations, take ownership and either drive themselves in becoming entrepreneurs or become responsible knowledge users in society
- To expose students some of the recent debates on the societal implications of IPR and its role in national/international trade and socio-economic development.

Course outcome:

Learners will be able to

- identify the types of intellectual property protection available for their research outcome
- conduct patent search and analyse patentability of the invention
- understand the basic structure of Patent document
- understand the registration and prosecution of different IPs
- understand the basics of IP commercialization and techno/commercial/legal issues in IPR commercialization

SYLLABUS

Introduction: Concept of property, Intellectual Property (IP) and Intellectual Property Rights (IPR), Importance of IP, Value creation through IP, Advantages of IP protection, Competitive advantage, Promotion of social good, Prevention of duplicates, counterfeit products and IP.

Evolution of IP system: Historical view of IP system in India and abroad, Legal basis and rationale behind development of IP system, WTO and TRIPS agreement, Role of WIPO.

Types of IPR: Major forms of IP in India and globally, Acts enacted in India related to IP.

Patent: Concept, Life of patent, Rights of Patentee, Criteria of patentability- novelty, non-obviousness, and utility, Non-patentable inventions.

Patent filing and prosecution: Prior art search, Process of obtaining a patent in India, Provisional and complete specification, Convention application, Patent Cooperation Treaty (PCT), Patent Infringement and Enforcement.

Trademark: Types of trademarks, Trademark and Brand, Trademark Registration, Trademark Infringement.

Copyright: Copyrights and related rights, Copyright registration, Copyright infringement, Section 52 of Indian Copyright Act.

Industrial Design: What is Industrial design, Design registration, Design infringement.

Trade Secret: What are Trade Secrets, How trade secrets are maintained in trade and business.

Other forms of IP: Semiconductor Integrated Circuits Layout Design, Geographical Indications, Protection of Plant Varieties & Farmers' right, Traditional knowledge.

IP commercialization: Licensing & Royalty; Technology Transfer; IP assignment, Compulsory License.

Emerging areas: Pat informatics, IP and bank loan, IP insurance, IP audit, IP valuation, IP management, Use of artificial intelligence in IP enforcement, Open innovation.

Text Books

1. Ganguli Prabuddha, Gearing up for Patents The Indian Scenario", Universities Press (1998)
2. Ganguli Prahuddha "Intellectual Property Rights-Unleashing the Knowledge Economy". Tata McGraw Hill (2001)
3. Geographical Indications of Goods Act 1990 Ganguli Piabaddha "Geographical Indications-its evolving contours accessible in http ips. nminsoda/files/2012/05/main book pdf (2009)

Reference Books

1. Ganguli Prabuddha and Jahade Siddharth, "Nanotechnology Intellectual Property Rights Research, Design, and Commercialisation", CRC Press, Taylor and Francis Group, USA (2012)
2. Beyond Intellectual Property: Toward Traditional Resource Rights for Indigenous Peoples and Local Communities [Paperback J,Darrell A. Posey and Graham Dotfield, IDRC Books; annotated edition (June (1996)
3. Netancl Neil Weinstock, Copyright's Paradox, Oxford University Press (2010)
4. The Indian Patents Act 1970 (as amended in 2005)
5. The Indian Copyright Act 1950 as amended in 2017)
6. Indian Trademarks Act 1999
7. The Indian Industrial Designs Act 2000
8. The Protection of Plant Varieties and Farmers' Right Act 2001
9. Inventing the Future: An Introduction to Patents for small and medium sized enterprises, WIPO publication No 917 www.wipo.int/ebookshop
10. Looking Good: An Introduction to Industrial Designs for Small and Medium sized Enterprises; WIPO publication No.498 www.wipo.int/ebookshop

IT2110 ENVIRONMENTAL SCIENCE

Course Objectives

The objectives of the Environmental Science course are to

- Familiarize the fundamental aspects of environment and the environmental management'
- Provide information of some of the important international conventions which will be useful during the future endeavours after graduation.
- Make realize the importance of natural resources management for the sustenance of the life and the society.
- Apprise the impact of pollution getting generated through the anthropogenic activities on the environment
- Provide the concept of Sustainable Development, energy and environmental management
- Impart knowledge on the new generation waste like e-waste and plastic waste.

Course Outcomes

After completion of the course the students will have

- Knowledge on the fundamental aspects of environment and the environmental management
- The knowledge on the salient features of the important international conventions
- Understanding of the importance of natural resources management for the sustenance of the life and the society.
- Familiarity on various forms of pollution and its impact on the environment.
- Understand the elements of Sustainable Development, energy and environmental management
- Knowledge on the new generation waste like e-waste and plastic waste.

SYLLABUS

Introduction: Structure and functions of Ecosystems-Ecosystems and its Dynamics-Value of Biodiversity-impact of loss of biodiversity, Conservation of bio-diversity. Environmental indicators - Global environmental issues and their impact on the ecosystems. Salient features of international conventions on Environment: Montreal Protocol, Kyoto protocol, Ramsar

Convention on Wetlands, Stockholm Convention on Persistent Organic Pollutants, United Nations Framework Convention on Climate Change (UNFCCC),

Natural Resources Management: Importance of natural resources management-Land as resource, Land degradation, Soil erosion and desertification, Effects of usage of fertilizer, herbicides and pesticide- watershed management.

Forest resources: Use and over-exploitation, Mining and dams – their effects on forest ecosystems and the living beings.

Water resources: Exploitation of surface and groundwater, Floods, droughts, Dams: benefits and costs.

Mineral Resources: Impact of mining on the environment and possible environmental management options in mining and processing of the minerals.

Sustainable resource management (land, water, and energy), and resilient design under the changing environment.

Environmental Pollution: Local and Global Issues. Causes, effects and control measures. Engineering aspects of environmental pollution control systems.

Air pollution: impacts of ambient and indoor air pollution on human health. Water pollution: impacts water pollution on human health and loss of fresh water resources. Soil pollution and its impact on environment. Marine pollution and its impact on blue economy. Noise pollution.

Solid waste management: Important elements in solid waste management- Waste to energy concepts. Air (prevention and control of pollution) Act, Water (prevention and control of pollution) Act and their amendments. Salient features of Environmental protection Act, 1986.

Sustainable Development: Fundamentals of Sustainable Development– Sustainability Strategies and Barriers – Industrialization and sustainable development. Circular economy concepts in waste (solid and fluid) management.

Energy and Environment: Environmental Benefits and challenges, Availability and need of conventional energy resources, major environmental problems related to the conventional energy resources, future possibilities of energy need and availability. Solar Energy: process of photovoltaic energy conversion, solar energy conversion technologies and devices, their

principles, working and applications, disposal of solar panel after their usage. Biomass energy: Concept of biomass energy utilization, types of biomass energy, conversion processes, Wind Energy, energy conversion technologies, their principles, equipment and suitability in context of India.

Management of plastic waste and E-waste: Sources, generation and characteristics of various e- and plastic wastes generated from various industrial and commercial activities; Waste management practices including onsite handling, storage, collection and transfer. E-waste and plastic waste processing alternatives. E-Waste management rules and Plastic waste management rules, 2016 and their subsequent amendments.

Text Books:

1. Bharucha,Erach (2004). Textbook for Environmental Studies for Undergraduate Courses of all Branches of Higher Education, University Grants Commission, New Delhi.
2. Basu, M., Xavier, S. (2016). Fundamentals of Environmental Studies, Cambridge University Press, India
3. Masters, G. M., &Ela, W. P. (1991). Introduction to environmental engineering and science. Englewood Cliffs, NJ: Prentice Hall.
4. Enger, E. and Smith, B., Environmental Science: A Study of Interrelationships, Publisher: McGraw-Hill Higher Education; 12th edition, 2010.

Reference Books:

1. Sharma, P. D., & Sharma, P. D. (2005). Ecology and environment. Rastogi Publications
2. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
3. Clark R.S. (2001). Marine Pollution, Clanderson Press Oxford (TB)
4. Jadhav, H & Bhosale, V.M. (1995). Environmental Protection and Laws. Himalaya Pub. House, Delhi 284 p.
5. MoEF&CC, Govt. of India, CPCB: E-waste management rules, 2016 and its amendments 2018.
6. MoEF&CC, Govt. of India, CPCB: Plastic waste management rules, 2016.

B.Tech (Information Technology)

II Year - II Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
IT2201	ES	Microprocessors	4	0	30	70	100	3
IT2202	PC	Design and Analysis of Algorithms	4	0	30	70	100	3
IT2203	PC	Database Management Systems	4	0	30	70	100	3
IT2204	PC	Formal Languages & Automata Theory	4	0	30	70	100	3
IT2205	HSS	Managerial Economics	4	0	30	70	100	3
IT2206	PC	Algorithms Lab through C++.	0	3	50	50	100	1.5
IT2207	PC	Database Management Systems Lab	0	3	50	50	100	1.5
IT2208	SC	Web Technologies	1	2	50	50	100	2
IT2209	MC	Professional Ethics& Universal Human Values	0	0	0	100	100	0
IT2210	MC	NCC/NSS	0	2	-	-	-	0
Total credits								**20**
Internship-I								

IT2201 MICROPROCESSORS

Course Objectives:

- To discuss the architectures of 8085, 8086 microprocessors, their instruction sets and related ALP programs.
- To discuss interfacing semiconductor memories, interfacing peripheral to Intel 8086.
- To study interfacing data converters to 8086 and discuss about micro controller 8051 architecture.

Course Outcomes:

- Understand the basic architectures of 8085 and 8086 microprocessors.
- Ability to write ALP programs using instruction sets.
- Understand the various interfacing concepts and micro controllers.

SYLLABUS

Introduction to Microprocessors and Microcomputers: A Brief Architecture and Programming of 8085Microprocessor.

Architecture: Instruction Set and Programming of 8086Microprocessor

Interfacing Semiconductor Memories and I/O Devices: Semiconductor Memories: Classification Internal Organization& Functional Description, Interfacing SRAMs and EPROMs to8086, Interfacing Characteristics of I/Devices, I/O Device addressing methods, I/O Device Programming Methods.

Interfacing Peripherals to Intel8086 -1: Parallel I/O Interface- 8255, Serial I/O Interface – 8251, Timer Interface -8253/8254

Interfacing Peripheral to Intel 8086 - 2: Keyboard / Display Interface – 8279, Interrupt Controller Interface – 8259

Interfacing Data Converters to 8086: D/A Conversion Methods, A/D Conversion methods, Interfacing DAC, Interfacing ADC.

Introduction to Micro controllers: Intel 8051Architecture and Programming

Text Books:

1. Microprocessor Architecture, Programming, and Applications with the 8085 Ramesh S.Gaonkar, 4thEdition, PenramInternational,1999
2. The 80x86 Family, Design, Programming and Interfacing, John E.Uffenbeck, 3rdEdition,Pearson Education Inc.,2002
3. KennethJ.Ayala, 8051 Microcontroller Architecture, Programming And Applications, 2ndEdition, Penram InternationalPublications,1999

Reference Books:

1. BARRYB.BREY, The Intel Microprocessors 8086 / 8088, 80186 / 80188, 80286, 80386 and 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium4, Architecture, Programming and Interfacing, 8th Edition, Pearson Education Inc.,2009
2. Walter A. Tribeland, Avtar Singh, The 8088 and 8086 Microprocessors, Programming, interfacing, Software, Hardware, and Applications, 4thEdition, Pearson Education Inc.,20033. Microprocessors and Interfacing, Programming and Hardware, 2ndEdition, Douglass V. Hall, TMH Edition,1999
3. Sanjay K Bose, Hardware and Software of Personal Computers, New Age International (P)Ltd.,1991 Myke Predko, Programming and Customizing the 8051 Microcontroller, TMH,1999

IT2202 DESIGN AND ANALYSIS OF ALGORITHMS

Course Objectives:

Upon completion of this course, students will be able to do the following:

- Analyse the asymptotic performance of algorithms.
- Write rigorous correctness proofs for algorithms.
- Demonstrate a familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations

Course Outcomes:

Students who complete the course will have demonstrated the ability to do the following:

- Argue the correctness of algorithms using inductive proofs and invariants.
- Analysis worst-case running times of algorithms using asymptotic analysis.
- Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and conquer algorithms. Derive and solve recurrences describing the performance of divide and-conquer algorithms.
- Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic programming algorithms, and analysis them.
- Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms, and analysis them.

SYLLABUS

Introduction: What is an Algorithm, Algorithm Specification, Pseudocode Conventions Recursive Algorithm, Performance Analysis, Space Complexity, Time Complexity, Amortized Complexity, Amortized Complexity, Asymptotic Notation, Practical Complexities, Performance Measurement.

Divide and Conquer: General Method, Defective Chessboard, Binary Search, Finding the Maximum and Minimum, Merge Sort, Quick Sort, Performance Measurement, Randomized Sorting Algorithms.

The Greedy Method: The General Method, Knapsack Problem, Job Sequencing with Deadlines, Minimum-cost Spanning Trees, Prim's Algorithm, Kruskal's Algorithms, An Optimal Randomized Algorithm, Optimal Merge Patterns, Single Source Shortest Paths.

Dynamic Programming: All - Pairs Shortest Paths, Multistage graphs, optimal binary search tree, String editing, 0/1 Knapsack, Reliability Design.

Backtracking: The General Method, The 8-Queens Problem, Sum of Subsets, Graph Colouring, Hamiltonian Cycles, Knapsack problem

Branch and Bound: Least cost (LC) Search, The 15-Puzzle, Control Abstraction for LC-Search, Bounding, FIFO Branch-and-Bound, LC Branch and Bound, 0/1 Knapsack Problem, LC Branch-and Bound Solution, FIFO Branch-and-Bound Solution, Traveling Salesperson problem.

Limitations of Algorithm Power: Lower-Bound Arguments, Decision Trees, P, NP and NP – complete problems – Challenges of Numerical Algorithms. Limitations of Algorithms Power: Backtracking – Branch-and Bound– Approximation Algorithms for NP-hard Problems – Algorithms for solving Nonlinear Equations.

Text Books:

1. Fundamentals of computer algorithms E. Horowitz S. Sahni, Sanguthevar Rajasekaran, University Press.
2. Introduction to Algorithms by Thomas H. Corman, Charles E. Leiserson, Ronald R.
   Rivest & Clifford Stein, Prentice Hall of India, New Delhi, New Delhi.

Reference Books:

1. Data structures and algorithm analysis in C++ / Mark Allen Weiss, Florida International University. — Fourth edition.
2. Introduction to Design & Analysis of Algorithms by Anany Levitin, Pearson

   Education, New Delhi, 2003

3. Introduction to Algorithms by Thomas H. Corman, Charles E. Leiserson, Ronald R.

   Rivest & Clifford Stein, Prentice Hall of India, New Delhi, New Delhi.

4. The Design and Analysis of Computer Algorithms, Alfred V. Aho, John E.

   Hopcroft, Jeffrey D. Ullman

IT2203 DATABASE MANAGEMENT SYSTEMS

Course Objectives:

- To learn the evolution of DBMS Versus File systems, data models, and layers of abstraction.
- To understand conceptual and physical aspects of database design.
- To learn formal and commercial query language specifications.
- To understand concurrency control, recovery management, and other related issues.

Course Outcomes:

- The student will understand ER-modelling for conceptual database design and relational model.
- The student is introduced to formal and commercial query languages: Relational Algebra, calculus and SQL.
- The student will learn schema refinement and normalization.
- The student understands locking protocols concurrency control, and crash recovery methods.

SYLLABUS

Introduction: File system versus a DBMS, Advantages of a DBMS, Describing and Storing Data in a DBMS, The Relational model, Levels of abstraction, Data Independence, Transaction management, Structure of a DBMS.

Introduction to Database Design and The Relational Model: Database Design and ER Diagrams, Entities, Attributes and Entity Sets, Relationships & Relationship Sets, Additional Features of the ER Model, Conceptual Design with ER Model, Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity Constraints, Querying Relational Data, Logical Database Design: ER to Relational, Introduction to Views, Destroying/ Altering Tables and Views.

Relational Algebra and SQL: Preliminaries, Relational Algebra, The form of a Basic SQL Query, UNION, INTERSECT and EXCEPT, Nested Queries, Aggregate Operators, Null Values, Complex Integrity Constraints in SQL, Triggers and Active Databases, Embedded SQL, Dynamic SQL, JDBC.

Database Design: Schema Refinement and Normal Forms, Introduction to Schema Refinement, Functional Dependencies, Reasoning about FD's, Normal Forms, Properties of Decomposition, Normalization, Other kinds of Dependencies.

Transaction Management: The ACID Properties, Transactions & Schedules, Concurrent Execution of Transactions, Lock-Based Concurrency Control.

Concurrency Control: 2PL, Serializability and Recoverability, Introduction to Lock Management, Lock Conversions, Dealing with Deadlocks, Specialized Locking Techniques, Concurrency Control without Locking.

Crash Recovery: Introduction to ARIES, The Log, Other Recovery-Related Structures, The Write-Ahead Log Protocol, Check pointing, Recovering from a System Crash, Media Recovery.

Text Books:

1. Database Management Systems; Raghu Ramakrishnan, Johannes Gehrke 4th Edition, McGraw-Hill.

Reference:

1. Database System Concepts; A. Silberschatz, H. Korth 5th Edition, McGraw-Hill

IT2204 FORMAL LANGUAGES AND AUTOMATA THEORY

Course objectives:

- To introduce the concepts in automata theory and theory of computation to design grammars and recognizers for different formal languages.
- To employ finite state machines to solve problems in computing.
- To introduce finite state machines, context free grammars and Turing Machines and their properties as the basis for the formal expressivity of computer languages for solving linguistic decision problems.
- To understand the concepts of tractability and decidability, the concepts of NP-completeness and NP-hard problem and also the challenges for Theoretical Computer Science and its contribution to other sciences.

Course outcomes:

- Ability to think analytically and intuitively for problem-solving situations in related areas of theory in computer science
- Ability to describe the language accepted by an automata or generated by a regular expression or a context-free grammar;
- Ability to Understand the functioning of Finite-State Machines, Deterministic Finite-State Automata, Nondeterministic Finite-State Automata and Pushdown Automata and Turing Machines.

SYLLABUS

Introduction to Grammars and Languages: Definitions of alphabet, strings, language, grammar, types of grammar, types of machines, generation of languages from grammar, construction of grammar from the given description of languages, Chomsky Hierarchy of languages.

Finite State Machine (FSM): Definition of finite state machine, Representation of FSMs. Classification of FSM's and their construction, Conversion from NFA to DFA, Elimination of ε – transitions from NFA, Equivalence of two FSM's, optimization of finite state machine (Equivalence theorem method and Table filling method), Finite state machine with output: Moore and Mealy machines. Applications of FSM.

Regular Expression and Languages: Regular Expression, Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Properties of Regular Languages: Pumping Lemma for regular Languages, Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, Equivalence and Minimization of Automata.

Context Free Grammars and Languages: Context Free Grammars, Parse Trees, Applications of Context-Free Grammars, Ambiguity in Grammars and Languages, Normal Forms, Pumping Lemma for CFL, Closure properties of CFL, Decision properties for CFL.

Push down Automata: Definition of push down automata, The Languages of a PDA, push down automata, Equivalence of PDA's and CFG's, push down automata to context free grammar, context free grammar to push down automata, Deterministic Pushdown Automata.

Turing Machines: The Definition of Turing Machine, Turing Machine Model, Representation of Turing Machines, Language Acceptability by Turing Machines, Design of Turing Machines, Description of Turing Machines, Techniques for TM Construction, Variants of Turing Machines, Turing Machines and Type 0 Grammars.

Undecidability: A Language That Is Not Recursively Enumerable, An Undecidable Problem That Is RE, Undecidable Problems About Turing Machines, Decidable & Undecidable Problems, Post Correspondence Problem.

Text books:

1. Introduction to automata theory, languages and computation, John.E.H.P croft/ Rajeev Motwani & JD Ullman—pearson education- III edition
2. Theory of computation, K.L.P.Mishra and N.Chandrasekhar, PHI

Reference Books:

1. Theory of computation, formal languages and automata theory, G P Saradhi Varma, B.Thirupathi Rao –Sci Tech publications.

IT2205 MANAGERIAL ECONOMICS

Course Objectives:

- To bring about an awareness about the nature of Managerial Economics and its linkages with other disciplines.
- To understand the Micro and Macro Environment of Business.
- To familiarize the prospective engineers with the concepts and tools of Managerial Economics with an objective to understand the real world of business.

Course Outcomes:

After completion of the course, student will be able to:

- Understand the various economic activities in business and industry.
- Analyse the real-world business problems.
- Make optimal business decisions for the effective and efficient management of Organisations.

SYLLABUS

Significance of Economics and Managerial Economics:

Economics: Definitions of Economics- Wealth, Welfare and Scarcity definitions Classification of Economics- Micro and Micro Economics.

Managerial Economics: Definition, Nature and Scope of Managerial Economics, Differences between Economics and Managerial Economics, Main areas of Managerial Economics, Managerial Economics with other disciplines.

Demand and Utility Analysis:

Demand - Definition, Meaning, Nature and types of demand, Demand function, Law of demand - Assumptions and limitations. Exceptional demand curve.

Elasticity of demand - Definition, Measurement of elasticity, Types of Elasticity

(Price, Income, Cross and Advertisement), Practical importance of Price elasticity of demand, Role of income elasticity in business decisions, Factors governing Price Elasticity of demand.

Utility Analysis: Utility- Meaning, Types of Economic Utilities, Cardinal and Ordinal Utility, Total Utility, Marginal Utility, The law of Diminishing Marginal Utility and its Limitations.

Theory of Production and Cost analysis:

Production - Meaning, Production function and its assumptions, use of production function in decision making; **Cost analysis** - Nature of cost, Classification of costs - Fixed vs. Variable costs, Marginal cost, Controllable vs. Non - Controllable costs, Opportunity cost, Incremental vs. Sunk costs, Explicit vs. Implicit costs, Replacement costs, Historical costs, Urgent vs. Postponable costs, Escapable vs. Unavoidable costs, Economies and Diseconomies of scale.

Market Structures: Definition of Market, Classification of markets; Salient features or conditions of different markets - Perfect Competition, Monopoly, Duopoly , Oligopoly, Importance of kinked demand curve ;Monopolistic Competition.

Pricing and Business Cycles:

Pricing Analysis: Pricing – Significance; Different Pricing methods- Cost plus pricing, Target pricing, Marginal cost pricing, Going -rate pricing, Average cost pricing, Peak load pricing , Pricing of joint Products, Pricing over the life cycle of a Product, Skimming pricing Penetration pricing, Mark- up and Mark- down pricing of retailers.

Business cycles - Definition, Characteristics, Phases, Causes and Consequences; Measures to solve problems arising from Business cycles.

Text Books:

1. Sankaran,S., Managerial Economics, Marghan Publications, 2015, Chennai.
2. Aryasri, A.R., Managerial Economics and Financial Analysis, MC Graw Hill Education, New Delhi,2015.

Reference Books:

1. Dwivedi, D.N., Managerial Economics, Vikhas Publishing House Pvt. Ltd. 6th Edition, New Delhi,2004.
2. Dewett, K.K., Modern Economic Theory, S.Chand & Company Ltd., New Delhi, 2005.

IT2206 ALGORITHMS LAB Through C++

Course objectives:

- The laboratory component will emphasize two areas:
- Implementation of algorithms covered in class: This will involve running the algorithms under varying input sets and measuring running times, use of different data structures for the same algorithm (wherever applicable) to see its effect on time and space, comparison of different algorithms for the same problem etc.
- Design of Algorithms: This will involve design and implementation of algorithms for problems not covered in class but related to topics covered in class.
- The exact set of algorithms to design and implement is to be decided by the instructor. In addition, there will be at least one significantly large design project involving some real world application. An efficient design of the project should require the use of multiple data structures and a combination of different algorithms/techniques.

Course Outcomes:

The student should be able to:

- Design algorithms using appropriate design techniques (brute-force, greedy, dynamic programming, etc.)
- Implement a variety of algorithms such assorting, graph related, combinatorial, etc., in a high level language.
- Analyze and compare the performance of algorithms using language features.
- Apply and implement learned algorithm design techniques and data structures to solve real-world problems.

Programs List:

1. a) Create a C++ class called Student with the following details as variables within it.

   (i) Register_number

   (ii) Student_name

   (iii) Programme_name

   (iv) Phone _number

   Write a program to create nStudent objects and print the Register_number, Student_name, Programme_name, and Phone_number of these objects with suitable headings.

   b). Write a program to implement the Stack using arrays. Write Push (), Pop(), and Display() methods to demonstrate its working.

2. a). Design a superclass called Staff with details as StaffId, Name, Phone, Salary. Extend this class by writing three subclasses namely Teaching (domain, publications), Technical (skills), and Contract (period). Write a C++ program to read and display at least 3 staff objects of all three categories.

b). Write a class called Customer to store their name and date_of_birth. The date_of_birth format should be dd/mm/yyyy. Write methods to read customer data as and display as using StringTokenizer class considering the delimiter character as "/".

3. a). Write a program to read two integers a andb. Compute a/b and print, when b is not zero. Raise an exception when b is equal to zero.

b). Write a program that implements a multi-thread application that has three threads. First thread generates a random integer for every 1 second; second thread computes the square of the number and prints; third thread will print the value of cube of the number.

4. Sort a given set of n integer elements using Quick Sort method and compute its time complexity. Run the program for varied values of n> 5000 and record the time taken to sort. Plot a graph of the time taken versus non graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using C++ how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.

5. Sort a given set of n integer elements using Merge Sort method and compute its time complexity. Run the program for varied values of n> 5000, and record the time taken to sort. Plot a graph of the time taken versus non graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using C++ how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.

6. Implement the Knapsack problem using (a) Dynamic Programming method (b) Greedy method.

7. Write a program-from a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm..

8. Find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal's algorithm. Use Union-Find algorithms in your program.

9. Find Minimum Cost Spanning Tree of a given connected undirected graph using Prim's algorithm.

10. Write programs to

(a) Implement All-Pairs Shortest Paths problem using Floyd's algorithm.

(b) Implement Travelling Sales Person problem using Dynamic programming.

11. Design and implement in C++, to find a subset of a given set S = {Sl, S2,.....,Sn} of n positive integers whose SUM is equal to a given positive integer d. For example, if S

={1, 2, 5, 6, 8} and d= 9, there are two solutions {1,2,6}and {1,8}. Display a suitable message, if the given problem instance doesn't have a solution.

12. Design and implement in C++ to find all Hamiltonian Cycles in a connected undirected Graph G of n vertices using backtracking principle.

REFERENCES:

1. T. H. Cormen, C. L. Leiserson, R. L. Rivest, and C. Stein, Introduction to Algorithms, MIT Press.
2. J. Kleinberg and E. Tardos, Algorithm Design, Addison-Wesley.
3. Harry R. Lewis and Larry Denenberg, Data Structures and Their Algorithms, Harper Collins.
4. A. Gibbons, Algorithmic Graph Theory, Cambridge University Press.
5. Michael T. Goodrich and Roberto Tamassia, Algorithm Design: Foundations, Analysis, and Internet Examples, John Wiley.
6. R. Sedgewick, Algorithms in C (Parts 1-5), Addison Wesley.
7. M. H. Alsuwaiyel, Algorithm Design Techniques and Analysis, World Scientific.
8. Gilles Brassard and Paul Bratley, Algorithmics: theory and practice, Prentice-Hall.
9. Udi Manber, Introduction to Algorithms: A Creative Approach, Addison-Wesley.
10. Sara Baase and Allen Van Gelder, Computer Algorithms: Introduction to Design and Analysis, Addison-Wesley.

IT2207 DATABASE MANAGEMENT SYSTEMS LAB

Course Objectives

- To introduce to a commercial DBMS such as ORACLE.
- To learn and practice SQL commands for schema creation, data manipulation.
- To learn conceptual and physical database design based on a case study.
- To apply database design stages by studying a case study.

Course Outcomes

By the end of the course, the student should be able to:

- The student is exposed to a commercial RDBMS environment such as ORACLE.
- The student will learn SQL commands for data definition and manipulation.
- The student understands conceptual through physical data base design.
- The student takes up a case study and applies the design steps.

SYLLABUS

Features of a commercial RDBMS package such as ORACLE/DB2, MS Access, MYSQL & Structured Query Language (SQL) used with the RDBMS.

I. Laboratory Exercises Should Include:

a. Defining Schemas for Applications,
b. Creation of Database,
c. Writing SQL Queries,
d. Retrieve Information from Database,
e. Creating Views
f. Creating Triggers
g. Normalization up to Third Normal Form
h. Use of Host Languages,
i. Interface with Embedded SQL,
j. Use of Forms
k. Report Writing

II. Some sample applications are given below:

1. Accounting Package for Shops,

2. Database Manager for Magazine Agency or Newspaper Agency,
3. Ticket Booking for Performances,
4. Preparing Greeting Cards & Birthday Cards
5. Personal Accounts - Insurance, Loans, Mortgage Payments, Etc.,
6. Doctor's Diary & Billing System
7. Personal Bank Account
8. Class Marks Management
9. Hostel Accounting
10. Video Tape Library,
11. History of Cricket Scores,
12. Cable TV Transmission Program Manager,
13. Personal Library.
14. Sailors Database
15. Suppliers and Parts Database

Reference Books

1. Database Management Systems; Raghu Ramakrishnan, Johannes Gehrke 4th Edition, McGraw Hill
2. Database System Concepts; A. Silberschatz, H. Korth 5th Edition, McGraw-Hill

IT2208 ` WEB TECHONOLOGIES

Course objectives

- To facilitate the graduates with the ability to visualize, gather information, articulate, analyze, solve complex problems, and make decisions. These are essential to address the challenges of complex and computation intensive problems increasing their productivity.
- To facilitate the graduates with the technical skills that prepare them for immediate employment and pursue certification providing a deeper understanding of the technology in advanced areas of computer science and related fields, thus encouraging to pursue higher education and research based on their interest.
- To facilitate the graduates with the soft skills that include fulfilling the mission, setting goals, showing self-confidence by communicating effectively, having a positive attitude, get involved in team-work, being a leader, managing their career and their life.

Course outcomes

- Able to understand the working principles of the computer system and its components, apply the knowledge to build, asses, and analyze the software and hardware aspects of it.
- Develops comprehensive skills of Programming Languages, Software process models, methodologies, and able to plan, develop, test, analyze, and manage the software and hardware intensive systems in heterogeneous platforms individually or working in teams.
- Able to use the professional, managerial, interdisciplinary skill set, and domain specific tools in development processes, identify the research gaps, and provide innovative solutions to them.

Syllabus

1. Design the following static web pages required for an online book store web site.
   a) HOME PAGE: The static home page must contain three frames.
   b) LOGIN PAGE
   c) CATOLOGUE PAGE: The catalogue page should contain the details of all the books available in the web site in a table.
   d) REGISTRATION PAGE
2. Write JavaScript to validate the following fields of the Registration page.
   a) First Name (Name should contains alphabets and the length should not be less than 6 characters).
   b) Password (Password should not be less than 6 characters length).

c) E-mail id (should not contain any invalid and must follow the standard pattern name@domain.com)
d) Mobile Number (Phone number should contain 10 digits only).
e) Last Name and Address (should not be Empty).

3. Develop and demonstrate the usage of inline, internal and external style sheet using CSS
4. Develop and demonstrate JavaScript with POP-UP boxes and functions for the following problems:

   a) Input: Click on Display Date button using onclick( ) function

   Output: Display date in the textbox

   b) Input: A number n obtained using prompt

   Output: Factorial of n number using alert

   c) Input: A number n obtained using prompt

   Output: A multiplication table of numbers from 1 to 10 of n using alert

   d) Input: A number n obtained using prompt and add another number using confirm

   Output: Sum of the entire n numbers using alert

5. Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next in the list. Add CSS to customize the properties of the font of the capital (colour, bold and font size).
6. Write an HTML page including any required JavaScript that takes a number from text field in the range of 0 to 999 and shows it in words. It should not accept four and above digits, alphabets and special characters.
7. Develop and demonstrate PHP Script for the following problems:
   a) Write a PHP Script to find out the Sum of the Individual Digits.
   b) Write a PHP Script to check whether the given number is Palindrome or not
8. Create an XML document that contains 10 users information. Write a Java Program, which takes User Id as input and returns the user details by taking the user information from XML document using DOM parser or SAX parser.
9. Implement the following web applications using (a) PHP (b) Servlets (c) JSP
   a) A web application that takes a name as input and on submit it shows a hello page where name is taken from the request. It shows the start time at the right top corner of the page and provides a logout button. On clicking this button, it should show a logout page with Thank You message with the duration of usage (hint: Use session to store name and time).
   b) Write a PHP Program to display current Date, Time and Day.
   c) A web application that takes name and age from an HTML page. If the age is less than 18, it should send a page with “Hello, you are not authorized to visit the site” message, where should be replaced with the entered name. Otherwise, it should send “Welcome to this site” message.
   d) A web application that lists all cookies stored in the browser on clicking “List Cookies” button. Add cookies if necessary.

10. Implement the web applications with Database using (a) PHP, (b) Servlets and (c) JSP.
11. Modify the above PHP program to use an xml instead of database
12. Write a program to design a simple calculator using
    (a) JavaScript
    (b) PHP
    (c) Servlet and
    (d) JSP.

References:

1. Internet and Web Technologies by Raj Kamal, Tata McGraw-Hill.

2. Programming the World Wide Web by Robert W. Sebesta, Pearson Education.

IT2209 PROFESSIONAL ETHICS AND UNIVERSAL HUMAN VALUES

Course Objectives:

- To recognize the moral values that should guide the Engineering profession.
- To resolve moral issues concerning one's profession.
- To develop and exhibit a set of moral beliefs and attitudes that engineers should inculcate.
- To inculcate social values and morality in one's life.
- To develop awareness about Professional/Engineering Ethics and Human Values.

Learning Outcomes:

Students will be able to:

- Apply the conceptual understanding of ethics and values into everyday practice.
- Understand the importance of moral awareness and reasoning in life.
- Acquire professional and moral etiquette that an engineer requires.
- Develop the acumen for self-awareness and self-development.
- Develop cultural tolerance and integrity.
- Tackle real-life challenges with empathy.

SYLLABUS

HUMAN VALUES
Values - Respect - Caring - Sharing - Honesty- Courage - Self confidence - Communal Harmony
Morals - Virtues

PROFESSIONAL VALUES
Integrity - Discipline - Valuing time - Cooperation - Commitment - Code of conduct - Challenges in the workplace

PROFESSIONAL ETHICS
Overview - Engineering ethics - Moral issues - Profession - Models of professional roles - Responsibility

RESPONSIBILITIES AND RIGHTS
Safety and risk - Collegiality and loyalty - Confidentiality - Occupational crime - Human rights - Employee rights - Intellectual property rights

GLOBAL ISSUES
Globalization - Environmental ethics - Computer ethics - Code of ethics - Multinational corporations - Engineers as advisors in Planning and Policy making

Textbook:
1. R.S. Nagarazan. *A Textbook on Professional Ethics and Human Values.* New Age International Publishers. 2006.

Reference Books:

1. Premvir Kapoor. *Professional Ethics and Human Values.* Khanna Publishing House. 2019.
2. B.S. Raghavan. *Human Values and Professional Ethics*. S.Chand Publications. 2012.
3. R.R. Gaur & Others. *A Foundation Course in Human Values and Proff. Ethics*. Excel Books. 2009.
4. A. N. Tripathi. *Human Values*. New Age International (P) Limited. 2009
5. R. Subramanian. *Professional Ethics*. OUP India. 2013.



SCHEME & SYLLABUS For All Semesters
(With effect from 2022-23 Admitted Batch)

B.Tech & B.Tech + M.Tech
(Computer Science and Engineering)

Department of Computer Science & Systems Engineering

Andhra University College of Engineering (A)

Andhra University

Guidelines for Obtaining MINOR in Computer Science Engineering:

Students belonging to other departments have to complete the following courses to obtain MINOR degree in Computer Science & Engineering:

1. A student belonging to other department have to study CPNM and Python Programming as Compulsory courses and any two of the following 4 open electives as follows:

   OE I: Artificial Intelligence & Machine Learning

   OE II: Data Science

   OE III: Cyber Security and Digital Forensics

   OE IV: Database Management System

   OR

   One or two MOOCS courses from NPTEL related to Computer Science Engineering without repetition from subjects within the curriculum can be used in Lieu of any of the above Open electives.
2. The duration of NPTEL courses should **NOT** be less than 12 weeks.
3. The MOOCS course(s) chosen by students of other departments for obtaining a MINOR in CSE should be taken prior permission/ approval from the Chairperson – BoS of the department of **CS & SE, AUCE(A)**.

Guidelines for Obtaining HONORS in Computer Science Engineering:

1. The student shall earn additional 15 credits beyond 160 credits from the same branch/ department/ discipline registered for major degree.
   (i) The students having 7.0 CGPA without any backlog subjects will be permitted to register for HONORS.
   (ii) If a student is detained due to lack of attendance either in Major or in Honors, registration shall be cancelled.
   (iii) Honors is to be completed simultaneously with B. Tech program.

To obtain Honors in CSE the following subjects are to be taken for obtaining Honors:

1) Large Language Model & Prompt Engineering
2) Reinforcement Learning
3) High Performance Computing
4) Social Media Analytics
5) Software Metrics
6) MOOCs for 3 credits of 12 weeks duration related to any one of the above courses. MOOCs may be treated as optional to obtain Honors degree in CSE. If a student completes MOOCs with good grade, then it may be considered as betterment for any of the above five Courses (1 to 5)

The above five courses and MOOCs may be completed or pursued during 3rd and 4th years of his/her study of B.Tech, B.Tech + M.Tech program



(With effect from 2022-23 AB)
B. Tech & B. Tech + M. Tech
(Computer Science and Engineering)
III year - I semester

Course Code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
CS3101	PC	Data Communications & Computer Networks	4	0	30	70	100	3
CS3102	PC	Artificial Intelligence	4	0	30	70	100	3
CS3103	PC	Compiler Design	4	0	30	70	100	3
CS3104	PE	Professional Electives - I	4	0	30	70	100	3
CS3105	OE	Open Electives - I	4	0	30	70	100	3
CS3106	PC	Data Communications & Computer Networks Lab	0	3	50	50	100	1.5
CS3107	PC	Python Programming Lab	0	3	50	50	100	1.5
CS3108	SC	Soft Skills	1	2	50	50	100	2
CS3109	INT	Internship - I	0	0	50	50	100	2
Summer Internship 2 Months (Mandatory) after 2nd year (to be evaluated during III year I semester)								
Total Credits								**22**

CS3101 DATA COMMUNICATIONS & COMPUTER NETWORKS

Course Objectives:

- To study basics of data communication systems.
- To study the various types of transmission media.
- To study the various hardware concepts related to data communications.
- To make the students understanding of basic requirements of network hardware, software and its architecture.

Course Outcomes:

- Ability to understand concepts related to data communication hardware and its interface.
- Ability to understand concepts related to Signal encoding techniques and multiplexing.
- The student must be able to understand the concepts related to MAC sub layer.
- Understand the concepts related to network and transport layer.

SYLLABUS:

Introduction to Data Communications: A Communications Model, Network Models(OSI, TCP/IP models), Analog and Digital Data Transmission, Transmission Impairments.

Data Communication Interface: Asynchronous and Synchronous Transmission. Data Link Control Flow Control, Error Detection, Error Control, High-Level Data Link Control (HDLC).

Signal Encoding Techniques: Digital data to Digital signal, Digital to Analog Signal, Analog data to Digital Signal, and Analog Data to Analog signal.

Multiplexing: Frequency-Division Multiplexing, Synchronous Time-Division Multiplexing: Characteristics, Digital Carrier Systems Statistical Time-Division Multiplexing: Characteristics.

Medium Access Control Sublayer: Wireless LAN's:802.11Architecture and Protocol Stack, 802.11Frame structure.

Network Layer: Network Layer Design Issues, Shortest path routing algorithm, Congestion Control Algorithms, IP Protocol, IP Address.

Transport layer: Transport Service, Elements of Transport Protocols, TCP and UDP Protocols, Simple Network Management Protocol (SNMP).

Text Books:

1. Data Communications and Networking, Behrouz A Forouzan, Tata McGraw-Hill Co Ltd, Second Edition, ISBN: 0-07-049935-7

2. Computer Networks, Andrews S Tanenbaum, 5th Edition, Pearson Edu.

References:

1. Data and Computer Communications, Eighth Edition, William Stallings, Pearson Education, Inc.

CS3102 ARTIFICIAL INTELLIGENCE

Course Objectives:

- To learn about AI problems, techniques and their modelling as state space search, problem characteristics, Production System categories.
- To learn different uninformed and heuristic search strategies for solving AI problems with examples
- To learn theorem proving with predicate logic, resolution, rulebased inference with forward and backward chaining
- Inheritable knowledge representation using slot-filler structures and dealing with different forms of uncertain and implicit knowledge
- To introduce essential concepts of plan generation, Natural Language understanding and Expert Systems.

Course Outcomes:

- By the end of the course the student understands, applies, evaluates and creates AI solutions as they are
- able to characterize and model AI problems in a state space search framework and identify appropriate production system category to solve them
- able to understand and evaluate pros & cons of different heuristic search strategies and apply appropriate heuristic search for specific problem solving scenario.
- able to represent domain knowledge in the form of predicates / rules and applies logic and inference for deducing the validity of a given assertion.
- able to create problem specific slot-filler knowledge structures and apply statistical, fuzzy and non-monotonic reasoning methods aptly to solve real world problems involving any type of uncertainty.
- able to understand basic concepts and approaches to natural language processing, plan generation and expert system development.

SYLLABUS:

Introduction to Artificial Intelligence: Artificial Intelligence, AI Problems, AI Techniques, Defining the Problem as a State Space Search, Production Systems, control strategies, Uninformed search using BFS and DFS, Heuristic search, Problem Characteristics, Production system categories for AI problem solving

Heuristic Search Techniques: Issues in The Design of Search Programs, Generate-And- Test, Hill Climbing and its variants, Best-First Search, A* Algorithm, Problem Reduction, AO*Algorithm, Constraint Satisfaction, Means-Ends Analysis.

Knowledge Representation using Predicate Logic and Rules: Propositional Logic, First Order Predicate Logic: Representing Instance and is-a Relationships, Computable Functions and Predicates, Resolution in propositional logic, Resolution in predicate logic with Clause form, Unification & Resolution algorithm, Question answering, Procedural Vs Declarative Knowledge, Logic programming with Prolog, Forward Vs Backward Reasoning and combining them, Matching Techniques, Matching with variables, RETE Algorithm, Conflict resolution

Reasoning under Uncertainty: Introduction to Non-Monotonic Reasoning, Logics for Non monotonic reasoning, Depth first search with Dependency-directed backtracking, Justification based Truth Maintenance

System, Statistical Reasoning: Bayes Theorem for probabilistic inference, Certainty Factors and Rule-Based Systems, Bayesian Belief Networks, Dempster Shafer Theory, Fuzzy Logic

Structured Representations of Knowledge: Semantic Nets, representing non-binary predicates, Partitioned Semantic Nets, Frames as sets and instances, Slots as full-fledged Objects, Property Inheritance through tangled hierarchies, Conceptual Dependency, Conceptual Dependency Graphs, Scripts, examples in natural language understanding, merits and demerits of strong slot filler structures.

Natural Language Processing: Steps in Natural Language Processing, Syntactic Processing and Augmented Transition Nets, Semantic Analysis and grammars, Discourse and pragmatic processing; Planning: Components of a Planning System, Goal Stack Planning, Non-linear Planning using Constraint Posting, Hierarchical Planning, Reactive Systems.

Experts Systems: Overview of an Expert System, Applications of expert systems, Components of an Expert Systems, Expert system development, Types of Expert Systems: Rule Based, Frame Based, Neural Network based, Black Board Architectures, Case studies of successful expert systems, Expert System Shells, Knowledge Acquisition and Validation Techniques.

Text Books:

1. Artificial Intelligence, Elaine Rich and Kevin Knight, Tata McGraw -Hill Publications 2. Introduction To Artificial Intelligence & Expert Systems, Patterson, PHI publications References:

2. Artificial Intelligence, George F Luger, Pearson Education Publications 2. Artificial Intelligence : A modern Approach, Russell and Norvig, Prentice Hall

CS3103 COMPILER DESIGN

Course objectives:

- To explain the basic understanding of grammars and language definition and introducing various phases of designing a compiler.
- To make the student to understand the concepts underlying the design and implementation of language processors and its mechanisms.
- To extend the knowledge of parser by parsing LL parser and LR parser.
- To enrich the knowledge in various phases of compiler ant its use, code optimization techniques, loop optimization techniques, machine code generation, and use of symbol table.

Course outcomes:

- Ability to understand grammars, language definitions and various phases of designing a compiler.
- Ability to understand Language processors and different parsers.
- Ability to learn the new code optimization techniques to improve the performance of a program in terms of speed & space.
- Ability to do usage of registers in efficient manner during the program execution.
- Ability to acquire the knowledge of modern compiler & its features.

SYLLABUS:

Introduction: Introduction to Compilers and Language processors, Programming Language basics, Structure & Different Phases of a Compiler, Review of Compiler Structure, Structure of Optimizing Compilation, Compiler construction tools, Boot strapping, Cross compilers.

Finite Automata & Lexical Analysis: Introduction to Lexical Analysis, Lexical Analyzers, Approaches to design Lexical Analysers, Language for specifying lexical analyzers, Introduction to Finite automata, Regular Expressions & Languages, Recognition of Tokens, Transition Diagrams, Implementation of lexical analyzers, Lexical Analyzer Generator LEX.

Syntax Analysis: Syntactic Specification of Programming Languages, Context Free Grammars & Languages, Introduction to Parsers. Top-down parsing techniques: Brute force parsing, Recursive Descent Parsing, Predictive Parsing, Bottom–up Parsing: Shift reduce parsing, Operator parsing, LR (k) parsing.

Semantic Analysis and Intermediate Code Generation: Semantic Actions, Syntax Directed Translations, Translation on the parse Tree, Implementation of Syntax Directed Translator, Intermediate Codes, Syntax Directed translation to Postfix code, Syntax Trees, Intermediate Code Generation, Three Addr5ess Code-Translation of Expressions, Type Checking & Type Conversions.

Code Optimization: Principal sources of Code Optimization, Loop Optimization, Basic Blocks & Flow Graphs, DAG Representation of Basic Blocks, Applications of DAG, Local Optimization, Unreachable Code Elimination, Dead Code Elimination, Data Flow Analysis, Data Flow Equations & Computations, Peep-Hole Optimization.

Machine Dependent Optimizations, Overview of Informal Compiler Algorithm Notation (ICAN), If Simplification, Loop Simplification, Loop Inversion, Branch Optimization and Prediction

Code Generation and Code Scheduling: Issues in Code Generation, Input to Code Generator, Instruction Selection, Register Allocation, Simple Target Machine Model, Program and Instruction Costs, Register allocation & Assignments, Code Generation Algorithm, Code Generators, Optimal Code Generation for Expressions, Code Generation From DAG.

Symbol Tables, Runtime Environment and Error Handling: Contents of a Symbol Table, Data Structures for Symbol Tables; Run time Environments, Implementation of a simple Stack allocation, Heap Management, Block Structured Languages; Error Detection & Recovery, Lexical Phase Errors, Syntactic & Semantic Errors, Error Handling Routines.

Text Books:

1. Principles of Compiler Design by Aho.D. Ullman, Lam and Ravi Sethi, Pearson Education Second Edition
2. Advanced Compiler Design and Implementation, Steven Muchnic, Elsevier Publications.

Reference Books:

1. Compiler Construction by Kenneth. C. Louden, Vikas Pub. House.
2. Compiler Design, A.A. Pentambekar, Technical Publications
3. Modern Compiler Design, Grune.D, Van Reeuwijk K, Bal H.E, Jacobs C J H, Lan gendoen K, Springer,

CS3106 DATA COMMUNICATIONS & COMPUTER NETWORKS LAB

Course Objectives:

- This course provides students with hands on training regarding the design, troubleshooting, modelling and evaluation of computer networks.
- To study the various hardware concepts related to data communications
- To make the students understand the basic requirements of network hardware, software and its architecture.
- To understand the various Error detection & control techniques
- To learn Socket programming techniques

Course Outcomes:

The students will learn:

- About networking concepts and connecting systems
- To setup Local Area Network using packet tracer software
- To experiment in a real tested networking environment, network design and troubleshooting topics and tools
- Simulator Error control and flow control techniques
- To write socket program and client server applications.

SYLLABUS: Module I: Packet tracer software

1. Study of different types of Network cables and practically implement the cross-wired cable and straight through cable using clamping tool.
2. Connect the computers in Local Area Network.
3. Study of basic network command Network configuration commands.
4. Configure a Network topology using packet tracer software.

Module II: Network simulator (NS)

1. Implementation of Error Detection/Error Correction Techniques
2. Implementation of Stop and Wait Protocol and sliding window
3. Implementation and study of Goback-N and selective repeat protocols
4. Implementation of High-Level Data Link Control
5. Study of Socket Programming and Client-Server model using Java
6. Write a socket program for Echo/Ping/Talk commands using Java
7. Study of Network simulator (NS) and simulation of Congestion Control Algorithms

CS3107 PYTHON PROGRAMMING LAB

Course Objectives:

- familiarize students with key data structures in Python including lists and dictionaries and apply them in context of searching, sorting, text and file handling
- introduce students to calculation of statistical measures using Python such as measures of central tendency, correlation
- familiarize students with important Python data related libraries such as Numpy and Pandas and use them to manipulate arrays and data frames
- introduce students to data visualization in Python through creation of line plots, histograms, scatter plots, box plots and others
- Implementation of basic machine learning tasks in Python including pre-processing data, dimensionality reduction of data using PCA, clustering, classification and cross-validation.

Course Outcomes:

- After completion of the course the student should be able to:
- implement searching, sorting and handle text and files using Python data structures such as lists and dictionaries
- calculate statistical measures using Python such as measures of central tendency, correlation
- use Python data related libraries such as Numpy and Pandas and create data visualizations
- implement basic machine learning tasks pre-processing data, compressing data, clustering, classification and cross-validation.

SYLLABUS:

1. Python Programs on lists & Dictionaries

2. Python Programs on Searching and sorting

3. Python Programs on Text Handling

4. Python Programs on File Handling

5. Python Programs for calculating Mean, Mode, Median, Variance, Standard Deviation

6. Python Programs for Karl Pearson Coefficient of Correlation, Rank Correlation

7. Python Programs on NumPy Arrays, Linear algebra with NumPy

8. Python Programs for creation and manipulation of Data Frames using Pandas Library

9. Write a Python program for the following.

   - Simple Line Plots,

- Adjusting the Plot: Line Colours and Styles, Axes Limits, Labelling Plots,
- Simple Scatter Plots,
- Histograms,
- Customizing Plot Legends,
- Choosing Elements for the Legend,
- Boxplot
- Multiple Legends,
- Customizing Colorbars,
- Multiple Subplots,
- Text and Annotation,
- Customizing Ticks

10. Python Programs for Data pre-processing: Handling missing values, handling categorical data, bringing features to same scale, selecting meaningful features

11. Python Program for Compressing data via dimensionality reduction: PCA

12. Python Programs for Data Clustering

13. Python Programs for Classification

14. Python Programs for Model Evaluation: K-fold cross validation.

Reference Books:

1. Core Python Programming, Second Edition, Wesley J. Chun, Prentice Hall
2. Chris Albon,―Machine Learning with Python Cookbook-practical solutions from pre-processing to Deep learning‖, O'REILLY Publisher,2018
3. Mark Summerfield, Programming in Python 3--A Complete Introduction to the Python Language, Second Edition, Additson Wesley
4. Phuong Vo.T.H , Martin Czygan, Getting Started with Python Data Analysis, Packt Publishing Ltd
5. Armando Fandango, Python Data Analysis, Packt Publishing Ltd
6. Magnus VilhelmPersson and Luiz Felipe Martins, Mastering Python Data Analysis, Packt Publishing Ltd
7. Sebastian Raschka&VahidMirjalili, ―Python Machine Learning‖, Packt Publisher, 201



(With effect from 2022-23 AB)
B. Tech & B. Tech + M. Tech
(Computer Science and Engineering)
III year - II semester

Course code	Category	Course Title	Hours per Week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
CS3201	PC	Object Oriented Software Engineering	4	0	30	70	100	3
CS3202	PC	Machine Learning	4	0	30	70	100	3
CS3203	PC	Cryptography & Network Security	4	0	30	70	100	3
CS3204	PE	Professional Elective - II	4	0	30	70	100	3
CS3205	OE	Open Elective - II	4	0	30	70	100	3
CS3206	PC	Object Oriented Software Engineering Lab	0	3	50	50	100	1.5
CS3207	PC	Machine Learning Lab	0	3	50	50	100	1.5
CS3208	PC	Cryptography & Network Security Lab	0	3	50	50	100	1.5
CS3209	SC	Embedded Systems Design	1	2	50	50	100	2
Industrial / Research Internship 2 months								
Total Credits								21.5

CS3201 OBJECT ORIENTED SOFTWARE ENGINEERING

Course objectives:

- The students would be able to get the concepts of Object Orientation and software engineering perceptions and software process models.
- The students would be able to understand requirements engineering processes, Unified Modeling Language and its notations and diagrams.
- The students would be able to understand various architectural styles and the concepts of various architectural patterns and some design patterns.
- The students would be able to understand various types of testing and quality assurance issues.
- The students would be able to gain understanding about software process and project management activities.

Course Outcomes:

- The students will be able to understand the best practices of Object Oriented software engineering and will be able apply various life cycle activities like Analysis, Design, Implementation, Testing and Maintenance.
- The students would be able to analyze, elicit and specify software requirements through a productive working relationship with various stakeholders of the project.
- The students would be able to create various design models for a software system to meet the user needs.
- Students can apply the knowledge, techniques, and skills in the development of a software product.
- The students would be able to evaluate the software through various types of testing and perform software process and project management and quality assurance activities.

SYLLABUS:

Introduction to Object Oriented Software Engineering: Nature of the Software, Types of Software, Software Engineering Projects, Software Engineering Activities, Software Quality, Introduction to Object Orientation, Software Process Models-Waterfall Model, Opportunistic Model, Phased Released Model, Spiral Model, Evolutionary Model, Concurrent Engineering Model.

Requirements Engineering: Domain Analysis, Problem Definition and Scope, Requirements Definition, Types of Requirements, Techniques for Gathering and Analyzing Requirements, Requirement Documents, Reviewing, Managing Change in Requirements.

Unified Modelling Language & Use Case Modelling: Introduction to UML, Modelling Concepts, Types of UML Diagrams with Examples; User-Centred Design, Characteristics of Users, Developing Use- Case Models of Systems, Use-Case Diagram, Use- Case Descriptions, Basics of User Interface Design, Usability Principles, User Interfaces.

Class Design and Class Diagrams: Essentials of UML Class Diagrams, Associations and Multiplicity, Other Relationships, Generalization, Instance Diagrams, Advanced Features of Class Diagrams, Interaction and Behavioural Diagrams: Interaction Diagrams, State Diagrams, Activity Diagrams, Component and Deployment Diagrams.

Software Design and Architecture: Process of Design, Principles Leading to Good Design, Techniques for Making Good Design Decisions, Good Design Document; Pattern Introduction, Design Patterns: Abstraction-Occurrence Pattern, General Hierarchical Pattern, Play-Role Pattern, Singleton Pattern, Observer Pattern, Delegation Pattern, Adaptor Pattern, Façade Pattern, Immutable Pattern, Read-Only Interface Pattern and The Proxy Pattern; Software Architecture Contents of Architecture Model, Architectural Patterns: Multilayer, Client-Server, Broker, Transaction Processing, Pipe& Filter and MVC Architectural Patterns.

Software Testing: Overview of Testing, Testing Concepts, Testing Activities, Testing Strategies, Unit Testing, Integration Testing, Function Testing, Structural Testing, Class Based Testing Strategies, Use Case/Scenario Based Testing, Regression Testing, Performance Testing, System Testing, Acceptance Testing, Installation Testing, OOTest Design Issues, Test Case Design, Quality Assurance, Root Cause Analysis, Post-Mortem Analysis.

Software Process Management: Introduction to Software Project Management, Rationale Management, Configuration Management, Activities of Software Project Management, Structure of Project Plan, Software Engineering Teams, Software Cost Estimation, Project Scheduling, Tracking and Monitoring.

Text Books:

1. Object-Oriented Software Engineering Practical software development using UML and Java by Timothy C. Leth bridge& Robert, LanganiereMcgraw-Hill
2. Software Engineering, K.K. Agarwal, New Age Publications2008
3. Object-Oriented Software Engineering: Using UML, Patterns and Java, Bernd Bruegge and Allen H. Dutoit, 2nd Edition, Pearson Education Asia.

References:

1. Software Engineering: A Practitioner's Approach, Roger S Pressman.
2. A Practical Guide to Testing Object-Oriented Software, John D. McGregor; David A.Sykes, Addison-Wesley Professional.

CS3202 MACHINE LEARNING

Course Objectives:

- This course introduces the essential concepts and techniques of machine learning to the students and more specifically
- provides a good foundation to machine learning concepts and paradigms
- introduces Bayes Decision theory and Maximum likelihood estimation for learning model parameters as a tradeoff between bias and variance
- Explains multi-variate data exploration methods like missing value imputation, dimensionality reduction for classification and regression.
- introduce semi-parametric approaches for mixture models with clustering and Expectation Maximization
- introduces non-parametric methods for density estimation, smoothening, regression, etc
- Demonstrates the applicability of Decision Trees, linear discriminants and SVMs for classification and regression and explains the comparative analysis of their performance

Course outcomes:

- After completion of the course, the student should be able to:
- understand different types of ML, applications of ML in different domains, VC dimension and PAC learning for concept learning and supervisory model selection
- create Bayesian discriminant functions for decision regions with maximum likelihood estimation of parameters considering bias-variance tradeoff
- Understand and apply methods for missing value imputation, parameter estimation and dimensionality reduction on Multi-variate datasets
- Explore data applying various approaches like Expectation Maximization, clustering and non-parametric methods like nearest neighbors
- Able to solve classification and regression problems with Decision Trees, linear discriminants and SVMs and analyze the performance of classification algorithms

SYLLABUS:

Introduction to Machine Learning, Types and applications of Machine learning, **Supervisory Learning**: Learning classes from examples, Vapnik-Charvonenkis (VC) Dimension, Probably Approximately Correct(PAC) Learning, noise, learning multiple classes, regression, model selection and generalization, dimensions of supervised machine learning algorithms

Bayesian Decision Theory: Classification, losses and risks, discriminant functions, Association Rules, Parametric Methods: Maximum likelihood estimation, evaluating an estimator with bias and variance, Bayes' estimator, parametric classification, regression, tuning model complexity: bias vs variance dilemma, model selection procedures

Multivariate methods: Multivariate data, parameter estimation, missing value imputation, Multivariate normal distribution, Multivariate classification, Tuning complexity, Discrete features, Multivariate regression, Dimensionality Reduction: Subset selection, PCA, Factor Analysis, SVD and Matrix factorization, multi-dimensional scaling, LDA

Clustering: Mixture densities, K-means clustering, Expectation Maximization algorithm, Supervised learning after clustering, Feature embedding, Laplacian Eigenmaps, Spectral clustering, Hierarchical clustering, choosing number of clusters

Non-parametric methods: Non-parametric density estimation methods like Histograms, kernel estimators, K-nearest neighbor estimators, generalization to multivariate data, nonparametric classification, condensed nearest neighbors, Distance based classification, outlier detection, non-parametric regression: smoothing models, choosing smoothing parameters

Decision Trees and Assessing Classification algorithms: Decision Tree purpose and structure, Uni-variate Trees for classification and regression, rule extraction from trees, Learning Rules from data, Multivariate trees, Assessing and comparing classification Algorithms: Cross-validation and resampling methods, measuring error, interval estimation, Hypothesis testing, assessing performance of a classifier, comparing two classification algorithms

Linear Discrimination: Generalizing linear model, two class and multi-class geometry of linear discriminant, pairwise separation, gradient descent, logistic discrimination for binary and multi-class problems, discrimination by regression, learning to rank, Kernel Machines: features of Support vector machines, optimal separating hyperplane, Soft margin hyperplane for non-separable spaces, kernel Trick, Vectorial kernels, SVM for regression.

Text Book:

1. Introduction to Machine Learning by Ethem Alpaydin, Prentice-Hall of India, 3rd Edition, 2019

Reference books:

1. Machine Learning, Peter Flach, Cambridge University Press, 2012

2. Machine Learning, Tom Mitchell , McGraw Hill, 1997

CS3203 CRYPTOGRAPHY & NETWORK SECURITY

Course Objectives:

- To understand the basic concepts of Cryptography and Network Security.
- To be able to understand message security, confidentiality and database security
- To learn about the various types of malwares and attacks.
- To learn about Intrusions, intrusion detection system and understand buffer overflow
- To understand various protocols for network security to protect against the threats in the networks.

Course Outcomes:

- After successful completion of the course, the students would be able to
- Realize the need and importance of network security, understand and apply the concepts of security towards data over network.
- Understand the principles of cryptography and network security and apply the knowledge to design cryptographic concepts and algorithms.
- Understand and analyze various types of malwares and several network attacks.
- Evaluate several intrusions and understand buffer overflow attacks.
- Understand and apply security standards and implement various network security protocols.

SYLLABUS:

Cryptography: Concepts & Techniques

Need for Security, Security Approaches, Principles of Security, Threats-Attacks & Attack Types-Services-Mechanisms, Basic Mathematics for cryptography- Factorization, Prime numbers, Primality Testing, Modular Arithmetic, Discrete logarithms, Residues, Fermat's & Euler's Theorem, Chinese Reminder theorem

Symmetric & Asymmetric Cryptography:

Network Security Model: Plain Text-Cipher Text-Encryption-Decryption-Key, Key Range and Key Size, Classic Cryptography: Stream ciphers, Substitution-Transposition, Steganography.

Basic Concept of Symmetric Cryptography, Algorithm Types and Modes, DES-AES-RC4, Principles of Public-Key Cryptography, Message Authentication, Hash functions, RSA, Concepts of Digital Signature.

Key Management and Integrity:

Symmetric Key Distribution, Diffie-Hellman Key exchange, Public Key Distribution, Public Key infra structure(PKI) Digital Certificates (public key), Basic principles of Access control.

E-mail & IP Security:

E-mail security -PGP/SMIME, IP Security & architecture, IPV6

Internet Security Protocols and Standards:

Basic concepts, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure hyper text transfer protocol (SHTTP), Time stamping protocol (TSP), Wireless Application Protocol (WAP), Secure Electronic Transaction (SET), security in GSM, Security in 3G.

Firewalls, Intrusion Detection System and Virtual Private Networks:

Types of Firewalls, Firewall Architectures, IDS- Signature and Anomaly based IDS, Basics of VPN, VPN architecture

Network Vulnerabilities:

Different types of Vulnerabilities in Network, Introduction to IP Spoofing, ICMP, ARP, DDOS, Buffer Overflow attacks

Text Books:

1. Cryptography And Network Security by Atul kahate, McGrawHill
2. Network Security Essentials- Applications and Standards by William Stallings, 3 rd Edition, Pearson

Reference Books:

1. Cryptography and Network Security by William Stallings, Pearson Education Asia, New Delhi.
2. Network Security Essentials Applications and Standards, by William Stallings, Pearson Education Asia, New Delhi.

CS3206 OBJECT ORIENTED SOFTWARE ENGINEERING LAB

Course objectives:

- The purpose of the Software Engineering Lab course is to familiarize the students with modern software engineering methods and tools, The course is realized as a project-like assignment that can, in principle, by a team of two/three students working full time. Typically the assignments have been completed during the semester requiring approximately 60-80 hours from each project team.
- The goal of the Software Engineering Project is to have a walk through from the requirements, design to implementing and testing. An emphasis is put on proper documentation. Extensive hardware expertise is not necessary, so proportionate attention can be given to the design methodology.
- Despite its apparent simplicity, the problem allows plenty of alternative solutions and should be a motivating and educating exercise. Demonstration of a properly functioning system and sufficient documentation is proof of a completed assignment.
- Term projects are projects that a group student or might take through from initial specification to implementation. The project deliverables include.

Course Outcomes:

- Ability to define a problem and to translate end-user requirements into system and software requirements.
- Ability to generate a high-level design of the system from the software requirements.
- Ability to draw various design diagrams (UML, Architectural Designs, Database Design and User Interface Designs) for the requirements gathered.
- Ability to implement the designed problem in Object Oriented Programming Language.
- Will have experience and/or awareness of testing problems, test whether all the requirements specified have been achieved or not and will be able to develop a simple testing report.

SYLLABUS:

1. Documentation including

   A. A problem statement

   B. A requirements document

   C. A Requirements Analysis Document.

   D. A System Requirements Specification.

   E. A Software Requirements Specification.

2. A design document

   A. A Software Design Description and a System Design Document.

3. A Test specification.

4. Manuals/guides for

    A. Users and associated help frames

    B. Programmers

    C. Administrators (installation instructions)

5. A project plan and schedule setting out milestones, resource usage and estimated costs.

6. A quality plan setting out quality assurance procedures

7. An implementation.

References:

1. Project-based software engineering: An Object-oriented approach, Evelyn Stiller, Cathie LeBlanc, Pearson Education
2. Visual Modelling with Rational Rose 2002 and UML, Terry Quatrini, Pearson Education
3. UML2 Toolkit, Hans -Erik Eriksson, etc; Wiley

CS3207 MACHINE LEARNING LAB

Course Objectives:

- The lab course provides hands-on experimentation for gaining practical orientation on different Machine learning concepts. Specifically students learn
- To write programs for various data exploration and analytics tasks and techniques in R Programming language.
- To apply various Machine learning techniques available in WEKA for data exploration and pre-processing datasets containing numerical and categorical attributes · To apply various Machine learning techniques for available in WEKA for extracting patterns / Knowledge and interpret the resulting patterns

Course Outcomes:

At the end of this course student are able to

- understand the data structures available in R programming and learn to write R programs to perform several data analytics operations like plotting, boxplots, normalization, discretization, transformation, attribute selection, etc., on datasets
- write R programs to build regression and classification models for numerical and categorical datasets and evaluate the models with appropriate performance metrics. 3. understand and use Weka explorer for data exploration, visualization, and other data pre processing tasks for numerical and categorical datasets.
- extract Association rules using A-priori and FP-growth methods available in WEKA and interpret the patterns.
- Build and cross-validate models for Classification and Clustering on labelled and unlabeled datasets respectively using different methods.

1. Exploratory data analysis using R

1. Load the 'iris.csv' file and display the names and type of each column. Find statistics such as min, max, range, mean, median, variance, standard deviation for each column of data. Repeat the above for 'mtcars.csv' dataset also.

2. Write R program to normalize the variables into 0 to 1 scale using min-max normalization

3. Generate histograms for each feature / variable (sepal length/ sepal width/ petal length/ petal width) and generate scatter plots for every pair of variables showing each species in a different color .
4. Generate box plots for each of the numerical attributes. Identify the attribute with the highest variance.

5. Study of homogeneous and heterogeneous data structures such as vector, matrix, array, list, data frame in R.

6. Write R Program using 'apply' group of functions to create and apply normalization function on each of the numeric variables/columns of iris dataset to transform them into a value around 0 with z-score normalization.

7. Write R Program using ‘apply’ group of functions to create and apply discretization function on each of the numeric variables/ features of iris dataset to transform them into 3 levels designated as “Low, Medium, High” values based on equi-width quantiles such that each variable gets nearly equal number of data points in each level.

8. a) Use R to apply linear regression to predict evaporation coefficient in terms of air velocity using the data given below:

    a. Air Velocity (cm/sec) 20,60,100,140,180,220,260,300,340,380

    b. Evaporation Coefficient (sqmm/sec)

    c. 0.18, 0.37, 0.35, 0.78, 0.56, 0.75, 1.18, 1.36, 1.17, 1.65

    d. b) Analyze the significance of residual standard-error value, R-squared value, F statistic. Find the correlation coefficient for this data and analyze the significance of the correlation value.

    e. c) Perform a log transformation on the ‘Air Velocity 'column, perform linear regression again, and analyze all the relevant values.

9. Write R program for reading ‘state.x77’ dataset into a dataframe and apply multiple regression to predict the value of the variable ‘murder’ based on the other independent variables based on their correlations.

10. Write R program to split ‘Titanic’ dataset into training and test partitions and build a decision tree for predicting whether survived or not given the description of a person travelled. Evaluate the performance metrics from the confusion matrix. .

2. WEKA Knowledge Extraction toolkit:

11. Create an ARFF (Attribute-Relation File Format) file and read it in WEKA. Explore the purpose of each button under the pre-process panel after loading the ARFF file. Also, try to interpret using a different ARFF file, weather.arff, provided with WEKA.

12. Performing data preprocessing in Weka Study Unsupervised Attribute Filters such as Replace Missing Values to replace missing values in the given dataset, Add to add the new attribute Average, Discretize to discretize the attributes into bins. Explore Normalize and Standardize options on a dataset with numerical attributes.

13. Classification using the WEKA toolkit Demonstration of classification process using id3 algorithm on categorical dataset(weather).
Demonstration of classification process using naïve Bayes algorithm on categorical dataset (‘vote’).
Demonstration of classification process using Random Forest algorithm on datasets containing large number of attributes.
14. Classification using the WEKA toolkit – Part 2
Demonstration of classification process using J48 algorithm on mixed type of dataset after discretizing numeric attributes.
Perform cross-validation strategy with various fold levels. Compare the accuracy of the results.

15. Association rule analysis in WEKA

Demonstration of Association Rule Mining on supermarket dataset using Apriori Algorithm with different support and confidence thresholds.
Demonstration of Association Rule Mining on supermarket dataset using FP- Growth Algorithm with different support and confidence thresholds.

16. Performing clustering in WEKA
Apply hierarchical clustering algorithm on numeric dataset and estimate cluster quality. Apply DBSCAN algorithm on numeric dataset and estimate cluster quality.

References:

1. Practical data science with R, Nina Zumel and John Mount- Dreamtech Press for module 1 on R
2. Data Mining: Practical Machine Learning tools and techniques, Ian H.Witten, Eibe Frank and Mark A.Hall, Morgan Kaufmann Pub, 3rd Edition for module 2 on WEKA

CS3208 CRYPTOGRAPHY & NETWORK SECURITY LAB

Course Objectives:

- Understand the concepts of encryption and decryption and various techniques.
- Understand various algorithms such as DES, Blowfish, Rijndael, Message Digest
- Understand how to find IP address, MAC address, neighbouring machines
- Understand Intrusion detection and ARP protocols

Course Outcomes:

By the end of the course, the student will be able to:

- Perform encryption and decryption using various algorithms
- Implement various encryption and Message Digest algorithms
- Find IP address, MAC address, neighbouring machines
- Detect intrusion packets and demonstrate ARP poisoning

List of Experiments cycle 1:

Cryptography

1. Write a C program that contains a string (char pointer) with a value ‗Hello world'. The program should XOR each character in this string with 0 and displays the result.
2. Write a C program that contains a string (char pointer) with a value ‗Hello world'. The program should AND or and XOR each character in this string with 127 and display the result.
3. Write a Java program to perform encryption and decryption using the following algorithms
4. Ceaser cipher
5. Substitution cipher
6. Hill Cipher
7. Write a C/JAVA program to implement the DES algorithm logic.
8. Write a C/JAVA program to implement the Blowfish algorithm logic.
9. Write a C/JAVA program to implement the Rijndael algorithm logic.
10. Write the RC4 logic in Java Using Java cryptography; encrypt the text ‗Hello world' using Blowfish. Create your own key using Java key tool.
11. Write a Java program to implement RSA algorithm.

12. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript.
13. Calculate the message digest of a text using the SHA-1 algorithm in JAVA.
14. Calculate the message digest of a text using the MD5 algorithm in JAVA.

Cycle 2 – Network Security:

1. a) Find the IP address, MAC address of your machine.

   b) Find the neighbouring machines in your network.

   c) Check if a server is up and running.
2. Run tcpdump/windump utility with atleast 4 options.
3. Capture the packets in your system using wireshark and analyse any one TCP packet in detail.
4. Use snort to detect intrusion packets.
5. Demonstrate ARP Poisoning.

Reference Books:

1.Computer Security - Principles and Practices, 2ndEdition by William Stallings, Pearson Education, Inc.

2.Cryptography and Network Security by William Stallings, Pearson Education Asia, New Delhi.

CS3209 EMBEDDED SYSTEMS DESIGN (SC)

Course Objectives:

- To introduce basics of electronics and reading electronics diagrams
- To introduce students to basics of Arduino programming language and IDE
- Assembly language program using 8051
- Interfacing 8051 Microprocessor
- Embedded system design using msp430

Course Outcomes:

At the end of this course, students will:

- Learn the basics of electronics, including reading schematics (electronics diagrams) and how to prototype circuits with a breadboard.
- Learn the Arduino programming language and IDE
- Acquire knowledge on how to program basic Arduino/ RASPBERRY Pi/8051/MSP430 using assemble language or C language.
- students able to learn how to build prototype models and interfacing various sensor to Arduino/ RASPBERY Pi/8051/MSP430

MODULE I: EMBEDDED SYSTEM DESIGN USING MSP430

1. Introduction to MSP430 launch pad and Programming Environment.
2. Read input from switch and Automatic control/flash LED (soft-ware delay).
3. Interrupts programming example using GPIO.
4. Configure watchdog timer in watchdog & interval mode.
5. Configure timer block for signal generation (with given frequency).
6. Read Temperature of MSP430 with the help of ADC.
7. Test various Power Down modes in MSP430.
8. PWM Generator.
9. Speed Control of DC Motor

MODULE II: EMBEDDED SYSTEM DESIGN USING 8051

1. Assemble language programs using 8051 implementing

a. Addition and subtraction of two 8bit numbers
b. Multiplication and division of two 8bit numbers
c. Largest and smallest in array of numbers
d. Arrange an array an ascending and descending orders
e. To move a block of data to another location

2. Hardware Interfacings with 8051

a. LEDS and Switches,

b. Seven Segment Display and Multi Segment Display,
c. Relays (AC Appliance Control)
d. LCD, Buzzer,
e. IR Sensors and other digital sensors,
f. Matrix Keypad
g. UART Communication (MCU to PC) UART Communication (MCU to MCU)
h. Graphical LCD
i. RTC Based Real Time Clock
j. Sensor Interfacing: Accelerometer/Gyro/Tilt Sensor, Analogue Sensors (Temperature, Gas & Alcohol) UART Based Sensors (Colour Sensor, Humidity Sensor).

MODULE III: EMBEDDED SYSTEM DESIGN USING ARDUINO

1. Embedded Systems Introduction, Different Microcontroller Architectures (CISC, RISC, ARISC).
Internal Resources & Hardware Chips in Details. History of AVR Microcontrollers and Features, Memory Architectures (RAM/ROM). 8051 Architecture and programming.
2. Introduction to ARDUINO, ARDUINO History and Family Programming in Embedded -C, Concepts of C language.
3. Hardware Interfacing with Arduino
k. LEDS and Switches,
l. Seven Segment Display and Multi Segment Display,
m. Relays (AC Appliance Control)
n. LCD, Buzzer,
o. IR Sensors and other digital sensors,
p. Matrix Keypad
q. UART Communication (MCU to PC) UART Communication (MCU to MCU)
r. Graphical LCD
s. RTC Based Real Time Clock
t. Sensor Interfacing: Accelerometer/Gyro/Tilt Sensor, Analogue Sensors (Temperature, Gas & Alcohol) UART Based Sensors (Colour Sensor, Humidity Sensor).
4. Software Programming/Assembly Language Programming for above HW interfacing experiments with development kits or Simulation environment.

MODULE IV: EMBEDDED SYSTEM DESIGN USING RASPBERRY Pi

1. Setup Headless Raspberry Pi

2. Basic Input and Output Using Pseudo File system

3. Basic Input and Output Using Address Map

4. Analog Input & Analog Output

5. Interfacing 7 Segment Display & 4x4 Matrix Keyboard/Keypad

6. I2C Communication

7. Servo Motor & stepper Motor



(With effect from 2022-23 AB)
B. Tech & B. Tech + M. Tech
(Computer Science and Engineering)
IV year - I semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
CS4101	PE	Professional Elective– III	4	0	30	70	100	3
CS4102	PE	Professional Elective - IV	4	0	30	70	100	3
CS4103	PE	Professional Elective - V	4	0	30	70	100	3
CS4104	OE	Open Elective– III	4	0	30	70	100	3
CS4105	OE	Open Elective - IV	4	0	30	70	100	3
CS4106	HSSE	HSS Elective	4	0	30	70	100	3
CS4107	SC	Design Thinking and product Innovation	1	2	50	50	100	2
CS4108	INT	Internship -II	0	0	50	50	100	2
Industrial / Research Internship 2 months(Mandatory) after 3rd year (to be evaluated during IV Year I Semester)								
Total Credits								22

CS4107 DESIGN THINKING AND PRODUCT INNOVATION (SC)

Course Outcomes:
After successful completion of this activity the student will be able to

- outline a problem, apply methods of Empathy on user groups
- describe and define the problem specific to the user group
- apply Ideation tools to generate Ideas to solve the problem
- develop prototype
- test the ideas and demonstrate Storytelling ability to present the Ideas

Students shall form into groups and Identify a problem (preferably societal problem with engineering orientation to solve) suitable for the design thinking and go through the process week-wise. At the end of each phase, brief documentation shall be submitted and a final report covering all phases has to be submitted at the end of the semester.

SYLLABUS:

Introduction to Design Thinking: A primer on design thinking - Traditional approach, The new design thinking approach. Stages in Design Thinking: Empathize, Define, Ideate, Prototype, Test. Mindset for design thinking, Design thinking for product and process innovation, Difference between engineering design and design thinking.

Case Studies: General, Engineering and Service applications.

Activities: Identify an Opportunity and Scope of the Project Explore
the possibilities and Prepare design brief

Methods and Tools for Empathize and Define phases:

Empathize - Methods of Empathize Phase: Ask 5 Why / 5W+H questions, Stakeholder map, Empathy Map, Peer observation, Trend analysis

Define - Methods of Define Phase: Storytelling, Critical items diagram, Define success

Activities: Apply the methods of empathize and Define Phases Finalize
the problem statement

Methods and Tools for Ideate phase:

Ideate - Brainstorming, 2X2 matrix, 6-3-5 method, NABC method;

Activities: Apply the methods of Ideate Phase: Generate lots of Ideas

Methods and Tools for Prototype Phase:

Prototype - Types of prototypes - Methods of prototyping - Focused experiments, Exploration map, Minimum Viable Product;

Activities: Apply the methods of Prototype Phase: Create prototypes for selected ideas

Methods and Tools for Test Phase:

Test - Methods of Testing: Feedback capture grid, A/B testing

Activities: Collect feedback; iterate and improve the ideas

Solution Overview - Create a Pitch - Plan for scaling up - Road map for implementation

Activities: Present your solution using Storytelling method

Project Submission: Fine tuning and submission of project report

Reference Books:

1. Tim Brown, *Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation*, HarperCollins e-books, 2009.
2. Michael Lewrick, Patrick Link, Larry Leifer, *The Design Thinking Toolbox*, John Wiley & Sons, 2020.
3. Michael Lewrick, Patrick Link, Larry Leifer, *The Design Thinking Playbook*, John Wiley & Sons, 2018.
4. Kristin Fontichiaro, *Design Thinking*, Cherry Lake Publishing, USA, 2015.
5. Walter Brenner, Falk Uebernickel, *Design Thinking for Innovation - Research and Practice*, Springer Series, 2016.
6. Gavin Ambrose, Paul Harris, *Design Thinking*, AVA Publishing, 2010.
7. Muhammad Mashhood Alam, *Transforming an Idea into Business with Design Thinking*, First Edition, Taylor and Francis Group, 2019.
8. S.Balaram, *Thinking Design*, Sage Publications, 2011.

Web References:

1. https://designthinking.ideo.com/
2. https://thinkibility.com/2018/12/01/engineering-vs-design-thinking/
3. https://www.coursera.org/learn/design-thinking-innovation
4. https://swayam.gov.in/nd1_noc20_mg38/preview

(With effect from 2022-23 AB)
B. Tech & B. Tech + M. Tech
(Computer Science and Engineering)
IV year - II semester

Course code	Category	Course Title	Internal Marks	External Marks	Total Marks	Credits
CS4201	PROJ	Project work	100	100	200	14
Internship (6 Months)						
					Total Credits	14

SC: Skilled Course

OE/PE: Open Elective/Professional Elective

HSSE: Humanities and Social Science Elective

MC: Mandatory Course

PROFESSIONAL ELECTIVES (CSE)

1. REAL TIME SYSTEMS
2. SOFTWARE PROJECT MANAGEMENT
3. SOFTWARE TESTING TECHNIQUES
4. DISTRIBUTED SYSTEMS
5. GRID COMPUTING
6. SENSOR NETWORKS
7. CLOUD COMPUTING
8. DIGITAL IMAGE PROCESSING
9. BIG DATA ANALYTICS
10. NATURAL LANGUAGE PROCESSING
11. SOFT COMPUTING
12. HUMAN COMPUTER INTERACTION
13. BIO INFORMATICS
14. DATA WAREHOUSING AND DATA MINING
15. DEEP LEARNING

REAL TIME SYSTEMS
PROFESSIONAL ELECTIVE
SYLLABUS

Course Objectives:

The objective of this course is:

- To learn and understand the evolution of Real Time Systems
- To study and examine hardware architectures for Real Time Systems
- To study and analyze the design issues for Real Time Operating Systems
- To study and evaluate programming language paradigms for creating Real Time applications
- To study and apply the techniques for Real Time performance analysis

Course Outcomes:

On completion of this course, the students shall be able to

- Understand the need for Real Time Systems, their characteristics and applications
- Recognize the processor, memory and interfacing hardware architectures for Real Time Systems
- Analyze and implement appropriate policy for Real Time Operating System services
- Choose appropriate programming language for development of real time software
- Evaluate the performance of a Real Time System

SYLLABUS:

Fundamentals of Real-Time Systems: Concepts and Misconceptions, Multidisciplinary Design Challenges, Birth and Evolution of Real-Time Systems.

Hardware for Real-Time Systems: Basic Processor Architecture, Memory Technologies, Architectural Advancements, Peripheral Interfacing, Microprocessor versus Microcontroller, Distributed Real-Time Architectures.

Real-Time Operating Systems: From Pseudokernels to Operating Systems, Theoretical Foundations of Scheduling, System Services for Application Programs, Memory Management Issues, Selecting Real-Time Operating Systems.

Programming Languages for Real-Time Systems: Coding of Real-Time Software, Assembly Language, Procedural Languages, Object-Oriented Languages, Overview of Programming Languages, Automatic Code Generation, Compiler Optimizations of Code.

Requirements Engineering Methodologies and Software Design Approaches: Requirements Engineering for Real-Time Systems, Formal Methods in System Specification, The Requirements Document, Qualities of Real-Time Software, Software Engineering Principles, Procedural Design Approach, Object-Oriented Design Approach.

Performance Analysis Techniques: Real-Time Performance Analysis, Applications of Queuing Theory, Input/Output Performance, Analysis of Memory Requirements.

Text Books:

1. “Real-Time Systems Design and Analysis” by Philips A. Laplante, Seppo J. Ovaska, 4e, Wiley

Reference Books:

1. “MicroC/OS-II: The Real-Time Kernel” by J. J. Labrosse, CRC Presss
2. “Real-Time and Embedded Guide” by Herman B
3. “Linux for Embedded and Real-Time Applications” by Doug Abbott
4. “Real Time Systems” by C. M. Krishna, Kang G. Shin, McGraw-Hill Intl. Edition
5. “Real-Time Systems” by Jane W. S. Liu, Pearson Education

SOFTWARE PROJECT MANAGEMENT
PROFESSIONAL ELECTIVE
SYLLABUS

Course Objectives:

- To understand the Software Project Planning and Evaluation techniques.
- To plan and manage projects at each stage of the software development life cycle (SDLC).
- To learn about the activity planning and risk management principles.
- To manage software projects and control software deliverables.
- To develop skills to manage the various phases involved in project management and people management.
- To deliver successful software projects that support organization ‘s strategic goals.

Course Outcomes:

At the end of the course, the students should be able to:

- Understand Project Management principles while developing software.
- Gain extensive knowledge about the basic project management concepts, framework and the process models.
- Obtain adequate knowledge about software process models and software effort estimation techniques.
- Estimate the risks involved in various project activities.
- Define the checkpoints, project reporting structure, project progress and tracking mechanisms using project management principles.
- Learn staff selection process and the issues related to people management

SYLLABUS:

Introduction to Software Project Management: Introduction to Project and Project Management, Reasons for IT project failure, Triple constraint of IT project management, Management spectrum of project, Overview of project life cycle models, Project manager skills and job description conceptualization and initiation of IT project, Business case.

Project Charter: Introduction, Project management process and their correlation with project life cycle phases, Introduction to Project Integration management and seven processes, Project Charter.

Project Scope Management: Introduction, Processes of scope management.

Project Human Resource Management: Introduction, Organizational structure – Function, Project and Matrix, Keys to managing people motivation theories and improving effectiveness, Project team selection.

Project Time and Cost Management: Introduction, Development of project schedule, CPM and PERT, Activities their sequencing and dependencies, Project network diagrams, Development of Gantt Charts, Earned Value Management, Introduction to Constructive Cost Model (COCOMO).

Project Risk Management: Introduction, Risk Management Process, Risk Identification for IT projects, Qualitative and Quantitative approaches to Risk Analysis, Risk Strategies, Risk Monitoring and Control, Risk Response and Evaluation Project Quality Management.

Project Communication Management: Introduction, Project Communication Plan, Project metrics, Information distribution, Performance Reporting. Project Change Management: Introduction, Impact of change, Change as a process, Change Management plan, Dealing with resistance and conflict, Configuration management.

Project Procurement Management: Introduction, Processes Planning Purchases and Acquisition, Contracting, Request Seller Responses, Select Sellers, Contract Administration, Contract Closure, Outsourcing of products and services.

Project Leadership and Ethics: Introduction, Project Leadership, Modern approaches, Styles of leadership, Ethical leadership, Making sound ethical decisions in the situations of conflict. Closure of a Project: Introduction, Project implementation, Administrative closure, Project Evaluation.

Text Book:

1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition, Tata McGraw Hill, New Delhi, 2012.

References:

1. Robert K. Wysocki ―Effective Software Project Management – Wiley Publication, 2011.
2. Walker Royce: ―Software Project Management- Addison-Wesley, 1998.
3. Gopalaswamy Ramesh, ―Managing Global Software Projects – McGraw Hill Education (India), Fourteenth Reprint 2013

SOFTWARE TESTING TECHNIQUES
PROFESSIONAL ELECTIVE
SYLLABUS

Course Objectives:

- To study fundamental concepts in software testing and discuss various software testing issues and solutions in software unit, integration, regression and system testing.
- To learn how to plan a test project, design test cases and data, conduct testing, manage software problems and defects, generate a test report.
- To expose the advanced software testing concepts such as object-oriented software testing methods, web-based and component-based software testing.

Course Outcomes:

By the end of the course, the student should have the ability to:

- Identify and understand various software testing problems, apply software testing knowledge and engineering methods and solve these problems by designing and selecting software test models, criteria, strategies, and methods
- Design and conduct a software test process for a software project
- Analyze the needs of software test automation
- Use various communication methods and skills to communicate with their teammates to conduct their practice-oriented software testing projects.

SYLLABUS:

Software Testing: Introduction, Evolution, Myths & Facts, Goals, Psychology, definition, Model for testing, Effective Vs Exhaustive Software Testing.

Software Testing Terminology and Methodology: Software Testing Terminology, Software Testing Life Cycle, Software Testing Methodology.

Verification and Validation: Verification & Validation Activities, Verification, Verification of Requirements, High level and low level designs, verifying code, Validation Dynamic Testing-Black Box testing techniques: Boundary Value Analysis, Equivalence class Testing, State Table based testing, Decision table based testing, Cause-Effect Graphing based testing, Error guessing

White-Box Testing: need, Logic Coverage criteria, Basis Path testing, Graph matrices, Loop testing, data flow testing, mutation testing Static Testing: Inspections, Structured Walkthroughs, Technical Reviews. Validation activities: Unit testing, Integration Testing, Function testing, system testing, acceptance testing

Regression testing: Progressives Vs regressive testing, Regression test ability, Objectives of regression testing, Regression testing types, Regression testing techniques Efficient Test Suite Management: growing nature of test suite, Minimizing the test suite and its benefits,

test suite prioritization, Types of test case prioritization, prioritization techniques, measuring the effectiveness of a prioritized test suite. Software Quality Management: Software Quality metrics, SQA models Debugging: process, techniques, correcting bugs.

Automation and Testing Tools: need for automation, categorization of testing tools, selection of testing tools, Cost incurred, Guidelines for automated testing, overview of some commercial testing tools such as Win Runner, Load Runner, Jmeter and Unit. Test Automation using Selenium tool.

Testing Object Oriented Software: basics, Object oriented testing, Testing Web based Systems: Challenges in testing for web based software, quality aspects, web engineering, testing of web based systems, Testing mobile systems

Text Books:

1. Software Testing, Principles and Practices, Naresh Chauhan, Oxford.
2. Software Testing- Yogesh Singh, CAMBRIDGE.

Reference books:

1. Foundations of Software testing, Aditya P Mathur, 2ed, Pearson.
2. Software testing techniques – BarisBeizer, Dreamtech, second edition.

DISTRIBUTED SYSTEMS
PROFESSIONAL ELECTIVE
SYLLABUS

Course Objectives:

The objective of this course is:

- To learn and understand distributed system design issues
- To study and examine communication protocols and models for distributed systems
- To study and analyze centralized and distributed algorithms for synchronization, processor allocation, fault tolerance and real time systems
- To study design and implementation issues for distributed file systems
- To examine and evaluate the approaches for distributed shared memory

Course Outcomes:

After completion of this course, the student shall be able to:

- Understand the advantages and usage of distributed systems over centralized systems
- Choose an appropriate communication protocol and model for implementing a distributed system
- Evaluate alternate policies for processor allocation, fault tolerance and real time systems
- Choose appropriate distributed file system models for distributed applications
- Critically examine and choose appropriate distributed shared memory model

SYLLABUS:

Introduction to Distributed Systems : What is a Distributed System?, Hard ware concepts, Software concepts, Design issues.

Communication in Distributed Systems: Layered Protocols, ATM networks, The Client – Server model, Remote Procedure Call, Group communication.

Synchronization in Distributed Systems: Synchronization in Distributed System, Clock Synchronization, Mutual Exclusion, Election algorithms, Atomic transactions, Deadlocks in Distributed Systems.

Process Management: Processes and processors in Distributed System, Threads, System Models, Processors allocation, Scheduling in Distributed System, Fault Tolerance, Real Time Distributed System.

Distributed File Systems: Distributed File System Design, Distributed File System implementation, Trends in Distributed File System.

Distributed Shared Memory: Introduction, What is Shared memory? Consistency models, Page based Distributed Shared Memory, Shared –Variable Distributed Shared Memory, Object based Distributed Shared Memory.

Text Book:

1. Distributed Operating Systems by Andrew S. Tanenbaum, Pearson Education

Reference Books:

1. Advanced Concepts in Operating Systems by Mukesh Singhal and Niranjan G.Shivaratri,Tata McGraw Hill
2. Distributed Systems- Concepts and Design by George Coulouris, Jean Dollimore, Tim Kindberg, Pearson Education

GRID COMPUTING
PROFESSIONAL ELECTIVE
SYLLABUS

Course Objectives:

The student should be made to:

- Understand how Grid computing helps in solving large scale scientific problems.
- Gain knowledge on the concept of virtualization that is fundamental to cloud computing.
- Learn how to program the grid and the cloud.
- Understand the security issues in the grid and the cloud environment.

Course Outcomes:

At the end of the course, the student should be able to:

- Apply grid computing techniques to solve large scale scientific problems
- Apply the concept of virtualization
- Use the grid and cloud tool kits
- Apply the security models in the grid and the cloud environment

SYLLABUS:

Introduction: The Data Centre, the Grid and the Distributed / High Performance Computing, Cluster Computing and Grid Computing, Meta computing – the Precursor of Grid Computing, Scientific, Business and e-Governance Grids, Web Services and Grid Computing, Business Computing and the Grid – a Potential Win – win Situation, e-Governance and the Grid.

Technologies and Architectures: for Grid Computing Clustering and Grid Computing, Issues in Data Grids, Key Functional Requirements in Grid Computing, Standards for Grid Computing, Recent Technological Trends in Large Data Grids

World Wide Grid Computing: Activities, Organizations and Projects Standard Organizations, Organizations Developing Grid Computing Tool Kits, Framework, and Middleware, Grid Projects and Organizations Building and Using Grid Based Solutions, Commercial Organizations Building and Using Grid Based Solutions.

Web Services and the Service Oriented: Architecture (SOA) History and Background, Service Oriented Architecture, how a Web Service Works, SOAP and WSDL, Description, Creating Web Services, Server Side. OGSA and WSRF OGSA for Resource Distribution, Stateful Web Services in OGSA, WSRF (Web Services Resource Framework), Resource Approach to Stateful Services, WSRF Specification.

Globus Toolkit History of Globus Toolkit: Versions of Globus Toolkit, Applications of GT4- Cases, GT4-Approaches and Benefits, Infrastructure Management, Monitoring and Discovery, Security, Data,

Choreography and Coordination, Main Features of GT4 Functionality – a Summary, GT4 Architecture, GT4 Command Line Programs, GT4 Containers

The Grid and the Databases: Issues in Database Integration with the Grid, The Requirements of a Grid-enabled Database, Storage Request Broker (SRB), How to Integrate the Databases with the Grid? The Architecture of OGSA-DAI for Offering Grid Database Services

Cluster Computing: Approaches to Parallel Computing, how to Achieve Low Cost Parallel Computing through Clusters, Definition and Architecture of a Cluster,

Cluster Middleware: An Introduction Levels and Layers of Single System Image (SSI), Cluster Middleware Design Objectives, Resource Management and Scheduling, Cluster Programming Environment and Tools. Early Cluster Architectures and High Throughput Computing Clusters: Early Cluster Architectures, High Throughput Computing Clusters, Condor.

Textbooks:

1. C.S.R.Prabhu – ―Grid and Cluster Computing‖-PHI(2008) Chapters: 1 to 13, 16, 17.

Reference books:

1. Jankiram, "Grid Computing Models: A Research Monograph", TMH (2005)

SENSOR NETWORKS
PROFESSIONAL ELECTIVE
SYLLABUS

Course Objectives:

- To understand the concepts of sensor networks
- To understand the MAC and transport protocols for ad hoc networks
- To understand the applications and security concepts of sensor networks

Course Outcomes:

- Ability to understands concepts related to Wireless Sensor Networks and Single node architecture.
- Ability understands concepts related to MAC Protocol and Network architecture.
- Ability understands concepts related to Link layer protocol, naming and addressing.
- Understands the concepts of Data-centric, content-based networking, Transport layer and Quality of Service.

SYLLABUS:

Introduction: The vision of Ambient Intelligence, Application examples, Types of applications, Challenges for Wireless Sensor Networks (WSNs), Sensor networks vs Enabling Technologies for WSNs, **Single node architecture:** Hardware components, Energy consumption of sensor nodes, Some examples of sensor nodes, Operating systems and execution environments

Network Architecture: Sensor network scenarios, Optimization goals and figures of merit, Design principles for WSNs, Physical layer and transceiver design considerations in WSNs

MAC Protocols: Fundamentals of (wireless) MAC protocols, Low duty cycle protocols and wakeup concepts, Contention-based protocols, Schedule-based protocols.

Link layer protocols: Fundamentals: tasks and requirements, Error control, Framing, Link management

Naming and addressing: Fundamentals, Address and name management in wireless sensor networks, Assignment of MAC addresses

Data-centric and content-based networking: Introduction, Data-centric routing, Data aggregation, Data-centric storage

Transport layer and Quality of Service: The transport layer and QoS in wireless sensor networks, Coverage and deployment, Reliable data transport, Single packet delivery.

Text Books:

1. Protocols and Architectures for Wireless Sensor Networks, Holger Karl, Andreas Willig., John Wiley& Sons Ltd, 2005

2. Network Management Fundamentals, Alexander Clemm CISCO Press 2007

CLOUD COMPUTING
PROFESSIONAL ELECTIVE
SYLLABUS

Course Objectives:

- To define Cloud Computing and expose the students to the frontier areas of Cloud Computing.
- To provide an in-depth and comprehensive knowledge of the Cloud Computing fundamental issues, technologies, applications and implementations.
- To introduce various levels of services that can be achieved by cloud.
- To gain knowledge on virtualization techniques.
- To understand the working methodology of existing clouds, such as, Amazon, Google and Azure.

Course Outcomes:

- Articulate the main concepts, key technologies, strengths, and limitations of cloud computing and the possible applications for state-of-the-art cloud computing.
- Identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, laaS, public cloud, private cloud, hybrid cloud, etc.
- Classify the Levels of Virtualization and mechanism of tools and Analyze Cloud Architectures.
- Assess Control Storage Systems.
- Get an idea and set up Private Clouds.

SYLLABUS:

History of Computing Paradigms: Overview of Distributed Computing, Cluster Computing, Grid Computing, Ubiquitous Computing, Peer-to-Peer Computing. Distributed System Models and Enabling Technologies

Introduction to Cloud Computing: Cloud Computing and Service Models- Public, Private, and Hybrid Clouds, Cloud Ecosystem and Enabling Technologies, Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS) and Software-as-a-Service (SaaS)

Virtual Machines and Virtualization: Implementation Levels of Virtualization, VMM Design Requirements and Providers, Virtualization Support at the OS Level, Middleware Support for Virtualization, Virtualization Structures/Tools and Mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management

Public Cloud Platform-Architectures and Programming: Google App Engine (GAE). Amazon Web Services (AWS), Microsoft Windows Azure. Service Oriented Architecture: REST, Publish Subscribe Model

Storage Systems: Storage Models, File Systems, and Databases, Distributed File Systems, General Parallel File System, Google File Systems, Apache Hadoop, Locks and Chubby: A Locking Service, Transaction Processing and NoSQL Databases, Big Table, Mega Store

Case Studies: The Grep The Web Application, Aneka Application of Maya Rendering Case Study

Text Books:

1. Kai Hwang, Geoffrey C. Fox, Jack K. Dongarra, Distributed and Cloud Computing: From parallel processing to Internet of Things, Morgen Kauffmann 2013.
2. Cloud Computing Theory and Practice, Dan C. Marinescu.

References:

1. Cloud Computing: A Hands-On Approach, Arshdeep Bagha & Vijay Madisetti, University Press, 2022 Edition
2. Cloud Computing: A Practical Approach Anthony T. Velte Toby J.Velte, Ph.D. Robert Elsenpeter
3. Cloud Computing Bible, Barrie Sosinsk
4. Cloud Computing Course (nptel.ac.in)

DIGITAL IMAGE PROCESSING
PROFESSIONAL ELECTIVE
SYLLABUS

Course objectives:

To explain fundamentals of Image processing concepts.

- To provide mathematical foundation of image enhancement, image compression and image segmentation.
- To explain the students about Morphology and its applications in image processing.
- To explain various methods and techniques for image transformation.

Course outcomes:

By the end of the course, the student should be able to :

- Understand the concepts of digital images and operations on the images
- Develop algorithms for fundamental concepts in Image processing.
- Perform image enhancement, image compression and image segmentation using various methods.
- Ability to implement Image transformation techniques

SYLLABUS:

Fundamentals of Image Processing: Image Acquisition, Image Model, Sampling, Quantization, Relationship Between Pixels, Distance Measures, Connectivity, Image Geometry, Photographic Film. Histogram: Definition, Decision Of Contrast Basing On Histogram, Operations Basing on Histograms Like Image Stretching, Image Sliding, Image Classification. Definition and Algorithm of Histogram Equalization.

Image Enhancement in Spatial Domain: Arithmetic and Logical Operations, Pixel or Point Operations, Size Operations; Smoothing Filters-Mean, Median, Mode Filters – Comparative Study.

Edge enhancement in spatial domain: Edge enhancement filters, Directorial Filters, Sobel, Laplacian, Robert, KIRSCH Homogeneity & DIFF filters, PREWITT Filter, Contrast based edge enhancement techniques, Comparative study, Low pass filters, High pass filters, Sharpening filters, Comparative study, Color fundamentals and color model

Image Compression: Run Length Encoding, modified run length encoding, Contour Coding, Huffman Code, Compression Due to Change in Domain, Compression Due to Quantization Compression at the Time of Image Transmission. Brief Discussion on: - Image Compression Standards.

Image Segmentation: Definition of segmentation, Characteristics of Segmentation, Detection of Discontinuities, Thresholding. Pixel Based Segmentation Method. Region Based Segmentation Methods,

Segmentation by Pixel Aggregation, Segmentation by Sub Region Aggregation, Histogram Based Segmentation, Split and Merge Technique, Segmentation of moving objects.

Morphology: Dilation, Erosion, Opening, Closing, Hit-And-Miss Transform, Thinning, Thickening, Skeletons, Pruning Extensions to Gray – Scale Images Application of Morphology in I.P

Image Transforms: A Detail Discussion On Fourier Transform, DFT, FFT, Properties of Fourier transform, WALSH TransForm, WFT, HADAMARD Transform, DCT Image Enhancement in Frequency Domain: Design of Low Pass, High Pass, EDGE Enhancement, Smoothening Filters in Frequency Domain. ButterWorth Filter, Homomorphic Filters in Frequency Domain Advantages of Filters in Frequency Domain, Comparative Study of Filters in Frequency, Domain and Spatial Domain.

Text Book:

1. Digital Image Processing, Rafael C. Gonzalez and Richard E. Woods, Addision Wesley

Reference Books:

1. Fundamentals Of Electronic Image Processing By Arthyr – R – Weeks, Jr.(PHI)
2. Image Processing, Analysis, And Machine Vision By Milan SonkaVaclanHalavac Roger Boyle, Vikas Publishing House.
3. Digital Image Processing, S. Jayaraman, S. Esakkirajan& T. Veera Kumar, TMH
4. Fundamentals of Digital Image Processing, Chris Solomon, Tobi Breckon, WileyBlackwell

BIG DATA ANALYTICS
PROFESSIONAL ELECTIVE
SYLLABUS

Course Objectives:

This course is aimed at enabling the students to

- Provide an overview of an exciting growing field of big data analytics.
- Introduce the tools required to manage and analyse big data like Hadoop, NoSQL,
- Map Reduce, HIVE, Cassandra, Spark.
- Teach the fundamental techniques and principles in achieving big data analytics with scalability and streaming capability.
- Optimize business decisions and create competitive advantage with Big Data analytics.

Course Outcomes:

After the completion of the course, student will be able to

- Illustrate on big data and its use cases from selected business domains.
- Interpret and summarize on NoSQL, Cassandra
- Analyze the HADOOP and Map Reduce technologies associated with big data analytics and explore Big Data Applications Using Hive.
- Make use of Apache Spark, RDDs etc. to work with datasets and real time processing with Spark streaming.

SYLLABUS:

Introduction big data, why big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data, big data technologies, introduction to Hadoop, open source technologies, cloud and big data, mobile business intelligence, Crowd sourcing analytics, inter and trans firewall analytics.

Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schema less databases, materialized views, distribution models, sharding, master-slave replication, peer- peer replication, sharding and replication, consistency, relaxing consistency, version stamps, Working with Cassandra, Table creation, loading and reading data.

Data formats, analyzing data with Hadoop, scaling out, Architecture of Hadoop distributed file system (HDFS), fault tolerance with data replication, High availability, Data locality , Map Reduce Architecture, Process flow, Java interface, data flow, Hadoop I/O, data integrity, compression, serialization.

Introduction to Hive, data types and file formats, HiveQL data definition, HiveQL data manipulation, Logical joins, Window functions, Optimization, Table partitioning, Bucketing, Indexing, Join strategies.

Apache spark- Advantages over Hadoop, lazy evaluation, In memory processing, DAG, Spark context, Spark Session, RDD, Transformations- Narrow and Wide, Actions, Data frames, RDD to Data frames, Catalyst optimizer, Data Frame Transformations, Working with Dates and Timestamps, Working with Nulls in Data,

Working with Complex Types, Working with JSON, Grouping, Window Functions, Joins, Data Sources, Broadcast Variables, Accumulators, Deploying Spark- On-Premises Cluster Deployments, Cluster Managers- Standalone Mode, Spark on YARN, Spark Logs, The Spark UI- Spark UI History Server, Debugging and Spark First Aid

Spark-Performance Tuning, Stream Processing Fundamentals, Event-Time and State full Processing - Event Time, State full Processing, Windows on Event Time- Tumbling Windows, Handling Late Data with Watermarks, Dropping Duplicates in a Stream, Structured Streaming Basics - Core Concepts, Structured Streaming in Action, Transformations on Streams, Input and Output.

Text Books:

1. Big Data, Big Analytics: Emerging, Michael Minnelli, Michelle Chambers, and AmbigaDhiraj
2. SPARK: The Definitive Guide, Bill Chambers &MateiZaharia, O'Reilley, 2018Edition
3. Business Intelligence and Analytic Trends for Today's Businesses", Wiley,2013
4. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World Polyglot Persistence", Addison-Wesley Professional,2012
5. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley,2012
6. Big Data Analytics - Chandramouli Subramanian, Asha A George, C R Rene Robin D Doreen Hephzibah Miriam, J Jasmine Christina Magdalene

Reference Books:

1. "Hadoop Operations", O'Reilley, Eric Sammer,2012
2. "Programming Hive", O'Reilley, E. Capriolo, D. Wampler, and J. Rutherglen,2012
3. "HBase: The Definitive Guide", O'Reilley, Lars George,2011
4. "Cassandra: The Definitive Guide", O'Reilley, Eben Hewitt,2010
5. "Programming Pig", O'Reilley, Alan Gates,2011

NATURAL LANGUAGE PROCESSING
PROFESSIONAL ELECTIVE
SYLLABUS

Course Objectives:

This course introduces the fundamental concepts and techniques of Natural Language Processing (NLP).

- Students will gain an in-depth understanding of the computational properties of natural languages and the commonly used algorithms for processing linguistic information.
- The course examines text representations and NLP algorithms using both the traditional symbolic and the more recent statistical and distributional approaches.
- Enable students to develop NLP models for text classification, information extraction, and dialog systems
- Provides a comprehensive study on NLP applications in a wide variety of domains

Course Outcomes:

After completion of this course the student will be able to:

- Understand the basic concepts and challenges of NLP and different stages of NLP Pipeline
- Understand and analyze various representational approaches starting from vectorization-based to distribution-based embeddings for processing natural language text
- Build and interpret machine learning and deep learning models for Text Classification
- Understand basic concepts of information extraction for building different variants of NER systems and the concepts and challenges underlying the development of dialog systems / chatbots
- Understand the approach and analyze the effectiveness of NLP applications in different domains.

SYLLABUS:

INTRODUCTION TO NLP and NLP Pipeline:
NLP tasks and applications, building blocks of language, NLP challenges, Basic approaches to NLP -Heuristics based NLP, Machine Learning for NLP, Deep Learning for NLP. NLP Pipeline- Data Acquisition, Text Extraction and Cleanup, Pre-processing, Feature Engineering, Building the model, Evaluation.

TEXT REPRESENTATION:
Vector space models, Basic Vectorization approaches, Distributed representations, Distributed representations beyond words and characters, Universal Text Representations, visualizing embeddings.

TEXT CLASSIFICATION:
Applications of text classification, Pipeline for building Text classification systems, One pipeline-many classifiers- Naïve Bayes, Logistic regression, SVM, Using Neural Embeddings in Text Classification, Deep Learning for Text Classification, Interpreting text classification models, Learning with no or less data and adapting to new domains, case study on corporate ticketing.

INFORMATION EXTRACTION:

Information Extraction-IE Applications, IE Tasks, General IE Pipeline, Keyphrase Extraction, Named Entity Recognition, Building an NER System, Building an NER System using existing library, using active learning, Named Entity Disambiguation and Linking, Relationship Extraction and other IE tasks

CHATBOTS:

Chatbots- Applications, Taxonomy of Chatbots, Pipeline for building Dialog Systems, Components of a Dialog system, other dialog pipelines with end-to-end approach, Deep Reinforcement learning for dialog generation, human-in-the-loop, case study on recipe recommender, open-ended generative chatbots

BRIEF OVERVIEW ON NLP APPLICATIONS:

Search and Information Retrieval- Components of Search Engine, Topic Modeling, Text Summarization, Recommender Systems for textual data, Machine Translation, Question- Answering Systems.

NLP APPLIED TO SOCIAL MEDIA AND E-COMMERCE:

Applications and challenges of NLP for Social Media, Issues related to NLP for social media data, NLP for supporting e-commerce activities, Search in E-commerce, Building E-commerce catalog, Review analysis, recommendations for e-commerce

Text Books:

1. Sowmya Vajjala, Bodhisattwa Majumder, Anuj Gupta and Harshit Surana, "*Practical Natural Language Processing*", O'Reilly Media Inc., 2021, ISBN: 978-93- 8588-918-9.

Reference Books:

1. Lewis Tunstall, Leandro von Werra, Thomas Wolf, "*Natural Language Processing with Transformers: Building Language Applications with Hugging Face*", O'Reilly Media Inc., 2022

2. Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, 2ndEdition, Daniel Jurafsky, James H. Martin - Pearson Publication,2014.

SOFT COMPUTING
PROFESSIONAL ELECTIVE
SYLLABUS

Course Objectives:

- To explain the role of Soft Computing in addressing the imprecision and uncertainty in real world scenarios.
- To explain fuzzy systems, fuzzy logic and its applications.
- To explain Artificial Neural Networks and various categories of ANN.
- Design hybrid system to revise the principles of soft computing in various applications.
- To explain Genetic algorithms and rough set.

Course Outcomes:

By the end of the course, the student should be able to obtain:

- Ability to represent Uncertainty / imprecision data.
- Understand perceptrons and counter propagation networks.
- Ability to select a suitable method of Soft Computing to solve a particular problem.
- Ability to build hybrid systems using Soft Computing techniques.
- Analyze the genetic algorithms and their applications.

SYLLABUS:

Soft Computing: Introduction to Fuzzy Computing, Neural Computing, Genetic Algorithms, Associative Memory, Adaptive Resonance Theory, Different Tools and Techniques, Usefulness and Applications.

Fuzzy Sets and Fuzzy Logic: Introduction, Fuzzy Sets Versus Crisp Sets, Operations on Fuzzy Sets, Extension Principle, Fuzzy Relations and Relation Equations, Fuzzy Numbers, Linguistic Variables, Fuzzy Logic, Linguistic Hedges, Applications,

Interference in fuzzy logic: fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzifications and Defuzzifications, Fuzzy Controller, Fuzzy Controllers, Fuzzy Pattern Recognition, Fuzzy Image Processing, Fuzzy Database.

Artificial Neural Network: Introduction, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, re-current networks. Various learning techniques, perception and convergence rule, Auto-associative and hetro-associative memory, Hebb's Learning, Adaline, Perceptron.

Multilayer Feed Forward Network: Back Propagation Algorithms, Different Issues Regarding Convergence of Multilayer Perceptron, Competitive Learning, Self-Organizing, Feature Maps, Adaptive Resonance Theory, Associative Memories, Applications.

Evolutionary and Stochastic Techniques: Genetic Algorithm (GA), Genetic Representations, (Encoding) Initialization and Selection, Different Operators of GA, Analysis of Selection Operations, Hypothesis of Building Blocks, Schema Theorem and Convergence of Genetic Algorithm, Simulated Annealing and Stochastic Models, Boltzmann Machine, Applications.

Rough Set: Introduction, Imprecise Categories Approximations and Rough Sets, Reduction of Knowledge, Decision Tables and Applications. Hybrid Systems: Neural Network-Based Fuzzy Systems, Fuzzy Logic-Based Neural Networks, Genetic Algorithm for Neural Network Design and Learning, Fuzzy Logic and Genetic Algorithm for Optimization, Applications

Text Books:

1. Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications, S.Rajsekaran and G.A. VijayalakshmiPai, Prentice Hall of India.
2. Rough Sets, Z.Pawlak, Kluwer Academic Publisher, 1991.
3. Intelligent Hybrid Systems, D. Ruan, Kluwer Academic Publisher, 1997

References:

1. Artificial Intelligence and Intelligent Systems, N.P.Padhy, Oxford University Press.
2. Neural Fuzzy Systems, Chin-Teng Lin & C. S. George Lee, Prentice Hall PTR. Addison-Wesley
3. Learning and Soft Computing, V. Kecman, MIT Press, 2001
4. Fuzzy Sets and Fuzzy Logic, Klir& Yuan, PHI, 1997

HUMAN COMPUTER INTERACTION
PROFESSIONAL ELECTIVE
SYLLABUS

Course Objectives:

- To gain an overview of Human-Computer Interaction, with an understanding of user interface design in general, and alternatives to traditional "keyboard and mouse" computing
- Be able to predict user performance in various human-computer interaction tasks
- Appreciate the importance of a design that maintains a focus on the user; be familiar with a variety of both conventional and non-traditional user interface paradigms

Course Outcomes:

By the end of the course, the student should be able to:

- Apply HCI and principles for interaction and design.
- Appreciate importance of user documentation and information search

SYLLABUS:

Introduction: Usability of Interactive Systems- introduction, usability goals and measures, usability motivations, universal usability, goals for our profession Managing Design Processes: Introduction, Organizational design to support usability, Four pillars of design, development methodologies, Ethnographic observation, Participatory design, Scenario Development, Social impact statement for early design review, legal issues, Usability Testing and Laboratories

Menu Selection, Form Fill-In and Dialog Boxes: Introduction, Task- Related Menu Organization, Single menus, Combinations of Multiple Menus, Content Organization, Fast Movement Through Menus, Data entry with Menus: Form Fill-in, dialog Boxes, and alternatives, Audio Menus and menus for Small Displays

Command and Natural Languages: Introduction, Command organization Functionality, Strategies and Structure, Naming and Abbreviations, Natural Language in Computing Interaction Devices: Introduction, Keyboards and Keypads, Pointing Devices, Speech and Auditory Interfaces, Displays- Small and large

Quality of Service: Introduction, Models of Response-Time impacts, Expectations and attitudes, User Productivity, Variability in Response Time, Frustrating Experiences Balancing Function and Fashion: Introduction, Error Messages, Nonanthropomorphic Design, Display Design, Web Page Design, Window Design, Color

User Documentation and Online Help: Introduction, Online Vs Paper Documentation, reading from paper Vs from Displays, Shaping the content of the Documentation, Accessing the Documentation, Online tutorials and animated documentation, Online communities for User Assistance, The Development Process

Information Search: Introduction, searching in Textual Documents and Database Querying, Multimedia Document Searches, Advanced Filtering and Searching Interfaces

Information Visualization: Introduction, Data Type by Task Taxonomy, Challenges for Information Visualization

Text Books:

1. Designing the User Interface, Strategies for Effective Human Computer Interaction, 5ed, Ben Shneiderman, Catherine Plaisant, Maxine Cohen, Steven M Jacobs, Pearson
2. The Essential guide to user interface design,2/e, Wilbert O Galitz, Wiley DreamaTech.

Reference Books:

1. Human Computer, Interaction Dan R.Olsan, Cengage ,2010.
2. Designing the user interface. 4/e, Ben Shneidermann , PEA.

BIO-INFORMATICS
PROFESSIONAL ELECTIVE
SYLLABUS

Course Objectives:

- To import fundamental concepts in the area of Bioinformatics.
- To understand the concept of DNA Sequence analysis and Protein Information Resources.
- To learn Pairwise alignment techniques and Secondary database searching.
- To gain competence in Analysis packages.

Course Outcomes:

At the end of the course, students will be able to

- Get introduced to the basic concepts of Bioinformatics and its significance in biological data analysis
- Overview about types and biological data and database search tools
- Explain about the methods to characterize and manage the different types of biological data.
- Classify different types of Biological Databases
- Implement the algorithms for single and multiple sequence alignments

SYLLABUS:

Introduction: Definition, History and Application areas of Bioinformatics. Major Information Resources: NCBI, EBI, ExPasy, TIGR, JGI, DDBJ Biological Databases: Primary & Secondary; Structure Databases, Specialized Databases, Chemical Databases.File Formats in Bioinformatics-Genbank, EMBL, Swissprot/Uniprot, PDB, Clustal, FASTA etc.

Sequence Similarity Searching: Basics of sequence alignment, Local and Global Sequence Alignment, similarity, Identity, homology, Sensitivity/Selectivity, Scoring System & Substitution Matrices: Distance and Similarity matrices, Identity Matrices, PAM & BLOSUM matrices & their Derivation DNA sequence databases, specialized genomic resources

Similarity Searching Tools: BLAST and FASTA, Theory and Algorithms, variants of BLAST and FASTA, PSI & PHI Blast, Statistical Significance. Sequence Pattern and Profiles: Concepts of motif, pattern and profile. Profile construction and its application in Bioinformatics. Gene Identity and identification tools

Tools for DNA & Protein Sequence Analysis: EMBOSS, PHYLIP, Mega2 Tools at NCBI, EBI, DDBJ, Microarray data analysis tools

Markov models: Hidden Markov models – The evaluation, decoding and estimation problem and the algorithms. Application in sequence analysis.

Molecular phylogeny: maximum Parsimony, distance Matrix and maximum likelihood methods. Concepts of adaptive evolution.

Application of graph theory in Biology: Biochemical Pathway, Protein-protein interaction network, Regulatory network and their analysis.

Text Books:

1. T.K Attwood & D.J Parry-Smith. Delhi. "Introduction to Bioinformatics". Pearson Education (Singapore) Pte.Ltd., 2001.
2. Bioinformatics: David Mount
3. Biological Sequence Analysis: Probabilistic Models of Proteins and Nucleic acids, R.
4. Durbin, S.R. Eddy, A. Krogh and G. Mitchison**.**

DATA WAREHOUSING AND DATA MINING
PROFESSIONAL ELECTIVE
SYLLABUS

Course Objectives:

- To understand the evolution of data warehousing and data mining systems
- To provide an understanding of data objects, similarity and dissimilarity metrics and
- preprocessing techniques.
- To impart knowledge about the basics of data warehousing and modelling using data
- cubes, OLAPs, AOI.
- To familiarize the concepts of mining frequent patterns based on Associations.
- To discuss about pattern mining using classification and clustering methods.

Course Outcomes:

- Understands data objects, attribute types, metrics, cleaning and transformation of data.
- Ability to represent and comprehend information with data warehousing technologies for multidimentional modelling and generalisation using Cubes, OLAPS and AOI.
- Grasp the concepts of Association mining using Apriori and FP- Growth.
- Learn about various approaches to supervised learning like classification approach.
- Learn about various approaches to unsupervised learning like clustering approach.

SYLLABUS:

Introduction to Data Mining: Importance of Data Warehousing and Data Mining, Kinds of data, Kinds of patterns, Technologies, Applications, Major Issues in Data Mining

Getting to know your data: Data Objects and Attributes Types, Statistical Descriptions of Data, Estimating Data Similarity and Dissimilarity, Data Visualization.

Data Preprocessing: Quality data, Data Cleaning, Data Integration, Data Reduction, Data Transformation, Discretization and Concept Hierarchy Generation.

Data Warehouse and OLAP Technology: Basic Concepts of Data warehouse, Data Modelling using Cubes and OLAP, DWH Design and usage, Implementation using Data Cubes and OLAPs,Data Generalization with AOI.

Mining Frequent Patterns Based on Associations and Correlations: Basic Concepts, Frequent Item set Mining Methods: Apriori Algorithm, Association Rule Generation, Improvements to A Priori, FP-Growth Approach, Pattern Evaluation Methods.

Classification and Prediction: Basic Concepts, Decision Tree Induction, Bayes Classification,Rule-Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy, Classification by Back Propagation, K-nearest neighbour classifier.

Cluster Analysis: Basic Concepts and issues in clustering, Requirments for Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density Based Methods, Grid Based Methods, Evaluation of Clustering Solutions.

Text Books:

1. Data Mining- Concepts and Techniques by Jiawei Han, Micheline Kamber and Jian Pei–Morgan Kaufmann publishers –--3rd edition

2. Data Mining Techniques, A.K.Pujari, University Press.

References Books:

1. Data mining concepts by Tan, Steinbech, and Vipin Kumar - Pearson Edu

DEEP LEARNING
PROFESSIONAL ELECTIVE
SYLLABUS

Course Objectives:

From the course the student will learn

- Knowledge and expertise for building deep learning models.
- Various architectures for deep learning and their suitability to specific problems
- Program development and evaluation support from Tensorflow
- Q-learning and the other methods for deep reinforcement learning
- Different types of auto-encoders for unsupervised feature extraction

Course Outcomes:

At the end of the course, student will be able to

- Build feed forward neural networks with appropriate options using Tensorflow
- Write Tensorflow programs for learning using convolution neural networks.
- Apply the concepts of recurrent NNs with LSTM and attention for learning word embeddings and NLP tasks
- Apply various methods for deep reinforcement learning
- Use the appropriate type of auto-encoders for problem solving.

SYLLABUS:

Feed forward neural networks:perceptrons, cross-entropy loss estimation, derivatives and Stochastic Gradient descent, NN implementation issues, matrix representation of NNs, Data independence,

Tensorflow: preliminaries, simple TF program, Multi-layered NNs, setting checkpoints, tensordot, initialization of TF variables, simplifying TF graph creation. PyTorch basics and uses

Convolutional Neural Networks: Filters, strides and padding, simple TF Convolution program, Multilevel Convolution, convolution details, biases, layers with convolution, pooling

Recurrent NNs and Word Embeddings: Word Embeddings for Language Models,Building feed forward LMs, Improving Feed forward models, Overfitting, Recurrent Neural networks, Long-Short term Memory cells, TF implementation

Sequence to sequence Learning: Seq2Seq paradigm, writing a Seq2Seq Machine Translation program, Attention in Seq2Seq,Multilength Seq2Seq, Implementation in TF

Deep Reinforcement Learning: Value Iteration, Q-learning,Basic deep Q-learning,Policy gradient methods,Actor-critic methods, Experience replay

Unsupervised NN Models: Basic autoencoding, Convolutional autoencoding, variational autoencoding, Generative adversarial networks

Textbook:

1. Eugene Charniak, “Introducing to Deep Learning”, MIT press, 2018

2. Sherin Thomas,Sudhanshu Passi, “PyTorch Deep Learning hands-On”, Packt publishers

3. Ian Goodfellow, YoshuaBengio and Aaron Courville, “Deep Learning”, MIT press, 2016

Reference Books:

1. Jeremy Howard and Sylvain Gugger, “Deep Learning for coders with Fastai and Pytorch”, OReilly, 2020
2. John Krohn, etal, “Deep Learning Illustrated”, Pearson edu. India, 2020

OPEN ELECTIVES

1. CYBER SECURITY & DIGITAL FORENSICS
2. BLOCKCHAIN TECHNOLOGY
3. MOBILE COMPUTING
4. MOBILE ADHOC NETWORKS
5. RECOMMENDER SYSTEMS
6. NOSQL DATABASES
7. DATA SCIENCE
8. BUSINESS ANALYTICS
9. PYTHON PROGRAMMING
10. INTERNET OF THINGS
11. EMBEDDED SYSTEMS
12. ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
13. INDUSTRY 4.0

OPEN ELECTIVES for other departments - (MINOR)

1. ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
2. DATA SCIENCE
3. CYBER SECURITY & DIGITAL FORENSICS
4. DATABASE MANAGEMENT SYSTEMS

CYBER SECURITY & DIGITAL FORENSICS
OPEN ELECTIVE
SYLLABUS

Course Objectives:

- Understand the threats in networks and security concepts.
- Apply authentication applications in different networks.
- Understand security services for email.
- Awareness of firewall and it applications.

Course Outcomes:

By the end of the course, the student should be able to:

- Differentiate among different types of security attacks.
- Define computer forensics.
- Identify the process in taking digital evidence.
- Describe how to conduct an investigation using methods of memory, operating system, network and email forensics with different forensic tools.

SYLLABUS:

Introduction to Information Security Fundamentals and Best Practices: Protecting Your Computer and its Contents, Securing Computer Networks--Basics of Networking, Compromised Computers, Secure Communications and Information Security Best Practices, Privacy Guidelines, Safe Internet Usage.

Ethics in Cyber Security & Cyber Law: Privacy, Intellectual Property, Professional Ethics, Freedom of Speech, Fair User and Ethical Hacking, Trademarks, Internet Fraud, Electronic Evidence, Cybercrimes.

Penetration Testing: Overview of the web from a penetration testers perspective, Exploring the various servers and clients, Discussion of the various web architectures, Discussion of the different types of vulnerabilities, defining a web application test scope and process, Defining types of penetration testing.

Web Application Security: Common Issues in Web Apps, what is XSS, SQL injection, CSRF, Password Vulnerabilities, SSL, CAPTCHA, Session Hijacking, Local and Remote File Inclusion, Audit Trails, Web Server Issues.

Forensics & Network Assurance: Forensic Technologies, Digital Evidence Collection, Evidentiary Reporting, Layered Defense, Surveillance and Reconnaissance, Outsider Thread Protection

Information Risk Management: Asset Evaluation and Business Impact Analysis, Risk Identification, Risk Quantification, Risk Response Development and Control, Security Policy, Compliance, and Business Continuity. Forensic investigation using Access Data FTK, En-Case

Cyber Incident Analysis and Response: Incident Preparation, Incident Detection and Analysis. Containment, Eradication, and Recovery. Proactive and Post-Incident Cyber Services, CIA triangle

Text Books:

1. Cyber Security & Digital Forensics by Anas Zakir, Clever Fox Publishing, Publication Date-2022
2. "Beginners Guide To Ethical Hacking and Cyber Security ", by Abhinav Ojha, Khanna Publishers, First Edition, Publication Date-2023

Reference Books:

1. The Official CHFI Study Guide for Computer Hacking Forensic Investigator by Dave Kleiman
2. CISSP Study Guide, 6th Edition by James M. Stewart

BLOCKCHAIN TECHNOLOGY
OPEN ELECTIVE
SYLLABUS

Course Objectives:

- To understand the basic concepts block chain technology and to explore the driving force behind the crypto currency Bitcoin.
- To understand about the different methods of Decentralization using Block Chain and different Bitcoins and Alternative Coins.
- To understand about Ethereum and applications using Smart contracts and Block Chain Applications.
- To get familiarity with future currencies and to create own crypto token.

Course Outcomes:

At the end of the course the student will be able to:

- Explore the primitives of the distributed computing and cryptography related to blockchain
- Understand the types, benefits and limitation of block chain.
- Enumerate the Bitcoin features and its alternative options.
- Understand the modern currencies and its market usage.
- Implement and deploy the smart contracts in different environments like Ethereum.
- Usage of smart contracts in various real world application domains.

SYLLABUS:

Block Chain and its History: History of blockchain, Types of blockchain, Blockchain Components – Permissioned Blockchain Permission less Blockchain – Consortium Blockchain – basics of Consensus Algorithms, Architecture & Properties of Blockchain.

Decentralization and Consensus Algorithms: Decentralization using blockchain, Methods of decentralization, Routes to decentralization, Decentralized organizations, Distributed systems, Distributed ledger, Merkle tree, structure of a block, Consensus

Algorithms: Proof of Work, Proof of Stack, Proof of Burn, Proof of Elapsed Time, Proof of Activity, Proof of Concept.

Bitcoin and Alternative Coins: Bitcoin, Transactions, Bitcoin payments , Bitcoin properties – Transaction life cycle – creation of coin –sending payments – double spending using blockchain – bitcoin anonymity – Ether: Ethercoin properties, Alternative Coins, Bitcoin limitations, Namecoin, Litecoin, Primecoin, Zcash

Ethereum and smart contracts: Ethereum Architecture, solidity programming basics, Smart Contract, Deploying Smart Contracts, Integration with UI.

Blockchain Applications: Blockchain-Outside of Currencies: Internet of Things, Government, Health, Finance, Media, Secure Voting and Digital Identity, Real Estate, Education

Textbooks:

1. Mastering Blockchain - Distributed ledgers, decentralization and smart contracts explained, Author- Imran Bashir, Packt Publishing Ltd, Second Edition, ISBN 978-1- 78712-544-5, 2017
2. Bitcoin and Cryptocurrency Technologies, Author- Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder, Princeton University, 2016
3. Blockchain Technology, Author- Chandramouli Subramanian, Asha A George, Abhilash K A, Meena Karthikeyan, University Press (India) Private Limited, 2021

References Books:

1. Blockchain Basics: A Non-Technical Introduction in 25 Steps, Author- Daniel Drescher, Apress, First Edition, 2017

MOBILE COMPUTING
OPEN ELECTIVE
SYLLABUS

Course Objectives:

- To introduce the basic concepts and principles in mobile computing. This includes major techniques involved, and networks & systems issues for the design and implementation of mobile computing systems and applications.
- To explore both theoretical and practical issues of mobile computing.
- To provide an opportunity for students to understand the key components and technologies involved and to gain hands-on experiences in building mobile applications.

Course Outcomes:

On successful completion of course learner will be able:

- To identify basic concepts and principles in mobile communication & computing, cellular architecture.
- To describe the components and functioning of mobile networking.
- To classify variety of security techniques in mobile network.
- To describe and apply the concepts of mobility management

SYLLABUS:

Introduction: Mobile Communications, Mobile Computing – Paradigm, Promises/Novel Applications and Impediments and Architecture, Mobile and Handheld Devices, Limitations of Mobile and Handheld Devices, GSM - Services, System Architecture, Protocols, Localization, Calling, Handover, Security, New Data Services, GPRS-network operation, data services and applications

(Wireless) Medium Access Control (MAC): Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA, Wireless LAN/(IEEE 802.11)

Mobile Network & Transport Layers: IP and Mobile IP Network Layers, Packet Delivery and Handover, Management, Location Management, Registration, Tunnelling and Encapsulation, Route Optimization, DHCP, Indirect TCP, Snooping TCP, Mobile TCP, Other Transport Layer Protocols for Mobile Networks

Database Issues: Database Hoarding & Caching Techniques, Client-Server Computing & Adaptation Transactional Models, Query processing, Data Recovery Process & QoS Issues

Data Dissemination and Synchronization: Communications Asymmetry, Classification of Data Delivery Mechanisms, Data Dissemination, Broadcast Models, Selective Tuning and Indexing Methods, Data Synchronization – Introduction, Software and Protocols.

Mobile Ad hoc Networks (MANETs): Introduction, Applications & Challenges of a MANET, Routing, Classification of Routing Algorithms, Algorithms such as DSR,AODV,DSDV, etc., Mobile Agents, Service Discovery

Protocols and Platforms for Mobile Computing:
Basic of WAP, Bluetooth, XML, J2ME, JavaCard, PalmOS, Windows CE, SymbianOS, Linux for Mobile Devices, Android.

Text Books:

1. Jochen Schiller, "Mobile Communications", Addison-Wesley, Second Edition, 2009
2. Raj Kamal, "Mobile Computing", Oxford University Press, 2007, ISBN: 0195686772

Reference Books:

1. ASOKE K TALUKDER, HASAN AHMED, ROOPA R YAVAGAL, "Mobile Computing, Technology Applications and Service Creation" Second Edition, Mc Graw Hill.
2. UWE Hansmann, Lother Merk, Martin S. Nocklous, Thomas Stober, "Principles of Mobile Computing," Second Edition, Springer.

MOBILE ADHOC NETWORKS
OPEN ELECTIVE
SYLLABUS

Course Objectives:

- To understand the concepts of mobile adhoc networks
- To understand the concepts of wireless LANs, wireless adhoc networks, types and their routing protocols.
- To introduce students to mobile communications and mobile computing.
- To understand basics of HIPERLAN, Wireless ATM technologies.

Course Outcomes:

By the end of the course, the student should be able to obtain:

- Ability to understand the state-of-the-art research in the emerging subject of Mobile Adhoc Networks
- Understand GSM, TDMA, CDMA, IS-95 technology
- Understand wireless LANs, IEEE 802.11 WLANs.
- Understand Wireless ATM and HIPERLAN, Adhoc networking and WPAN.

SYLLABUS:

GSM and TDMA Technology: Introduction, What is GSM, Mechanisms to support a Mobile Environment, Communications in the Infrastructure.

CDMA Technology,IS-95, and IMT-2000: Introduction, Reference Architecture for North American Systems, What is CDMA, IMT-2000.

Mobile Data Networks: Introduction, The Data-Oriented CDPD Network, GPRS and Higher Data Rates, Short Messaging Service in GSM, Mobile Application Protocols.

Introduction to Wireless LANs: Introduction, Historical Overview of the LAN Industry, Evolution of the WLAN Industry, New Interest from Military and Service Providers, A New Explosion of Market and Technology, Wireless Home Networking.

IEEE 802.11 WLANs: Introduction, What is IEEE 802.11, The PHY Layer, MAC sub layer, MAC Management sub layer.

Wireless ATM and HIPERLAN: Introduction, What is Wireless ATM, What is HIPERLAN, HIPERLAN-2.

Ad Hoc Networking and WPAN: Introduction, What is IEEE 802.15 WPAN, What is HomeRF, What is Bluetooth, Interference between Bluetooth and 802.11

Wireless Geolocation Systems: Introduction, What is Wireless Geolocation, Wireless Geolocation System Architecture, Technologies for Wireless Geolocation, Geolocation Standards for E-911 Services, Performance measures for Geolocation Systems.

Text Books:

1. Principles of Wireless networks KavethPahlavan, K.Prasanth Krishnamurthy, Pearson Publications, Asia,2002

RECOMMENDER SYSTEMS
OPEN ELECTIVE
SYLLABUS

Course Objectives:

To understand the

- Basic concepts of recommender systems
- Various approaches for building Recommender systems
- Personalization algorithms, evaluation tools, and user experiences
- Various attacks and privacy aspects on collaborative recommender systems
- Several applications of Recommender systems

Course Outcomes:

By the end of the course, the student should be able to:

- Describe basic concepts behind Recommender Systems
- Explain a variety of approaches for building recommender systems
- Describe system evaluation methods from both algorithmic and users' perspectives
- Describe various attacks and privacy aspects on collaborative recommender systems.
- Describe applications of recommender systems in various domains

SYLLABUS:

Collaborative recommendations: User-based nearest neighbor recommendation, Item -based nearest neighbor recommendation, About ratings, Model-based and Preprocessing-based approaches, Recent practical approaches and Systems.

Content- based recommendation: Content representation and content similarity, Similarity-based retrieval, other text classification methods.

Knowledge-based recommendation: Introduction, Knowledge representation and reasoning, Interacting with constraint—based recommenders, Interacting with case-based recommenders, Example applications.

Hybrid recommendation approaches: Opportunities for hybridization, Monolithic hybridization design, Parallelized hybridization design, Pipelined hybridization design.

Evaluating recommender systems: Introduction, General properties of evaluation research, Popular evaluation designs, Evaluation on historical datasets, Alternate evaluation designs.

Attacks on collaborative recommender systems: A first example, Attack dimensions, Attack types, Evaluation of effectiveness and countermeasures, Countermeasures, Privacy aspects - distributed collaborative filtering.

Online consumer decision making: Introduction, Context effects, Primacy/recency effects, Further effects, Personality and social psychology. Recommender systems and the next-generation web: Trust aware recommender systems, Folksonomies and more, Ontological filtering, Extracting semantics from the web.

Text Book:

1. Recommender Systems: An Introduction by Dietmar Jannach, Markus Zanker, Alexander Felfernig, Gerhard Friedrich, Cambridge University Press.

Reference Book:

1. Recommender Systems: The Textbook by Charu C. Aggarwal, Springer Publications.

NoSQL DATABASES
OPEN ELECTIVE
SYLLABUS

Course Objectives:

Upon successful completion of this course, a student will be able to:

- Define NoSQL, its characteristics and history, and the primary benefits for using NoSQL data
- Define the major types of NoSQL databases including a primary use case and advantages/disadvantages of each type
- Create wide-column, document, key-value, graph and object-oriented databases, add content, and run queries.
- Describe the NoSQL data architecture patterns
- Perform basic database administration tasks.
- Develop NoSQL desktop and cloud database solutions.

Course Outcomes:

On completion of this course, the student will be able to:

- Enumerate different features of NOSQL Databases
- Compare different data models
- Design a Key-Value Database for a real world problem
- Design a Document Database for a real world problem
- Design a Graph Database for a real world problem

SYLLABUS:

Introduction to NoSQL. The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Standard Model, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters,The Emergence of NoSQL.

Aggregate Data Models, Aggregates, Consequences of Aggregate Orientation, Key-Value and Document Data Models, Column-Family Stores, Summarizing Aggregate-Oriented Databases.

More Details on Data Models, Relationships, Graph Databases, Schemaless Databases, Materialized Views, Modeling for Data Access, Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication, Consistency, Update Consistency, Read Consistency, Relaxing Consistency, The CAP Theorem, Relaxing Durability, Quorums

Key-Value Databases, Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preferences, Shopping Cart Data, When Not to Use, Relationships among Data, Multi operation Transactions, Query by Data, Operations by Sets

Document Databases, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, E-Commerce Applications, When Not to Use, Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure

Column-Family Stores, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Counters.

Graph Databases, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Connected Data, Routing, Dispatch, and Location-Based Services Recommendation Engines

Text Books:

1. Sadalage, P. & Fowler, M., NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence. (1st Ed.). Upper Saddle River, NJ: Pearson Education, In, 2012.

Reference Books:

1. Gauravvaish, Getting started with NoSQL , PACKT publishing, ISBN: 978184969488
2. Redmond, E. & Wilson, J., Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQL Movement (1st Ed.), 2012
3. Raleigh, NC: The Pragmatic Programmers, LLC. ISBN-13: 978- 1934356920 ISBN-10: 1934356921

DATA SCIENCE
OPEN ELECTIVE
SYLLABUS

Course Objectives:

From the course the student will learn

- Knowhow and expertise to become a data scientist.
- Essential concepts of statistics and machine learning that are vital for data science;
- Significance of exploratory data analysis (EDA) in data science.
- Critically explore and analyze data visualizations presented on the dashboards
- Suitability and limitations of tools and techniques related to data science process

Course Outcomes:

At the end of the course, student will be able to

- Describe the steps involved in Data Science process and the technologies needed for a data scientist.
- Identify suitable ML techniques for data modelling and apply them for decision support.
- handle large datasets with distributed storage and processing system
- use appropriate tools for data collection, EDA and model building for specific types of data 5. build a prototype application of Data Science as a case study.

SYLLABUS:

Introduction to Data science, benefits and uses, facets of data, data science process in brief, big data ecosystem and data science

Data Science process: Overview, defining goals and creating project charter, retrieving data, cleansing, integrating and transforming data, exploratory analysis, model building, presenting findings and building applications on top of them

Applications of machine learning in Data science, role of ML in DS, Python tools like sklearn, modelling process for feature engineering, model selection, validation and prediction, types of ML including semi-supervised learning

Handling large data: problems and general techniques for handling large data, programming tips for dealing large data, case studies on DS projects for predicting malicious URLs, for building recommender systems

NoSQL movement for handling Bigdata: Distributing data storage and processing with Hadoop framework, case study on risk assessment for loan sanctioning, ACID principle of relational databases, CAP theorem, base principle of NoSQL databases, types of NoSQL databases, case study on disease diagnosis and profiling

Tools and Applications of Data Science: Introducing Neo4j for dealing with graph databases, graph query language Cipher, Applications graph databases, Python libraries like nltk and SQLite for handling Text mining and analytics, case study on classifying Reddit posts

Data Visualization and Prototype Application Development: Data Visualization options, Cross filter, the JavaScript Map Reduce library, creating an interactive dashboard with dc.js, Dashboard development tools, Applying the DS process for respective engineering problem solving scenarios as a detailed case study.

Textbook:

1. Davy Cielen, Arno D.B.Meysman, and Mohamed Ali, "Introducing to Data Science using Python tools", Manning Publications Co, Dreamtech press, 2016

2. Prateek Gupta, "Data Science with Jupyter" BPB publishers, 2019 for basics

Reference Books:

1. Joel Grus, "Data Science From Scratch", OReilly, 2019

2. Doing Data Science: Straight Talk From the Frontline, 1 st Edition, Cathy O'Neil and Rachel Schutt, O'Reilly, 2013

BUSINESS ANALYTICS
OPEN ELECTIVE
SYLLABUS

Course objectives:

- To introduce students to problem solving with Business Analytics and the use of spreadsheets for descriptive analytics, data queries and visualization
- To introduce students to statistical sampling, sampling distributions, confidence intervals and statistical inference
- To learn the basic arithmetic functions used in MS Excel
- To familiarize students with various types of regression including simple linear regression and multiple linear regression

Course outcomes:

After completion of the course the student should be able to:

- Describe data and models used for Business Analytics and apply various descriptive analytic techniques to analyze data
- Estimating population parameters, interval estimates, construct confidence intervals and perform hypothesis testing
- Estimate and interpret the parameters of simple linear regression and multiple linear regressions

SYLLABUS:

Foundations of Business Analytics: Evolution of Business Analytics, Scope, data and models for Business Analytics, problem solving with Business Analytics, Analytics on spreadsheets, Excel functions for Database queries, Add-ons for Business Analytics. Descriptive Analytics: Data visualization, creating charts in MS Excel, Data Queries, Tables, sorting and filtering, Data summarization with statistics, Data exploration using Pivot tables

Statistical Sampling: methods, estimating population parameters, sampling error, sampling distributions, interval estimates, confidence intervals, using confidence intervals for decision making, prediction intervals Statistical Inference: Hypothesis testing, one-sample Hypothesis testing, two-tailed test of Hypothesis for mean, two-sample Hypothesis testing, Analysis of variance, chi-square test for independence

Trendliness and Regression: Modelling Relationships and trends in data, Simple linear regression, least squares regression, regression on analysis of variance, testing hypothesis for regression coefficients, Confidence intervals for regression coefficients, Residual analysis and regression assumptions, Multiple linear regression, building regression models, regression with categorical independent variables with two or more levels, regression with nonlinear terms, advanced techniques for regression modelling

Forecasting Techniques: Qualitative and judgmental forecasting, statistical forecasting models, forecasting models for stationary time series, forecasting models for time series with linear trend, forecasting models for time series with seasonality, selecting appropriate time-series-based forecasting models, regression forecasting with casual variables, practice of forecasting

Spreadsheet modeling and Analysis: Strategies for predictive decision modelling, Implementing models on spreadsheet, spreadsheet applications in Business analytics, Model assumptions, complexity and realism, developing user-friendly applications, analyzing uncertainty and model assumptions, model analysis using analytics solver platform

Linear Optimization & Applications: Building Linear Optimization Models on spreadsheets, solving Linear Optimization models, Graphical interpretation of linear optimization, Using optimization models of prediction and insight, Types of constraints in optimization models, process selection models, Blending Models, Portfolio Investment models

Text Book:

1."Business Analytics: Methods, Models, and Decisions" James R. Evans, Pearson Publications,Second edition

Reference Book:

1."Business Analytics: The Science of Data-Driven Decision Making", U.Dinesh Kumar, Wiley Publications

PYTHON PROGRAMMING
OPEN ELECTIVE
SYLLABUS

Course Objectives:

- To develop skills on procedural oriented and object oriented programming in Python.
- To understand key data structures in Python and apply different data wrangling techniques using Python.
- To understand data related libraries such as Numpy and Pandas.
- To understand concepts of data analysis using Python libraries
- To introduce exploratory data analysis using Matplotlib data visualization concepts

Course Outcomes:

After completion of the course the student should be able to:

- Acquire knowledge on basic Python programming and usage of associated Python Libraries
- Acquire knowledge on usage of Object oriented Programming concepts in Python.
- Acquire knowledge on pre-processing data, compressing data, clustering, classification and cross-validation.
- Acquire knowledge on Data analysis with Pandas
- Acquire Knowledge on implementing Data Visualization techniques in Python.

SYLLABUS:

Introduction to Python: Rapid Introduction to Procedural Programming, Data Types: Identifiers and Keywords, Integral Types, Floating Point Types Strings: Strings, Comparing Strings, Slicing and Striding Strings, String Operators and Methods, String formatting with str, format, Collections Data Types: Tuples, Lists, Sets, dictionaries, Iterating and copying collections, Introduction to PIP

Control Structures & Functions: Python Control Structures, Functions and OOP:Control Structures and Functions: Conditional Branching, Looping, Exception Handling, Custom Functions, Python Library Modules: random, math, time, os, shutil, sys, glob, re, statistics, creating a custom module

Object Oriented Programming: Object Oriented Concepts and Terminology, Custom Classes, Attributes and Methods, Inheritance and Polymorphism, Using Properties to Control Attribute Access, File Handling: Writing and Reading Binary Data, Writing and Parsing Text Files

NumPy Arrays and Vectorized Computation: NumPy arrays, Array creation, Indexing and slicing, Fancy indexing, Numerical operations on arrays, Array functions, Data processing using arrays, Loading and saving data, Saving an array, Loading an array, Linear algebra with NumPy, NumPy random numbers

Data Analysis with Pandas: An overview of the Pandas package, The Pandas data structure-Series, The DataFrame, The Essential Basic Functionality: Reindexing and altering labels , Head and tail, Binary operations, Functional statistics , Function application Sorting, Indexing and selecting data, Computational tools, Working with Missing Data, Advanced Uses of Pandas for Data Analysis - Hierarchical indexing, The Panel data

Data Analysis Application Examples: Data munging, Cleaning data, Filtering, Merging data, Reshaping data, Data aggregation, Grouping data

Data Visualization: The matplotlib API primer-Line properties, Figures and subplots, Exploring plot types-Scatter plots, Bar plots, Histogram plots, Legends and annotations, Plotting functions with Pandas

Text Books

1. Programming in Python 3: A Complete Introduction to Python Language, Mark Summerfield, Second Edition, Addison-Wesley Publications

2. Python: End-to-End Data Analysis Learning Path, Module 1: Getting Started with Python Data Analysis , Phuong VothiHong , Martin Czygan, , Packt Publishing Ltd

Reference Books

1. Learning Python, 5th Edition, Mark Lutz, Orielly Publications

2. Python for Data Analysis, Wes McKinney, Orielly Publications

3. How to Think Like a Computer Scientist: Learning with Python 3 Documentation 3rd Edition, Peter Wentworth, Jeffrey Elkner, Allen B. Downey, Chris Meyers

4. Core Python Programming, Second Edition, Wesley J. Chun, Prentice Hall

5. Python Cookbook – Recipes for Mastering Python 3,3rdEdition, David Beazley, Brian K. Jones, Oreilly

INTERNET OF THINGS
OPEN ELECTIVE
SYLLABUS

Course Objectives:

- Understand IoT conceptual framework and design standardisation of IoT/M2M architectural layers and domains
- Learning the usage of messaging protocols between connected devices and the web
- Identify the functions and usage of data analytics and cloud services for IoT applications and business processes.
- Elucidate sensor technology for sensing the real world using analog and digital sensors
- Develop the codes, design and test the embedded devices for IoT and M2M using IDEs and development platforms

Course Outcomes:

At the end of the course, student will be able to

- Understand the IoT Standards and design principles.
- Understand various web-communication protocols and their practical usage.
- Able to use IoT cloud-based services using the Xively, Nimbits.
- Able to learn various types of sensors and actuators, interfacing and use in IoT environment.
- Able to use number of device platforms of IDEs, such as Arduino, Intel Galileo, RPi, BB and mBed, provide development tools, libraries and framework, and are used for the development of embedded Software.

SYLLABUS:

The Internet of Things: An Overview of Internet of things, Internet of Things Conceptual Frame work, IoT architectural View, Technology behind IoT, Sources of IoT, M2M Communication, Examples of IoTs, Design Principles for Connected Devices Internet Connectivity: IoT/M2M System Layers and Design Standardization.

Design for Web Connectivity.: Web communication protocols for connected devices, Message Communication protocols for connected devices, Web Connectivity for Connected-Devices Network using Gateway, SOAP, REST, HTTP RESTFUL, and Web Sockets, Principles, Internet connectivity, Application Layer Protocols: HTTP, HTTPS, FTP, Telnet.

Data Acquiring, Organizing, Processing and Analytics: Data Acquiring and Storage, Organizing the Data, Transactions, Business Processes, Integration and Enterprise Systems. Analytics, Knowledge acquiring, managing and storing process.

Data Collection, Storage and Computing Using a Cloud Platform: Cloud Computing Paradigm for Data Collection, Storage and Computing. Everything as a service and Cloud Service Models, IOT cloud-based services using the Xively, Nimbits and other platforms.

Sensor, Participatory Sensing, RFID, Wireless Sensor Networks: Sensors Technology, Participatory Sensing, Actuator, Sensor Data Communication Protocols, RFID, WSN.

Prototyping and Designing the Software for IoT Applications: Prototyping embedded device Software, Devices, Gateways, Internet and Web/Cloud Services Software Development, Prototyping Online Component APIs and WebAPIs.

IoT Case Studies: Design Layers, Design Complexity and Designing Using Cloud PaaS. IoT Applications for Smart Homes, Cities, Environmental Monitoring and Agriculture. Connected Car and Its applications.

Text Books:

1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education
2. Internet of Things, A.Bahgya and V.Madisetti, Univesity Press,2015

Reference Books:

1. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally,Wiley
2. Getting Started with the Internet of Things, CunoPfister , Oreilly

EMBEDDED SYSTEMS
OPEN ELECTIVE
SYLLABUS

Course Objectives:

- To study the basics of embedded systems and interrupt basics.
- To discuss various software architectures in embedded systems.
- To impart knowledge about RTOS.
- To discuss Inter Task Communication procedures and design issues of RTOS.
- To provide various embedded software development tools and debugging techniques.

Course Outcomes:

- Grasp basics of embedded systems and interrupts.
- Familiarize Round-Robin, Round-Robin with Interrupts, Function-Queue Scheduling and Real-Time Operating Systems Architectures
- Gain knowledge about the concepts related to RTOS
- Understand various Inter Task Communication methods and design issues in RTOS environment.
- Understand about embedded software development tools.

SYLLABUS:

Introduction to Embedded Systems: Examples, Typical Hardware, Memory, Microprocessors, Busses; Interrupt Basics, Shared-Data problem, Interrupt Latency.

Software Architectures: Round-Robin Architecture, Round-Robin with Interrupts Architecture, Function-Queue Scheduling Architecture, Real-Time Operating Systems Architecture, Selection of Architecture.

Real Time Operating System: Tasks and Task States, Tasks and Data, Semaphores and Shared Data, Semaphore Problems, Semaphore variants.

Inter Task Communication: Message Queues, Mailboxes, Pipes, Timer Functions, Events, Memory Management, Interrupt Routines in RTOS Environment.

Design issues of RTOS: Principles, Encapsulation Semaphores and Queues, Hard Real-time Scheduling Considerations, Saving Memory Space, Saving Power.

Embedded Software Development Tools: Host and Target Machines, Linker/Locator for Embedded Software, Getting Embedded Software into the Target System.

Embedded Software Debugging Techniques: Testing on your Host Machine, Instruction Set Simulators, Laboratory Tools used for Debugging.

Text Books:

1. An Embedded Software Primer, David E. Simon, Pearson Education, 2005.

Reference Book:

1. Embedded Systems: Architecture, Programming and Design, Raj Kamal, Tata McGraw-Hill Education, 2008

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
OPEN ELECTIVE
SYLLABUS

COURSE OBJECTIVES: From the course the student will learn

- Know user interfaces to improve human and AI interaction and decision making.
- Allows the students to develop AI skills.
- Introduce the concepts of expert systems and machine learning.
- To be able to apply machine learning algorithms to solve problems of moderate complexity.

COURSE OUTCOMES:

At the end of the course, student will be able to

- Understanding Artificial Intelligence and different branches of Artificial Intelligence and demonstrate awareness of informed search and exploration methods.
- Understanding various Machine Learning Methods.
- Analyzing the different Classification and Regression Techniques.
- Familiarization of Architecture in Convolution Neural Networks.
- **U**nderstanding the concepts of different supervised learning methods and its Applications.

Syllabus

Unit I: Introduction to Artificial Intelligence: Biological Motivation for a Human Brain, Neural Network Representation, ANN Architecture, Perceptron, Multi-Layer Perceptron Structure, Back Propagation.

Unit II: Machine Learning: Introduction to Machine Learning, Different Types of Machine Learning Methods, Supervised, Semi Supervised, Unsupervised and Reinforcement Learning.

Unit III: Classification and Regression Algorithms: Difference Between Classification and Regression, Classification Algorithms, KNN, SVM Algorithms and its Applications, Regression Algorithm, Linear Regression, Decision Tree Regression and Random Forest Regression.

Unit IV: Convolution Neural Networks: Introduction to Convolution Neural Networks**,** Basic Principle, Architecture**,** Types of CNN Layers, Pooling Layers, Convolution Layers and Fully Connected Layers, Applications of CNN.

Unit V: Advanced Topics in Artificial Intelligence and Machine Learning: DNN Model, Significance, Overview of DNN Technique and its Applications, Generative Models, Working Principle of GAN and its Applications.

Text Books:

1. Artificial Intelligence and Machine Learning by Vinod Chandra SS and Anand Hareendran S, PHI Publications.
2. Artificial Intelligence – A Model Approaceh Stuart Russel and Peter Norvig.

Reference Books:

1. Introduction to Artificial Intelligence by Ertel W (2018) Springer International Publishing.
2. Machine Learning and Artificial Intelligence by Joshi and Ameet V (2022) Springer International Publishing.

INDUSTRY 4.0
OPEN ELECTIVE
SYLLABUS

Course Objectives:

- This course provides students with an introduction to Industry 4.0, its building blocks, its applications and advantages compared to conventional production techniques.
- Learners get a deep insight into components and technologies of industry 4.0 can be used to build up the production of the future.
- It is also important that the theory is deepened by means of roadmap technologies with phase wise developments.
- To impart knowledge of smart manufacturing, IIot for industry 4.0.
- To expand Robotic technology with Augmented reality for Industry 4.0 and obstacle with framework conditions for Industry 4.0

Course Outcomes:

Students will be able to:

- Describe Industry 4.0 and scope for Indian Industry
- Demonstrate conceptual framework and road map of Industry 4.0
- Describe IIoT, cloud computing and big data, smart factories' role in Industry 4.0
- Describe Robotic technology and Augmented reality for Industry 4.0
- Demonstrate obstacle and framework conditions for Industry 4.0

SYLLABUS:

Introduction to Industry 4.0: Introduction, Idea of Industry 4.0, Various Industrial Revolutions, Origin concept of Industry 4.0, Industry 4.0 Production system, How is India preparing for Industry 4.0, Comparison of Industry Factory and Today's Factory.

Trends in Industry 4.0: Introduction, Main Concepts and Components of Industry 4.0, State of Art Technologies, Proposed Framework for Industry 4.0, Trends of Industrial Big Data and Smart Business Transformation.

Roadmap for Industry 4.0: Introduction, Proposed Framework for Technology Roadmap: Strategy Phase, Development Phase, Smart Manufacturing, Types of Smart Devices, Smart Logistics, Smart Cities, Predictive Analytics.

Advances in the Era of Industry 4.0: Introduction, Recent Technological Components of Robots- Advanced Sensor Technologies, Internet of Things, Industrial Robotic Applications- Manufacturing, Maintenance and Assembly, IIoT- Industrial IoT.

The Role of Industry 4.0 and Future Aspects: Introduction, Challenges & Future of Works and Skills for Workers in the Industry 4.0 Era, Strategies for competing in an Industry 4.0 world.

Reference Books:

1. Alp Ustundag and Emre Cevikcan,"Industry 4.0: Managing the Digital Transformation".
2. Bartodziej, Christoph Jan,"The Concept Industry 4.0".
3. Klaus Schwab,"The Fourth Industrial Revolution".
4. Christian Schröde, "The Challenges of Industry 4.0 for Small and Medium-sized Enterprises".

List of OpenSource Software/learning website:

1. www.nptel.ac.in/

(Material Is Readily Available On Internet)

HSS ELECTIVES

1. OPERATIONS RESEARCH
2. ORGANIZATIONAL BEHAVIOUR
3. INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP
4. FINANCIAL MANAGEMENT FOR ENGINEERS

OPERATIONS RESEARCH
HSS ELECTIVE
SYLLABUS

Course Objectives:

Upon completion of this course, you will be able to:

- Formulate a real-world problem as a mathematical programming model
- Understand the theoretical workings of the simplex method for linear programming and perform iterations of it by hand
- Understand the relationship between a linear program and its dual, including strong duality and complementary slackness
- Solve specialized linear programming problems like the transportation and assignment problems
- Solve network models like the shortest path, minimum spanning tree, and maximum flow problems

Course Outcome:

After learning the course, the students should be able to:

- Students will be able to describe characteristics and scope of OR.
- Students will be able to define and formulate mathematical problems.
- Students will be able to select optimal problems solving techniques for a given problem using LP.
- Students will be able to formulate and solve transportation, travelling sales man and transshipment problems.
- Students will be able to formulate and solve optimization problems related to job/ work assignments.
- Students will be able to demonstrate and solve simple models of Game theory.
- Students will be able to evaluate optimum solution using dynamic programming for different applications.

SYLLABUS:

Overview of Operations Research: Types of OR Models, Phases of Operations Research–OR Techniques, Introduction to Linear Programming, Formulation of Linear Programming Problem, Graphical Solution; Graphical Sensitivity Analysis.

Standard Form of LPP: Basic Feasible Solutions, Unrestricted Variables, Simplex Algorithm, Artificial Variables, Big M Method, Two Phase Simplex Method, Degeneracy,
Alternative Optimal, Unbounded Solutions, Infeasible Solutions, Primal and Dual Problems and Their Relations, Dual Simplex Method

Transportation Problem: LPP, Initial Solutions, North West Corner Rule, Lowest Cost Method, Vogel's Approximation Method, Optimum Solutions of TPP, Degeneracy in Transportation, Transportation Algorithms

Assignment Problem: Assignment Problem as LPP, Hungarian Method, Travelling Salesman Problem, Solutions of TSP, Sequencing Problems, N-Jobs Two Machine Problems, N Jobs K Machines Problems, Two-Jobs M- Machine Problems, Crew Scheduling Problems

Network Representation of a Project: CPM and PERT, Critical Path Calculations, Time – Cost Optimizations, PERT Analysis and Probability Considerations, Resource Analysis in Network Scheduling.

Replacement Problems: Individual and Group Replacement Policy, Reliability & System Failure Problems, Inventory-Factors Effecting Inventory-EOQ, Inventory Problems with and Without Shortages, Inventory Problems with Price Breakups, Multi Item Deterministic Problems. Probabilistic Inventory Problems

Game Theory: Two Person Zero Sum Games, Mixed Strategy Games and Their Algorithms.

Textbooks:

1. Operations Research, KantiSwaroop, P.K. Gupta, ManMohan, Sulthan Chand & Sons Education
2. Operations Research–An Introduction, HandyATaha–Pearson Education

References:

1. Taha.H.A, Operations Research : An Introduction, McMilan publishing Co., 1982. 7 th ed.
2. Ravindran A, Philips D.T & Solberg.J.J, Operations Research: Principles and practice, John Wiley & Sons, New York, 1987.
3. Frank S. Budnick, Dennis Mcleavey and Richard Mojena, Principles of Operations Research for Management. All India Traveler Book seller, Delhi.
4. Gillet.B.E., Introduction to Operations Research - A Computer oriented algorithmic approach, McGraw Hill, 1987.
5. Joseph.G.Ecker& Michael Kupper Schimd, Introduction to Operations Research, John Wiley & Sons, 1988.
6. Hillier.F.S & Liberman.G.J, Operations Research, Second Edition, Holden Day Inc, 1974.
7. Kanti Swarup, Gupta.P.K. & Man Mohan, Operations Research, S.Chand& Sons

ORGANIZATIONAL BEHAVIOUR
HSS ELECTIVE
SYLLABUS

Course Objectives:

- To understand the basic concepts of organizational behaviour, its foundations and importance.
- To enable students to have a basic perspective of Motivation and Motivation theories.
- To acquaint the students about group behaviour in organizations, including communication, leadership conflicts and organizational change and how these are linked to and impact organizational performance.

Course Outcomes:

- Identifying fundamental aspects of organizational dynamics.
- Evaluate main theories of motivation and formulating suitable motivational strategies.
- Analyse the behaviour of individuals and groups in organizations.
- Understanding of Leadership theories and Leadership behaviour.
- Apply relevant theories, concepts to address important Organizational Behaviour questions.

SYLLABUS:

Organizational Behaviour: Concept of Organisation - Concept of Organizational Behaviour - Nature of Organizational Behaviour - Role of Organizational behaviour - Disciplines contributing to Organizational Behaviour.

Motivation: Definition - Nature of Motivation - Role of Motivation - Theories of Motivation: Maslow's Need Hierarchy Theory, Herzberg's Motivation Hygiene Theory and Mc Gregor's Theory X and Theory Y.

Group Dynamics: Meaning - Concept of Group - Types of groups -Formal and Informal groups - Group development - Group cohesiveness and factors affecting group cohesiveness.

Leadership: Concept of Leadership - Difference between Leadership and Management - Importance of Leadership - Leadership styles: Autocratic leadership, Participative leadership and Free Rein leadership.

Communication: Meaning - Communication Process - Forms of communication: Oral, Written and Non-Verbal communication - Direction of communication: Downward, Upward and Horizontal communication.

Organizationalconflits: Concept of conflict - Reasons for conflict - Types of Conflict: Intrapersonal conflict, Interpersonal conflict, Intragroup conflict, Intergroup conflict, Inter organisational conflict - Conflict management.

Organizational Change: Nature - Factors in Organizational change -Planned change: Process of planned change - Resistance to change: Factors in resistance to change - Overcoming resistance to change.

Textbooks:

1. L.M.Prasad: Organizational Beaviour, Sultan Chand & Sons, New Delhi -110002
2. K. Aswathappa: Organizational Behaviour, Himalaya Publishing House, New Delhi

Reference Books:

1. Stephen Robbins: Organizational Behaviour, Pearsons Education, New Delhi.

INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP
HSS ELECTIVE
SYLLABUS

Course Objectives:

- To familiarize the students with the concepts of Management.
- To relate the concepts of Management with industrial organizations.
- To explain the factors affecting productivity and how productivity can be increased in an Industrial undertaking.
- To set forth a basic framework for understanding Entrepreneurship.

Course Outcomes:

On completion of the course, the students will be able to:

- Understand the roles, skills and functions of management.
- Distinguish the different types of business organizations.
- Identify the factors involved in Production Operations Management.
- Diagnose organizational problems and take suitable decisions.
- Establish good Human Resource Management practices.
- Acquire necessary knowledge and skills required for organizing and carrying out

SYLLABUS:

Basic Concepts of Management: Definition, Nature and Importance; Functions of the Management; Levels of Management; F.W Taylor's Scientific Management; Henry Fayol's Principles of Management;

Forms of Business Organizations: Introduction, Types of Business organizations: Private Sector- Individual Ownership, Partnership, Joint stock companies and Co-Operative organizations**;** Public sector- Departmental Organizations, Public Corporations and Government Companies; The Joint Sector Management.

Production and operations Management: Plant location- Factors to be considered in the selection of Plant location; Break - even analysis- Significance and managerial applications; Importance of Production Planning and Control and its Functions; Human Resource Management and Functions of Human Resource Manager (in brief); Functions of Marketing; Methods of Raising Finance.

Entrepreneurship: Definition, Characteristics and Skills, Types of Entrepreneurs, Entrepreneur vs. Professional Managers, , Growth of Entrepreneurs, Nature and Importance of Entrepreneurs, Women Entrepreneurs, Problems of Entrepreneurship.

Entrepreneurial Development and Project Management: Institutions in aid of Entrepreneurship Development, Idea generation: Sources and Techniques; Stages in Project formulation; Steps for starting a small enterprise - Incentives for Small Scale Industries by Government.

Textbooks:

1. Sharma,S.C, and Banga, T.R., Industrial Organization & Engineering Economics, Khanna Publishers, Delhi, 2000.
2. Vasant Desai , (The Dynamics of Entrepreneurial Development and Management (Planning for future Sustainable growth),HImalayan Publishing House, 2018.

Reference Books:

1. Aryasri , A.R., Management Science, McGraw HIll Education (India Private Limited , New Delhi 2014.
2. Sheela, P. , and Jagadeswara Rao**,** K., Entrepreneurship, Shree Publishing House, Guntur, Andhra Pradesh, 2017.

FINANCIAL MANAGEMENT FOR ENGINEERS
HSS ELECTIVE
SYLLABUS

Course Objectives:

- To provide awareness and understanding of the ways finance helps in reaching business objectives.
- To familiarise with the form, content and analysis of financial statements and the accounting principles and techniques.
- To Identify signals pointing to deterioration in financial condition and analyse the reasons for variances between the actual and budgeted results
- To facilitate in the improvement of organizations‘ performance by pointing out the importance of cost control, breakeven and variance analysis.
- To equip with the ability to communicate comfortably with Financial Executives and discuss the financial performance of the organization effectively.

Course Outcomes:

- Ability to Analyse financial statements
- Understanding costs and methods to reduce them
- Taking decisions regarding the price of the products services, or both
- Skill to practice different Budgeting Systems in organisations.

SYLLABUS:

Accounting concepts and systems - Elements of Financial Statements - Trading, Profit & Loss Statement- Cash Flow Statements - Notes to Accounts - Profits vs. Cash Flows

Analysis of Financial Statements - Financial Analysis - Financial Ratios and their Interpretations covering: Profitability Ratios; Liquidity Ratios; Return on Capital Ratios; - Management of Working Capital: Capital and Its Components - Working Capital Cycle - Working Capital Financing.

Management Decision Making- Cost concepts and its application in Decision Making - Types of cost – Direct & Indirect, Fixed & Variable - Cost Sheet - Cost Volume Profit Analysis - Understanding Cost behaviour – Cost concepts and its application in Decision Making - Relevance of Activity Based Costing - Marginal Costing - Make or Buy - Shut down or continue - Sell or process further - Domestic vs. Export Sales

Budgets and Budgetary Control- Different types of Budgets (Departmental, Function based, Cash, Master) - Budgeting systems (ABC / ZBB / Rolling/ Incremental / Planning) - Variance Analysis - Capital Budgeting and Investment Appraisals - Meaning of Capital Budgeting - Relevance of Capital Budgeting - Techniques of Capital Budgeting - Payback Period - Accounting Rate of Return - Net Present Value - Internal Rate of Return - Discounted Payback Period

Means of Finance- Financial Instruments - Shares, Debentures, Derivatives - Share Capital Vs. Term Loans- Leasing - Financial Markets - Capital Markets - Stock Exchanges.

Reference Books:

1. Finance for Non-Finance People by Sandeep Goal (2017), Publisher: Taylor and Francis.
2. Finance for Non-Finance Managers by B.K. Chatterjee (1988), Jaico Publishing House, Sold by Amazon
3. Finance for Nonfinancial Managers: Finance for Small Business, Basic Finance Concepts (Accounts and Finance) by Murugesan Ramaswamy (2021), Repro Books-On-Demand

SCHEME AND SYLLABUS FOR

FOUR YEAR UNDER GRADUATE DEGREE COURSE

B. TECH

Computer Science and Engineering (Artificial Intelligence and Machine Learning)

[W.E.F. 2022 - 2023 ADMITTED BATCH]



DEPARTMENT OF COMPUTER SCIENCE & SYSTEMS ENGINEERING

ANDHRA UNIVERSITY COLLEGE OF ENGINEERING (A)

ANDHRA UNIVERSITY

VISAKHAPATNAM-530 003

ANDHRA UNIVERSITY

DEPARTMENT OF COMPUTER SCIENCE AND SYSTEMS ENGINEERING

SCHEME AND SYLLABI

(With effect from 2022-23 admitted batch)

B. TECH Computer Science and Engineering (Artificial Intelligence and Machine Learning)

(Common with CSE and IT)

I Year – I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
AI1101	BS	Engineering Mathematics –I	4	0	30	70	100	3
AI1102	BS	Green Chemistry	4	0	30	70	100	3
AI1103	HSS	English	4	0	30	70	100	3
AI1104	ES	Computer Programming Using C	4	0	30	70	100	3
AI1105	ES	IT Essentials	4	0	30	70	100	3
AI1106	HSS	Communication skills Lab	0	3	50	50	100	1.5
AI1107	ES	Computer Engineering Workshop Lab	0	3	50	50	100	1.5
AI1108	ES	Computer Programming using C lab	0	3	50	50	100	1.5
Total Credits								**19.5**

I Year-II Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
AI1201	BS	Engineering Mathematics–II	4	0	30	70	100	3
AI1202	BS	Engineering Physics	4	0	30	70	100	3
AI1203	ES	Elements of Electronics Engineering	4	0	30	70	100	3
AI1204	ES	Data Structures Using C	4	0	30	70	100	3
AI1205	ES	Digital Logic Design	4	0	30	70	100	3
AI1206	ES	Linux Administration Lab	0	3	50	50	100	1.5
AI1207	BS	Engineering Physics Lab	0	3	50	50	100	1.5
AI1208	ES	Data Structures Lab	0	3	50	50	100	1.5
Total Credits								**19.5**

ANDHRA UNIVERSITY

DEPARTMENT OF COMPUTER SCIENCE AND SYSTEMS ENGINEERING

SCHEME AND SYLLABI

(With effect from 2022-23 admitted batch)

B. TECH Computer Science and Engineering (Artificial Intelligence and Machine Learning)
(Common with CSE and IT)

II Year - I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
AI2101	ES	Discrete Mathematical Structures	4	0	30	70	100	3
AI2102	PC	Computer Organization and Architecture	4	0	30	70	100	3
AI2103	BS	Probability, Statistics and Queuing theory	4	0	30	70	100	3
AI2104	PC	Operating Systems	4	0	30	70	100	3
AI2105	PC	Object Oriented Programming Through Java	4	0	30	70	100	3
AI2106	PC	Computer Organization & Architecture Lab	0	3	30	70	100	1.5
AI2107	PC	Object Oriented Programming Through Java Lab	0	3	50	50	100	1.5
AI2108	PC	Operating Systems Lab	0	3	50	50	100	1.5
AI2109	SC	Intellectual Property Rights (Internal)	1	2	100	0	100	2
AI2110	MC	Environmental Science	0	0	-	100	100	0
Total credits								**21.5**

II Year - II Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
AI2201	ES	Microprocessors	4	0	30	70	100	3
AI2202	PC	Design and Analysis of Algorithms	4	0	30	70	100	3
AI2203	PC	Database Management Systems	4	0	30	70	100	3
AI2204	PC	Formal Languages & Automata Theory	4	0	30	70	100	3
AI2205	HSS	Managerial Economics	4	0	30	70	100	3
AI2206	PC	Algorithms Lab through C++	0	3	50	50	100	1.5
AI2207	PC	Database Management Systems Lab	0	3	50	50	100	1.5
AI2208	SC	Web Technologies	1	2	50	50	100	2
AI2209	MC	Professional Ethics & Universal Human Values	0	0	0	100	100	0
AI2210	MC	NCC/NSS	0	2	-	-	-	0
Total credits								**20**
Internship-I								

ANDHRA UNIVERSITY
DEPARTMENT OF COMPUTER SCIENCE AND SYSTEMS ENGINEERING
SCHEME AND SYLLABI
(With effect from 2022-23 admitted batch)

B. TECH Computer Science and Engineering (Artificial Intelligence and Machine Learning)

III Year - I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
AI3101	PC	Data Warehousing and Data Mining	4	0	30	70	100	3
AI3102	PC	Artificial Intelligence	4	0	30	70	100	3
AI3103	PC	Machine Learning Techniques	4	0	30	70	100	3
AI3104	PE	Professional Elective-I	4	0	30	70	100	3
AI3105	OE	Open Elective-I	4	0	30	70	100	3
AI3106	PC	Data Warehousing and Data Mining Lab	0	3	50	50	100	1.5
AI3107	PC	Machine Learning Techniques Lab	0	3	50	50	100	1.5
AI3108	SC	Skill Development Course-I: (Continuous Integration and Continuous Delivery using DevOps)	1	3	50	50	100	2
AI3109	INT	Internship-I	0	0	50	50	100	2
Summer Internship 2 Months (Mandatory) after 2nd year (to be evaluated during III year I Semester								
Total credits								**22**

III Year - II Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
AI3201	PC	Computer Networks	4	0	30	70	100	3
AI3202	PC	Deep Learning Techniques	4	0	30	70	100	3
AI3203	PC	Big Data and Hadoop	4	0	30	70	100	3
AI3204	PE	Professional Elective-II	4	0	30	70	100	3
AI3205	OE	Open Elective-II	1	3	30	70	100	3
AI3206	PC	Computer Networks Lab						1.5
AI3207	PC	Deep Learning Techniques Lab	0	3	50	50	100	1.5
AI3208	PC	Big Data and Hadoop Lab	0	3	50	50	100	1.5
AI3209	SC	Skill Development Course-II: MEAN Stack Technologies	1	3	50	50	100	2
Total credits								**21.5**
Internship-II								

ANDHRA UNIVERSITY

DEPARTMENT OF COMPUTER SCIENCE AND SYSTEMS ENGINEERING

SCHEME AND SYLLABI

(With effect from 2022-23 admitted batch)

B. TECH Computer Science and Engineering (Artificial Intelligence and Machine Learning)

IV Year - I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
AI4101	PE	Professional Elective-III	4	0	30	70	100	3
AI4102	PE	Professional Elective-IV	4	0	30	70	100	3
AI4103	PE	Professional Elective-V	4	0	30	70	100	3
AI4104	OE	Open Elective-III	4	0	30	70	100	3
AI4105	OE	Open Elective-IV	4	0	30	70	100	3
AI4106	HSSE	HSSE Elective	4	0	30	70	100	3
AI4107	SC	Natural Language Processing Lab	1	3	50	50	100	2
AI4108	INT	Internship-II	0	0	50	50	100	2
Summer Internship 2 Months (Mandatory) after 3rd year (to be evaluated during IV year I Semester)								
Total Credits								**22**

IV Year - II Semester

Course code	Category	Course Title	Internal Marks	External Marks	Total Marks	Credits
AI4201	PROJ	Project Work	100	100	200	14
Internship (6 months)						
Total Credits						**14**

Professional Electives:

1. Software Engineering
2. Reinforcement Learning
3. Modern Cryptography & Network Security
4. Security and Privacy in Cloud
5. Compiler Design
6. Augmented Reality/Virtual Reality
7. Object-Oriented Analysis and Design
8. Image and Video Analytics
9. Digital and Mobile Forensics
10. Game Development
11. Soft Computing
12. Software Project Management
13. Ethical Hacking

14. Quantum Computing
15. Computer Vision
16. Cloud Computing
17. Natural Language Processing

Open Electives:

1. Python for Data Science
2. Renewable Energy Sources
3. Data Communications
4. Blockchain Technologies
5. Internet of Things
6. Introduction to Psychology
7. Industry 4.0
8. Geographic Information System
9. Business Analytics
10. Electric and Hybrid Vehicles
11. NoSQL Databases
12. Data Science
13. Python Programming
14. Mobile Computing
15. AI Chatbots

HSS Electives:

1. Human Resource Management
2. Operations Research
3. Industrial Management and Entrepreneurship
4. Financial Management for Engineers

Guidelines for Obtaining MINOR in Computer Science and Engineering (Artificial Intelligence and Machine Learning):

Students belonging to other departments have to complete the following courses to obtain MINOR degree in Computer Science and Engineering (Artificial Intelligence and Machine Learning):

1. A student belonging to other department have to study CPNM and Python Programming as Compulsory courses and any two of the following 4 open electives as follows:
   OE I: Python for Data Science
   OE II: NoSQL Databases
   OE III: Business Analytics
   OE IV: AI Chatbots

   OR

   One or two MOOCS courses from NPTEL related to Computer Science and Engineering (Artificial Intelligence and Machine Learning) without repetition from subjects within the curriculum can be used in Lieu of any of the aboveOpen electives.

2. The duration of NPTEL courses should **NOT** be less than 12 weeks.
3. The MOOCS course(s) chosen by students of other departments for obtaining a MINOR in CSE

(AI&ML) should be taken prior permission/ approval from the Chairperson – BoS of the departmentof **CS & SE, AUCE(A)**.

Guidelines for Obtaining HONORS in Computer Science and Engineering (Artificial Intelligence and Machine Learning):

The student shall earn additional 15 credits beyond 160 credits from the same branch/department/ discipline registered for major degree.

(i) The students having 7.0 CGPA without any backlog subjects will be permittedto register for HONORS.

(ii) If a student is detained due to lack of attendance either in Major or in Honors,registration shall be cancelled.

(iii) Honors is to be completed simultaneously with B. Tech program.

To obtain Honors in CSE (AI&ML) the following subjects are to be taken for obtaining Honors:

1. Generative AI Models
2. High Performance Computing
3. Social Network Analysis
4. Speech Processing
5. Data Visualization
6. MOOCs for 3 credits of 12 weeks duration related to any one of the above courses. MOOCs may be treated as optional to obtain Honors degree in CSE (AI&ML). If a student completes MOOCs with good grade, then it may be considered as betterment for any of the above five Courses (1 to 5)

The above five courses and MOOCs may be completed or pursued during 3rd and 4th years of his/her study of B.Tech, B.Tech + M.Tech program

ANDHRA UNIVERSITY

DEPARTMENT OF COMPUTER SCIENCE AND SYSTEM ENGINEERING

SCHEME AND SYLLABI

(With effect from 2022-23 admitted batch)

B. TECH Computer Science and Engineering (Artificial Intelligence and Machine Learning)

(Common with CSE and IT)

I Year – I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
AI1101	BS	Engineering Mathematics –I	4	0	30	70	100	3
AI1102	BS	Green Chemistry	4	0	30	70	100	3
AI1103	HSS	English	4	0	30	70	100	3
AI1104	ES	Computer Programming Using C	4	0	30	70	100	3
AI1105	ES	IT Essentials	4	0	30	70	100	3
AI1106	HSS	Communication skills Lab	0	3	50	50	100	1.5
AI1107	ES	Computer Engineering Workshop Lab	0	3	50	50	100	1.5
AI1108	ES	Computer Programming using C lab	0	3	50	50	100	1.5
Total Credits								**19.5**

AI1101 ENGINEERING MATHEMATICS-I

Course Objectives

- To transmit the knowledge of Partial differentiation.
- To know of getting maxima and minima of function of two variables and finding errorsand approximations.
- To evaluate double and triple integrals, volumes of solids and area of curved surfaces.
- To expand a periodical function as Fourier series and half-range Fourier series

Course Outcomes

- Find the partial derivatives of functions of two or more variables.
- Evaluate maxima and minima, errors and approximations.
- Evaluate double and triple integrals, volumes of solids and area of curved surfaces.
- To expand a periodical function as Fourier series and half-range Fourier series.
- Have a fundamental understanding of Fourier series and be able to givenFourier expansions of a given function.

SYLLABUS

Partial Differentiation: Introduction - Functions of two or more variables - Partial derivatives - Homogeneous functions – Euler's theorem - Total derivative - Change of variables – Jacobins.Mean value Theorems (without proofs)

Applications of Partial Differentiation: Geometrical interpretation -Tangent plane and Normal to a surface -Taylor's theorem for functions of two variables - Errors and approximations -Total differential. Maxima and Minima of functions of two variables - Lagrange's method of undetermined multipliers - Differentiation under the integral Sign - Leibnitz's rule.

Multiple Integrals: Introduction - Double Integrals - Change of Order of Integration - Double Integrals in Polar Coordinates - Triple Integrals - Change of Variables.

Multiple Integrals-Applications: Area enclosed by plane curves - Volumes of solids - Areaof a curved surface - Calculation of Mass - Centre of gravity - Moment of inertia - product of inertia – principal axes- Beta Function - Gamma Function - Relation between Beta and Gamma Functions. Error Function or Probability Integral.

Fourier Series: Introduction - Euler's Formulae - Conditions for a Fourier Expansion - Functions having points of discontinuity - Change of Interval - Odd and Even Functions - Expansions of Odd or Even Periodic Functions, Half-Range Series - Parseval's Formula. Practical Harmonic analysis

Text Book

1. Scope and Treatment as in "Higher Engineering Mathematics", by Dr. B.S. Grewal, 43rd Edition, Khanna publishers.

Reference Books

1. Graduate Engineering Mathematics by V B Kumar Vatti., I.K.International publishinghouse Pvt. Ltd.
2. Advanced Engineering Mathematics by Erwin Kreyszig.
3. A text book of Engineering Mathematics, by N.P. Bali and Dr. Manish Goyal, Lakshmi Publications.
4. Advanced Engineering Mathematics by H.K. Dass. S. Chand Company
5. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Graw Hill Company. 6.
6. Higher Engineering Mathematics by Dr. M.K.Venkataraman.

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AI1102 GREEN CHEMISTRY

Course Objectives:

- To apply the basic knowledge of Chemistry to the Engineering Discipline.
- To develop knowledge about water and its treatment for industrial and potablepurposes.
- To develop understanding in the areas of Batteries, Fuels Mechanism of Corrosion ofMetals and Corrosion Control Methods, Green Chemistry and Technology and Processes involving Green Chemistry and apply the knowledge for solving existing challenges faced in various engineering and societal areas.

Learning outcome:

- The students are able to apply the basic concepts and principles studied in Chemistry to the field of Engineering.
- The students are able to apply chemistry to different branches of engineering
- The students are able to acquire the knowledge in the areas of Water Chemistry, Mechanism of Corrosion of Metals and Corrosion Control Methods, Batteries, Fuel Cells, Green Chemistry and Technology and Processes involving Green Chemistry and suggest innovative solutions for existing challenges in these areas.

SYLLABUS

Water Technology

Sources of Water – Impurities and their influence of living systems – WHO Limits – Hardness and its Determination – Boiler Troubles and their removal – Water Softening Methods – Lime- Soda, Zeolite and Ion Exchange - Municipal Water Treatment-Break Point Chlorination – Desalination of Sea Water – Reverse Osmosis Method, Electro-dialysis.

Batteries

Primary batteries: The chemistry - Types: Zinc-carbon (Leclanche type), zinc alkaline (Duracell), zinc/air batteries; Lithium primary cells – liquid cathode, solid cathode and lithium- ferrous sulphide cells. Secondary batteries: Lead acid and VRLA (valve regulated (sealed) lead acid), nickel-cadmium, nickel-zinc, nickel-metal hydride batteries, lithium ion batteries, ultrathin lithium polymer cells. Advanced Batteries for electric vehicles, requirements of the battery – sodium-beta and redox batteries.

Fuel Cells

Fuel Cells: Description, working principle, anodic, cathodic and cell reactions, fabrication of electrodes and other components, applications, advantages, disadvantages and environmental aspects of the following types of fuel cells: Proton Exchange Membrane Fuel Cells, alkaline fuel cells, phosphoric acid, solid oxide, molten carbonate, direct methanol fuel cells- Membranes and Fuels

Corrosion

Corrosion: Origin and Theory – Types of Corrosion: Chemical and Electrochemical; Pitting,Inter granular, Waterline, Stress – Galvanic Series – Factors Effecting Corrosion. Corrosion Controlling Methods, Protective Coatings, Metallic Coatings, Electroplating and Electroless Plating.

Green Chemistry and Technology

Introduction and significance of green chemistry, Goals of green chemistry, 12 principles of green chemistry, toxicity of chemicals, material safety data sheet (MSDS), concept of zero pollution technologies, atom economy, functional toxicity vs non-functional toxicity, functional group approaches to green chemistry, Elimination of toxic functional group, optimization of frameworks for the design of greener synthetic pathways, Applications of green chemistry - Green solvents, green fuels and propellants, biocatalysis.

Text Books

1. Engineering Chemistry – PC Jain and M. Jain – Dhanpath Rai and Sons, New Delhi.
2. A Text book of Engineering Chemistry – S. S. Dara – S. Chand & Co. New Delhi.
3. Hand Book of Green Chemistry and Technology; by James Clarke and Duncan Macquarrie; Blakwell Publishing.

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AI1103 ENGLISH

Course Objectives

- To make students understand the explicit and implicit meanings of a text/topic;
- To give exposure to new words and phrases, and aid to use them in different contexts;
- To apply relevant writing formats to draft essays, letters, emails and presentations; and
- To adapt oneself to a given situation and develop a functional approach to findingsolutions: adaptability and problem solving.

Course Outcomes

- Students will be able to analyse a given text and discover the various aspects related tolanguage and literature;
- Learn the various language structures, parts of speech and figures of speech;
- Develop one's reading and writing abilities for enhanced communication; and
- Learn to apply the topics in real-life situations for creative and critical use.

SYLLABUS

On the conduct of life: William Hazlitt

Life skills: Values and EthicsIf: Rudyard Kipling The Brook: Alfred Tennyson

Life skills: Self-Improvement How I Became a Public Speaker: George Bernard ShawThe Death Trap: Saki

Life skills: Time ManagementOn saving Time: Seneca Chindu Yellama

Life skills: InnovationMuhammad Yunus Politics and the English Language: George Orwell

Life skills: Motivation Dancer with a White Parasol: Ranjana Dave

Grammar: Prepositions – Articles – Noun-Pronoun Agreement, Subject-Verb Agreement – Misplaced Modifiers–Clichés, Redundancies.

Vocabulary: Introduction to Word Formation – Root Words from other Languages –Prefixes and Suffixes–Synonyms, Antonyms– Common Abbreviations

Writing: Clauses and Sentences – Punctuation – Principals of Good Writing – Essay Writing – Writing a Summary Writing: Essay Writing**Life skills:** Innovation Muhammad Yunus

Textbook

1. Language and Life: A Skills Approach Board of Editors, Orient Blackswan Publishers, India.2018.

References

1. Practical English Usage, Michael Swan. OUP. 1995.
2. Remedial English Grammar, F.T. Wood. Macmillan.2007
3. On Writing Well, William Zinsser. Harper Resource Book. 2001
4. Study Writing, Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
5. Communication Skills, Sanjay Kumar and Pushp Lata. Oxford University Press. 2011.
6. Exercises in Spoken English, Parts. I-III. CIEFL, Hyderabad. Oxford University Press.

AI1104 COMPUTER PROGRAMMING USING C

Course Objectives

- The course is designed to provide complete knowledge of C language.
- To provide students with understanding of code organization and functional hierarchical decomposition with using complex data types.
- To provide knowledge to the students to develop logics which will help them to create programs, applications in C.
- This course aims to identify tasks in which the numerical techniques learned are applicable and apply them to write programs, and hence use computers effectively to solve the task.
- This course provides the fundamental knowledge which is useful in understanding the other programming languages.

Course Outcomes

- Identify basic elements of C programming structures like data types, expressions, control statements, various simple functions and apply them in problem solving.
- Apply various operations on derived data types like arrays and strings in problem solving.
- Design and implement of modular Programming and memory management using Functions, pointers.
- Apply Structure, Unions and File handling techniques to Design and Solve different engineering programs with minimal complexity.
- Apply Numerical methods to Solve the complex Engineering problems.

SYLLABUS

Introduction to C: Basic structure of C program, Constants, Variables and data types, Operators and Expressions, Arithmetic Precedence and associativity, Type Conversions. Managing Input and Output Operations Formatted Input, Formatted Output.

Decision Making, Branching, Looping: Decision making with if statement, Simple if statement, The if…else statement, Nesting of if…else statement, the else.. if ladder, switch statement, the (?:) operator, the GOTO statement., The while statement, the do statement, The for statement, Jumps in Loops.

Arrays & Strings: One, Two-dimensional Arrays, Character Arrays. Declaration and initialization of Strings, reading and writing of strings, String handling functions, Table of strings.

Functions: Definition of Functions, Return Values and their Types, Function Calls, Function Declaration, Category of Functions: No Arguments and no Return Values, Arguments but no Return Values, Arguments with Return Values, No Argument but Returns a Value, Functions that Return Multiple Values. Nesting of functions, recursion, passing arrays to functions, passing strings to functions, the scope, visibility and lifetime of variables.

Pointers: Accessing the address of a variable, declaring pointer variables, initializing of pointer variables, accessing variables using pointers, chain of pointers, pointer expressions, pointers and arrays, pointers and character strings, array of pointes, pointers as function arguments, functions returning pointers, pointers to functions, pointers to structures-Program Applications.

Structure and Unions: Defining a structure, declaring structure variables, accessing structure members, structure initialization, copying and comparing structure variables, arrays of structures, arrays within

structures, structures within structures, structures and functions and unions, size of structures and bit-fields- Program applications.

File handling: Defining and opening a file, closing a file, Input/ Output operations on files, Error handling during I/O operations, random access to files and Command Line Arguments- Program Applications.

Text Books

1. Programming in ANSI C, E Balagurusamy, 6th Edition. McGraw Hill Education (India)Private Limited.

Reference Books

1. Let Us C ,Yashwant Kanetkar, BPB Publications, 5th Edition.
2. Computer Science, A structured programming approach using C", B.A.Forouzan and R.F.Gilberg, " 3rd Edition, Thomson, 2007.
3. The C –Programming Language' B.W. Kernighan, Dennis M. Ritchie, PHI.
4. Scientific Programming: C-Language, Algorithms and Models in Science, Luciano M.Barone (Author), EnzoMarinari (Author), Giovanni Organtini, World Scientific.

AI1105 IT ESSENTIALS

Course Objectives

- Select the appropriate computer components to build, repair, or upgrade personalcomputers.
- Explain how to correctly use tools and safely work in a lab.
- Install components to build, repair, or upgrade personal computers.
- Configure computers to communicate on a network
- Configure devices to connect to the Internet and Cloud services
- Explain how to use, configure, and manage laptops and mobile devices

Course Outcomes

- Understands the roles and responsibilities of the IT professional
- Able to Troubleshoot advanced hardware and software problems
- Provides an experience-oriented course that employs industry-relevant instructionalapproaches to prepare students for entry-level jobs in the industry.

Syllabus

Introduction to the Personal Computer Describe a Computer System, Identify the Names, Purposes, and Characteristics of Cases and Power Supplies, Identify the Names, Purposes, and Characteristics of Internal Components, Identify the Names, Purposes, and Characteristics of Ports and Cables, Identify the Names, Purposes, and Characteristics of Input Devices, Identify the Names, Purposes, and Characteristics of Output Devices, Explain System Resources and Their Purposes.

Safe Lab Procedures and Tool Use Explain the Purpose of Safe Working Conditions and Procedures, Identify Tools and Software Used with Personal Computer Components and Their Purposes, Implement Proper Tool Use.

Computer Assembly Attach the Components to the Motherboard and Install the Motherboard, Install Internal Drives, Install Drives in External Bays, Install Adapter Cards, Connect the Power Cables Reattach the Side Panels to the Case, Boot the Computer for the First Time. **Basics of Preventive Maintenance and Troubleshooting** Explain the Purpose of Preventive Maintenance, Identify the Steps of the Troubleshooting Process.

Fundamental Laptops and Portable Devices Identify Common Preventive Maintenance Techniques for Laptops and Portable Devices, Describe How to Troubleshoot Laptops and Portable Devices.

Fundamental Operating Systems Explain the Purpose of an Operating System, Describe and Compare Operating Systems to Include Purpose, Limitations, and Compatibilities, Determine Operating System Based on Customer Needs, Install an Operating System, Identify and Apply Common Preventive Maintenance Techniques for Operating Systems, Troubleshoot Operating Systems.

Fundamental Networks Explain the Principles of Networking, Describe Types of Networks, Describe Basic Networking Concepts and Technologies, Describe the Physical Components ofa Network, Describe LAN Topologies and Architectures.

Fundamental Security: Explain Why Security Is Important, Describe Security Threats, Identify Security Procedures, Identify Common Preventive Maintenance Techniques for Security, Troubleshoot Security.

Text books:

1. IT Essentials: PC Hardware and Software Companion Guide Fourth Edition, CiscoNetworking Academy.

References:

1. Network security essentials application and standrads, by William stallings, 4th edition,prentice hall.
2. Mike Meyers' CompTIA A+ Guide to Managing and Troubleshooting PCs, SixthEdition 6th Edition

AIS1106 COMMUNICATION SKILLS LAB

Course Objectives

- To make students recognize the sounds of English through Audio-Visual aids;
- To help students build their confidence and help them to overcome their inhibitions andself-consciousness while speaking in English;
- To familiarize the students with stress and intonation and enable them to speak Englisheffectively; and
- To give learners exposure to and practice in speaking in both formal and informalcontexts.

Course Outcomes

- Students will be sensitized towards recognition of English sound patterns and thefluency in their speech will be enhanced;
- A study of the communicative items in the laboratory will help students becomesuccessful in the competitive world;
- Students will be able to participate in group activities like roleplays, group discussionsand debates; and
- Students will be able to express themselves fluently and accurately in social as wellprofessional context.

SYLLABUS

Introduction to Phonetics: The Sounds of English (Speech sound – vowels and consonants) - Stress and Intonation - Accent and Rhythm.

Listening Skills: Listening for gist and specific information - listening for Note taking, summarizing and for opinions - Listening to the speeches of eminent personalities.

Speaking Skills: Self-introduction - Conversation Skills (Introducing and taking leave) - Giving and asking for information - Role Play - Just A Minute (JAM) session - Telephone etiquette.

Reading and Writing skills: Reading Comprehension – Précis Writing - E-Mail writing - Punctuation.

Presentation skills: Verbal and non-verbal communication - Body Language - Making aPresentation

Reference Books

1. Ashraf Rizvi. Effective Technical Communication. Tata McGraw Hill Education Private Limited, New Delhi.
2. Speak Well. Orient Blackswan Publishers, Hyderabad.
3. Allan Pease. Body Language. Manjul Publishing House, New Delhi.

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AI1107 COMPUTER ENGINEERING WORKSHOP LAB

Course Objectives

- Explain the internal parts of a computer, peripherals, I/O ports, connecting cables
- Demonstrate basic command line interface commands on LINUX
- Teach the usage of Internet for productivity and self-paced lifelong learning
- Describe about Compression, Multimedia and Antivirus tools
- Demonstrate Office Tools such as Word processors, Spreadsheets and Presentationtools

Course Outcomes

- Assemble and disassemble components of a PC
- Construct a fully functional virtual machine, Summarize various LINUX operatingsystem commands.
- Able to Troubleshoot hardware and software problems.

Syllabus

Module I – Hardware Concepts

1. Every student should identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor. Every student should disassemble and assemble the PC back to working condition.

Module II – Software Installations

1. Every student should individually install operating system like LINUX or MS windows on the personal computer. The system should be configured as dual boot with both windows and LINUX.

2. Hardware Troubleshooting: Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fixit to get the computer back to working condition.

3. Software Troubleshooting: Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition.

4. Cyber Hygiene: Students should learn about viruses on the internet and install antivirus software. Student should learn to customize the browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

5. Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and popup blockers.

Module III – MS-Office

1. MS Word - Features to be covered: Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colours, Inserting Header and Footer, Using Date.

2. Creating project abstract Features to be covered: Formatting Styles, inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

3. Creating a Newsletter: Features to be covered: Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs in

word.

4. Spreadsheet Orientation: Accessing, overview of toolbars, saving spreadsheet files,Using help and resources. Creating a Scheduler: Gridlines, Format Cells, Summation, auto fill, Formatting Text.

5. Calculating GPA - Features to be covered: Cell Referencing, Formulae in spreadsheet – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, Sorting, Conditional formatting.

6. Creating Power Point: Student should work on basic power point utilities and tools in Latex and Ms Office/equivalent (FOSS) which help them create basic power point presentation. PPT Orientation, Slide Layouts, Inserting Text, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows, Hyperlinks, Inserting Images, Tables and charts.

AI1108 Computer Programming Using C Lab

Course Objectives

- To impart writing skill of C programming to the students and solving problems.
- To write and execute programs in C to solve problems such as Modularize the problemsinto small modules and then convert them into programs.,
- To write and execute programs in C to solve problems such as arrays, files, strings, structures and different numerical methods.
- This reference has been prepared for the beginners to help them understand the basic to advanced concepts related to Objective-C Programming languages.

Course Outcomes

- Understand various computer components, Installation of software. C programming development environment, compiling, debugging, and linking and executing a program using the development environment.
- Analysing the complexity of problems, Modularize the problems into small modules and then convert them into programs.
- Construct programs that demonstrate effective use of C features including arrays, strings, structures, pointers and files.
- Apply and practice logical ability to solve the real-world problems.
- Apply Numerical methods to Solve the complex Engineering problems.

Syllabus

Practice the following concepts with algorithm, flow chart and implementation.

1. C – Tokens, Data Types - Format Specifiers, I/O Statements.
2. Operators in C, their Precedence and Associativity, ArithmeticExpressions/Instructions, Type casting, Math.h functions.
3. Control Statements (Conditional): If and its Variants, Switch (Break).
4. Goto Statement, Control Statements (Looping): While, Do-While, For Loop, Continue& Break (Unconditional), Nested Loops
5. Arrays, One Dimensional Array: Declaration and Initialization, Accessing Array Elements.
6. Two Dimensional Array: Declaration and Initialization, Accessing Array Elements.
7. Strings: Read & Write, “String.h” Predefined Functions, without predefined functions. Pointers: Declarations, Types, Pointers to Arrays, Pointers to Character Strings, Pointers to Pointers, Array of Pointers
8. Structures: Nested Structures, Pointers to Structures, Unions.
9. Functions: Function Declaration, Classification (Arguments and Return Type), StorageClasses.
10. Parameter Passing Techniques, Passing Parameters Types, Recursion
11. Files: Opening, Closing of Files, Reading and Writing of Files.
12. Binary Files, Random Accessing of Files, Enum, Typedef, Pre-processor Commands.
13. Numerical methods: Bisection method, Newton Raphson method, Lagrange’s interpolation, Simpson’s rule for numerical integration.

References:

1. Programming in ANSI C, E Balagurusamy, 6th Edition. McGraw Hill Education (India)Private Limited.
2. Introduction to Numerical Methods, SS Sastry, Prentice Hall

ANDHRA UNIVERSITY

DEPARTMENT OF COMPUTER SCIENCE AND SYSTEM ENGINEERING

SCHEME AND SYLLABI

(With effect from 2022-23 admitted batch)

B. TECH Computer Science and Engineering (Artificial Intelligence and Machine Learning)

(Common with CSE and IT)

I Year – II Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
AI1201	BS	Engineering Mathematics–II	4	0	30	70	100	3
AI1202	BS	Engineering Physics	4	0	30	70	100	3
AI1203	ES	Elements of Electronics Engineering	4	0	30	70	100	3
AI1204	ES	Data Structures Using C	4	0	30	70	100	3
AI1205	ES	Digital Logic Design	4	0	30	70	100	3
AI1206	ES	LINUX Administration Lab	0	3	50	50	100	1.5
AI1207	BS	Engineering Physics Lab	0	3	50	50	100	1.5
AI1208	ES	Data Structures Lab	0	3	50	50	100	1.5
							Total Credits	**19.5**

AI1201 ENGINEERING MATHEMATICS – II

Course Objectives

- The way of obtaining rank, eigen values and eigen vectors of a matrix.
- To know the importance of Cayley-Hamilton theorem and getting canonical form froma given quadratic form.
- To solve the system of equations by using direct and indirect methods.
- To solve first order and higher order differential equations by various methods.
- To obtain the Laplace transforms and inverse Laplace transforms for a given functions and their applications.

Course Outcomes

- Find rank, eigen values and eigen vectors of a matrix and understand the importance of Cayley-Hamilton theorem.
- Reduce quadratic form to canonical forms and solving linear systems by direct and indirect methods.
- Demonstrate solutions to first order differential equations by various methods and solve basic applications problems related to electrical circuits, orthogonal trajectories and Newton's law of cooling
- Discriminate among the structure and procedure of solving higher order differential equations with constant and variable coefficients.
- Understand Laplace transforms and its properties and finding the solution of ordinary differential equations.

SYLLABUS

Linear Algebra: Rank of a matrix- Echelon form, Normal Form - Solution of Linear System of Equations - Consistency of Linear System of Equations - Direct & Indirect Methods: Gauss elimination method, LU Factorization method, Gauss Seidal Method. Complex Matrices: Hermitian, Skew-Hermitian and Unitary Matrices and their Properties.

Eigen Values and Eigen Vectors: Eigen Values and Eigen Vectors of a Matrix - Cayley- Hamilton theorem - Inverse and Powers of a Matrix using Cayley-Hamilton's theorem and its applications. Diagonalization of a Matrix - Quadratic Forms - Reduction of Quadratic Form to Canonical Form - Nature of a Quadratic Form.

Ordinary Differential Equations of First Order and its Applications: Formation of ordinary differential equations (ODEs) - Solution of an ordinary differential equation - Equations of the first order and first degree - Linear differential equation - Bernoulli's equation - Exact differential equations - Equations reducible to exact equations - Orthogonal Trajectories - Simple Electric (LR & CR) Circuits - Newton's Law of Cooling - Law of Natural growth and decay.

Differential Equations of Higher Order: Solutions of Linear Ordinary Differential Equations with Constant Coefficients - Rules for finding the complimentary function - Rules for finding the particular integral - Method of variation of parameters - Cauchy's linear equation - Legendre's linear equation - Simultaneous linear differential equations.

Laplace Transforms: Introduction - Existence Conditions - Transforms of Elementary Functions - Properties of Laplace Transforms - Transforms of Derivatives - Transforms of Integrals - Multiplication by tn - Division by t – Evaluation of integrals by Laplace Transforms

- Inverse Laplace Transform - Applications of Laplace Transforms to Ordinary Differential Equations - Simultaneous Linear Differential Equations with Constant Coefficients - Second Shifting Theorem - Laplace Transforms of Unit Step Function, Unit Impulse Function and Laplace Transforms of Periodic Functions.

Text Book

1. Scope and Treatment as in "Higher Engineering Mathematics", by Dr. B.S. Grewal, 43rd edition, Khanna publishers.

Reference Books

1. Graduate Engineering Mathematics by V B Kumar Vatti., I.K. International publishinghouse Pvt. Ltd.
2. Advanced Engineering Mathematics by Erwin Kreyszig.
3. A text book of Engineering Mathematics, by N.P. Bali and Dr. Manish Goyal. Lakshmi Publications.
4. Advanced Engineering Mathematics by H.K. Dass. S. Chand Company.
5. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Graw Hill Company.

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AI1202 ENGINERING PHYSICS

Course Objectives

- To impart knowledge in basic concept of physics of Thermodynamics relevant toengineering applications.
- To grasp the concepts of physics for electromagnetism and its application to engineering. Learn production of Ultrasonics and their applications in engineering.
- To Develop understanding of interference, diffraction and polarization: connect it to a few engineering applications.
- To Learn basics of lasers and optical fibres and their use in some applications.
- To Understand concepts and principles in quantum mechanics and Nanophase Materials. Relate them to some applications.

Course Outcomes

- Understand the fundamentals of Thermodynamics and Laws of thermodynamics. Understand the working of Carnot cycle and concept of entropy.
- Gain Knowledge on the basic concepts of electric and magnetic fields. Understand the concept of the nature of magnetic materials. Gain knowledge on electromagnetic induction and its applications.
- Understand the Theory of Superposition of waves. Understand the formation of Newton's rings and the working of Michelson's interferometer. Remember the basics of diffraction, Evaluate the path difference. Analysis of Fraunhofer Diffraction due toa single slit
- Understand the interaction of matter with radiation, Characteristics of Lasers, Principle, working schemes of Laser and Principle of Optical Fibre. Realize their role in optical fibre communication.
- Understand the intuitive ideas of the Quantum physics and understand dual nature of matter. Compute Eigen values, Eigen functions, momentum of Atomic and subatomic particles using Time independent one-Dimensional Schrodinger's wave equation. Understand the fundamentals and synthesis processes of Nanophase materials.

SYLLABUS

Thermodynamics: Introduction, Heat and Work, First law of thermodynamics and applications, Reversible and Irreversible process, Carnot cycle and Efficiency, Second law of thermodynamics, Carnot's Theorem, Entropy, Second law in terms of entropy, Entropy and disorder, Third law of thermodynamics (statement only).

Electromagnetism: Concept of electric flux, Gauss's law - some applications, Magnetic field - Magnetic force on current, torque on current loop, The Biot-Savart's Law, B near a long wire, B for a circular Current loop, Ampere's law, B for a solenoid, Hall effect, Faraday's law of induction, Lenz's law, Induced magnetic fields, Displacement current, Maxwell's equations (no derivation), Magnetic materials: Classification of magnetic materials and properties.

Ultrasonics: Introduction, Production of Ultrasonics – Piezoelectric and Magnetostriction methods, acoustic grating, applications of ultrasonics.

Optics-Interference: Principles of superposition – Young's Experiment – Coherence - Interference in thin films (reflected light), Newton's Rings, Michelson Interferometer and its applications.
Diffraction: Introduction, Differences between interference and diffraction, Fresnel and Fraunhofer

diffraction, Fraunhofer diffraction at a single slit (Qualitative and quantitativetreatment).

Polarisation: Polarisation by reflection, refraction and double refraction in uniaxial crystals, Nicol prism, Quarter and Half wave plate, circular and elliptical polarization.

Lasers And Fibre Optics: Introduction, characteristics of a laser beam, spontaneous and stimulated emission of radiation, population inversion, Ruby laser, He-Ne laser, Semiconductor laser, applications of lasers Introduction to optical fibres, principle of propagation of light in optical fibres, Acceptance Angle and cone of a fibre, Numerical aperture, Modes of propagations, classification of fibres, Fibre optics in communications, Application of optical fibres.

Modern Physics-

Introduction, De Broglie concept of matter waves, Heisenberg uncertainty principle, Schrodinger time independent wave equation, application to a particle in a box. Free electron theory of metals, Kronig - Penney model (qualitative treatment), Origin of energy band formation in solids, Classification of materials into conductors, semi-conductors and insulators.

Nanophase Materials: Introduction, properties, Top-down and bottom-up approaches,Synthesis - Ball milling, Chemical vapour deposition method, sol-gel methods, Applications of nano materials.

Text Books

1. Physics by David Halliday and Robert Resnick – Part I and Part II - Wiley.
2. A textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar - S.Chand
3. Engineering Physics by R.K. Gaurand S.L. Gupta–Dhanpat Rai

Reference Books

1. Modern Engineering Physics by A.S. Vadudeva
2. University Physics by Young and Freedman

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AI1203 ELEMENTS OF ELECTRONICS ENGINEERING

Course Objectives

- Introduce students to basics of semiconductors, their classification and properties
- To provide theory of PN junction diode, its characteristics and applications
- To introduce basics of rectifying circuits and bipolar junction transistor
- To provide basics of transistor biasing, transistor amplifiers and field effect transistors

Course Outcomes

- By the end of the course, the student should be able to:
- Explain the basics of semiconductors and their classification
- Understand the theory of PN junction diode, rectifying circuits and bipolar junctiontransistor
- Explain the concepts of transistor biasing, transistor amplifiers and field effect transistors

SYLLABUS

Introduction to Electronics and Semiconductors: Energy band theory, Conduction in Insulators, Semiconductors and metals, Electron emission from metals, Classification of semiconductors, Carrier concentration in an intrinsic semiconductor, Properties of intrinsic semiconductor, Drift and diffusion currents.

Semi-Conductor Diode: Theory of PN junction diode, Open circuited PN junction, V-I characteristics of a PN diode, Diode current equation, Transition and diffusion capacitances, Break down in PN diode, Applications of PN diodes. Zener diode, Zener regulator, Tunnel diode, Schottky diode.

Rectifying circuits: Half wave and full wave rectifiers, Bridge rectifiers, Efficiency, Ripple and regulation of each rectifier, Capacitor filters.

Bipolar Junction Transistor: Introduction, construction, Operation of PNP and NPN Transistors – Transistor Circuit configurations- Characteristics of a CE configurations – h parameters, low frequency small signal equivalent circuit of a Transistor.

Transistor Biasing and thermal stabilization: Transistor Biasing, Stabilization, Different methods of transistor biasing – Fixed bias, Collector feedback bias – self bias – Bias compensation.

Transistor Amplifiers: CE, CB, CC amplifier configurations –Multistage amplifier – A Two Stage RC coupled amplifier – frequency response curve and bandwidth.

Field Effect Transistors: Junction Field Effect Transistors (JFET) – JFET characteristics, JFET Parameters, Small signal equivalent circuit – MOSFETS – Depletion and Enhancement MOSFETS.

Text Books:

1. Electronic Device and Circuits by Sanjeev Guptha.

Reference Books:

1. Electronic Device and Circuits Theory by Robert L. Boylested Electronic Device andCircuits by David. A. Bell

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AI1204 DATA STRUCTURES USING C

Course objectives

- Assess how the choice of data structures and algorithm design methods impacts theperformance of programs.
- Choose the appropriate data structure and algorithm design method for a specifiedapplication.
- Solve problems using data structures such as linear lists, stacks, queues, binary trees, heaps binary search trees, and graphs and writing programs for these solutions.

Course outcomes

- Describe how arrays, records, linked structures, stacks, queues, trees, and graphs arerepresented in memory and used by algorithm.
- Demonstrate different methods for traversing trees.
- Compare alternative implementations of data structures with respect to performance.
- Discuss the computational efficiency of the principal algorithms for sorting andsearching

SYLLABUS

Introduction to Data Structures: Review of C Programming, Recursive Definition and Processes, Recursion in C, Simulation of Recursion, Efficiency of Recursion, Abstract Data Types, Meaning and Definition of Data Structures, Arrays.

Stacks: Stack as an Abstract Data Type, Primitive Operations, Implementing Stack Operations using Arrays, Infix, Postfix and Prefix: Definitions, Evaluation and Conversions.

Queues: Queue as an Abstract Data Type, Sequential Representation, Types of Queues, Operations, Implementation using Arrays.

Linked List: Operations, Implementation of Stacks, Queues and priority Queues using Linked Lists+, Circular Lists: Insertion, Deletion and Concatenation Operations, Stacks and Queuesas Circular Lists, Doubly Linked Lists.

Trees: Binary Trees - Definitions and Operations, Binary Tree Representation: Node Representation, Implicit array Representation, Binary Tree Traversal, Threaded Binary Trees and their Traversal, Trees and their Applications; Tree Searching: Insertion and Deletion of a node from a Binary Search Tree, Efficiency of Binary Search Tree operations.

Searching: Basic Searching Techniques: Dictionary as an Abstract Data Type, Algorithmic Notation, Sequential Searching and its Efficiency, Binary Search, Interpolation Search.

Sorting: General Background: Efficiency, Asymptotic Notations, Efficiency of Sorting, Bubble Sort and Quick Sort and their Efficiency, Selection Sorting, Binary Tree Sort, HeapSort, Insertion Sorts, Shell Sort, Address calculation Sort, Merge and Radix Sorts.

Graphs and Their Application: Definition of Graphs, Representation of Graphs, Transitive closure, Linked Representation of Graphs, Topological Ordering of nodes, Graph Traversal and Spanning Forests, Undirected Graphs and their Traversals, Applications of Graphs, Minimal Spanning Trees.

Textbooks

1. Data Structures Using C and C++ Yddish Langsam, Moshe J. Augenstein and Aaron M.Tanenbaum, Prentice Hall Of India (2nd Edition)
2. Data Structures, Algorithms and Applications with C++, Sahani Mc-Graw Hill.

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AI1205 DIGITAL LOGIC DESIGN

Course objectives

- To introduce the basic principles for design of combinational circuit and sequential circuits.
- To learn simple digital circuits in preparation for computer engineering.

Course Outcomes

A student who successfully fulfils the course requirements will have demonstrated:

- An ability to define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.
- An ability to understand the different Boolean algebra theorems and apply them for logic functions.
- An ability to define the Karnaugh map for a few variables and perform an algorithmic reduction of logic functions.
- An ability to define the following combinational circuits: multiplexer, de-multiplexers encoders/decoders, comparators, arithmetic-logic units; and to be able to build simple circuits.
- An ability to understand asynchronous and synchronous sequential circuits, like counters and shift registers.
- An ability to understand memories like RAM and ROM, Programmable Logic Array and Programmable Array Logic.

SYLLABUS

Binary Systems: Digital Systems. Binary Numbers. Number Base Conversions. Octal and Hexadecimal Numbers. Complements. Signed Binary Numbers. Binary Codes. Binary Storage and Registers. Binary Logic

Boolean Algebra and Logic Gates: Basic Definitions. Axiomatic Definition of Boolean Algebra. Basic Theorems and Properties of Boolean Algebra. Boolean Functions. Canonical and Standard Forms. Other Logic Operations. Digital Logic Gates. Integrated Circuits.

Combinational Logic Design, Gate-Level Minimization: The Map Method. Four Variable Map. Five-Variable Map. Product of Sums Simplification. Don't-Care Conditions. NAND and NOR Implementation. Other Two- Level Implementations. Exclusive-OR Function. Hardware Description Language (HDL).

Combinational Logic: Combinational Circuits. Analysis Procedure. Design Procedure. Binary Adder Subtractor. Decimal Adder. Binary Multiplier. Magnitude Comparator. Decoders. Encoders. Multiplexers. HDL For Combinational Circuits.

Sequential Logic Design, Synchronous Sequential Logic: Sequential Circuits. Latches Flipflops. Analysis of Clocked Sequential Circuits. HDL For Sequential Circuits. State Reduction and Assignment. Design Procedure.

Registers ad Counters: Registers. Shift Registers. Ripple Counters. Synchronous Counters. Other Counters. HDL for Registers and Counters.

Memory and Programmable Logic: Introduction. Random-Access Memory. Memory Decoding, Error Detection and Correction. Read-Only Memory. Programmable Logic Array. Programmable Array Logic. Sequential Programmable Devices.

Text Book

1. DigitalDesign,3rdEdition, M. Morris Mano, Pearson Education.

Reference Books

1. Digital Logic Design Principles, Norman Balabanian & Bradley Carlson, John Wiley&Sons (Asia) Pvt.Ltd.,2002
2. Fundamentals of Digital Logic with VHDL Design, Stephen Brown and ZvonkoVranesic, TataMcGraw-HillEdition,2002.

AI1206 LINUX ADMINISTRATION LAB

Course Objectives

- To understand LINUX operating system and its internals.
- To understand LINUX file system structure and its operations.
- To understand LINUX shell environment and its programming.
- To understand communication in LINUX and the corresponding primitives.

Course Outcomes

- The student learns about LINUX features for multiuser, multitasking capabilities.
- The student learns about file system organization, file and directory manipulation, setting file permissions, and disk free space administration.
- The student learns about writing shell scripts for different applications.
- The student learns about how users communicate with each other in LINUX environment.

SYLLABUS

1) Study and practice on file system / handling files with commands, syntax, usage,application.
2) Practice on vi editor.
3) Study and practice on redirection operators with relevant commands, syntax, usage, application.
4) Study and practice on filters with relevant commands, syntax, usage, application.
5) Study and practice on Backup with relevant commands, syntax, usage, application.
6) Study and practice on internet related commands, syntax, usage, application.
7) Study and practice on shells/shell programming with relevant programming constructs, syntax, usage, application.
8) Study and practice on awk with relevant commands, syntax, usage, application.
9) Study and practice on regular expressions and the grep family with relevant commands,syntax, usage, application.
10) Study and practice on compilation process of C programs under UNIX.

References:

1. Unix concepts and applications by Sumitabha Das, TMH Publications.
2. Shell programming by Yashwanth Kanetkar.

AI1207 ENGINNERING PHYSICS LAB

Course Objectives

- To enable the students to acquire skill, technique and utilization of the Instruments
- Draw the relevance between the theoretical knowledge and to imply it in a practicalmanner with respect to analyse various electronic circuits and its components.
- To impart the practical knowledge in basic concepts of Wave optics, Lasers and fibreoptics.
- To familiarize the handling of basic physical apparatus like Vernier callipers, screw gauge, spectrometers, travelling microscope, laser device, optical fibre, etc.

Course Outcomes

- Ability to design and conduct experiments as well as to analyse and interpret
- Ability to apply experimental skills to determine the physical quantities related to Heat, Electromagnetism and Optics
- The student will learn to draw the relevance between theoretical knowledge and themeans to imply it in a practical manner by performing various relative experiments.

SYLLABUS

1. Determination of Radius of Curvature of a given Convex Lens By forming Newton'sRings.
2. Determination of Wavelength of Spectral Lines in the Mercury Spectrum by Normal Incidence method.
3. Study the Intensity Variation of the Magnetic Field along axis of Current CarryingCircular Coil.
4. Determination of Cauchy's Constants of a Given Material of the Prism usingSpectrometer.
5. Determination of Refractive Index of Ordinary ray □o and Extraordinary □e ray.
6. Determination of Thickness Given Paper Strip by Wedge Method.
7. Calibration of Low Range Voltmeter.
8. Calibration of Low Range Ammeter.
9. Determination of Magnetic Moment and Horizontal Component of Earth's Magnetic Field.
10. Lees Method - Coefficient of thermal Conductivity of a Bad Conductor.
11. Carey Foster's Bridge – Verification of laws of Resistance and Determination of Specific Resistance.
12. Melde's Apparatus – Frequency of electrically maintained Tuning Fork.
13. Photoelectric cell-Characteristics.
14. Planks Constants.
15. Laser- Diffraction.

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AI1208 DATA STRUCTURES LAB

Course Objectives

- To implement stacks and queues using arrays and linked lists.
- To develop programs for searching and sorting algorithms.
- To write programs using concepts of various trees.
- To implement programs using graphs.

Course Outcomes

- Student will be able to write programs to implement stacks and queues.
- Ability to implement various searching and sorting techniques.
- Ability to implement programs using trees and graphs.

SYLLABUS

List of Programs:

1. Write a C program for sorting a list using Bubble sort and then apply binary search.
2. Write a C program for implementing the operations of a queue.
3. Write a C program to implement the operations on priority queues.
4. Write a C to implement the operations on circular queues.
5. Write a C program to implement the operations on stacks.
6. Write a C program for evaluating a given postfix expression using stack.
7. Write a C program for converting a given infix expression to postfix form using stack.
8. Write a C program to implement the operations on single linked list.
9. Write a C program for demonstrate operations on double linked list.
10. Write a C program for the representation of polynomials using circular linked listand for the addition of two such polynomials
11. Write a C program to create a binary search tree and for implementing the in order, Pre order, post order traversal using recursion
12. a) Write a C program for finding the transitive closure of a digraph
    b) Write a C program for finding the shortest path from a given source to any vertexin a digraph using Dijkstra's algorithm.
13. a) Write a C program for finding the Depth First Search of a graph.
    b) Write a C program for finding the Breadth First Search of a graph

References:

1. Data Structures Using C and C++ Yddish Langsam,Moshe J. Augenstein and Aaron M.Tanenbaum, Prentice Hall Of India (2nd Edition)
2. Data Structures, Algorithms and Applications with C++, Sahani Mc-Graw Hill.

ANDHRA UNIVERSITY

DEPARTMENT OF COMPUTER SCIENCE AND SYSTEM ENGINEERING

SCHEME AND SYLLABI

(With effect from 2022-23 admitted batch)

B. TECH Computer Science and Engineering (Artificial Intelligence and Machine Learning)

(Common with CSE and IT)

II Year - I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
AI2101	ES	Discrete Mathematical Structures	4	0	30	70	100	3
AI2102	PC	Computer Organization and Architecture	4	0	30	70	100	3
AI2103	BS	Probability, Statistics and Queuing theory	4	0	30	70	100	3
AI2104	PC	Operating Systems	4	0	30	70	100	3
AI2105	PC	Object Oriented Programming Through Java	4	0	30	70	100	3
AI2106	PC	Computer Organization & Architecture Lab	0	3	30	70	100	1.5
AI2107	PC	Object Oriented Programming Through Java Lab	0	3	50	50	100	1.5
AI2108	PC	Operating Systems Lab	0	3	50	50	100	1.5
AI2109	SC	Intellectual Property Rights (Internal)	1	2	100	0	100	2
AI2110	MC	Environmental Science	0	0	-	100	100	0
Total credits								**21.5**

AI2101 DISCRETE MATHEMATICAL STRUCTURES

Course Objectives

- To understand mathematical arguments using logical connectives and quantifiers and verify the validity of logical flow of arguments using propositional, predicate logic and truth tables.
- To understand about permutations and combinations.
- To understand various types of relations and discuss various properties of the relations.
- To study the graphs, graph isomorphism and spanning trees.
- To study about Boolean algebra and Finite State Machines.

Course Outcomes

At the end of the course student will be able to

- Rewrite mathematical arguments using logical connectives and quantifiers and verify the validity of logical flow of arguments using propositional, predicate logic.
- Identify and give examples of various types of relations and describe various properties of the relations.
- Ability to solve problems using permutations and combinations.
- Determine isomorphism of graphs and spanning tree of a given graph using BFS/DFS algorithms. Also determine minimal spanning tree of a given graph.

SYLLABUS

The Foundations-Logic and Proofs: Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers Rules of Inference, Introduction to Proofs, Proof Methods and Strategy, Basic Structures-Sets, Functions, Sequences and Sums: Sets, Set Operations, Functions, Sequences and Summations.

The Fundamentals-Algorithms, the Integers and Matrices: Algorithms, The Growth of Functions, Complexity of Algorithms, The Integers and Division, Primes and Greatest Common Devisors, Integers and Algorithms, Applications of Number Theory, Matrices.

Induction and Recursion: Mathematical Induction, Strong Induction and Well-Ordering, Recursive Definitions and Structural Induction, Recursive Algorithms, Program Correctness.
Counting: The Basics of Counting, The Pigeonhole Principle, Permutations and Combinations, Binomial Coefficients, Generalized Permutations and Combinations, Generating Permutations and Combinations.

Advanced Counting Techniques: Recurrence Relations, Solving Linear Recurrence Relations, Divide-and-Conquer Algorithms and Recursion Relations, Generating Functions, Inclusion-Exclusion, and Applications of Inclusion-Exclusion.
Relations: Relations and their properties, n-ary relations, applications, Representation, closure, equivalence relations, Partial orderings.

Graphs: Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Colouring.

Trees: Introduction to Trees, Applications of Trees, Tree Traversal, Spanning Trees, Minimum Spanning Trees,

Boolean Algebra: Boolean Functions, Representing Boolean Functions, Logic Gates,Minimization of Circuits

Modelling Computation: Languages and Grammars, Finite-State Machines with Output, Finite-State Machines with No Output, Language Recognition, Turing Machines.

Text Book

1. Discrete Mathematics & Its Applications with Combinatorics and Graph Theory byKenneth H Rosen, Tata McGraw-Hill Publishing Company Ltd., New Delhi.

Reference Books

1. Discrete Mathematics for Computer Scientists & Mathematicians by Joe L. Mott,Abraham Kandel, Theodore P. Baker, Prentice-Hall, India.
2. Discrete Mathematics by Richard Johnson Baug, Pearson Education, New Delhi.
3. Discrete and Combinatorial Mathematics by Ralph. G. Grimaldi, Pearson Education,New Delhi.

AI2102 COMPUTER ORGANIZATION AND ARCHITECTURE

Course Objectives

- To study about structure and functional components of a computer.
- Understanding the hierarchical organization of a computer system which consists of instruction set of commands.
- Learn about the architecture of a computer from a programming view.
- To design a balance system that minimizes performance and utilization of all elements.

Course Outcomes

By the end of the course, the student should be able to:

- Demonstrate knowledge about major components of a computer such as processor, memory and I/O modules along with their interconnections internally with outsideworld.
- have detailed idea about architecture of central processing unit, functions of control unit, memory, I/O devices and their issues.
- Understand simple and multiple processor organization and their issues.

SYLLABUS

Register Transfer and Micro operations: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations, Arithmetic Logic Shift Unit.

Basic Computer Organization and Design: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-ReferenceInstructions, Input- Output and Interrupt, Complete Computer Description, Design of Basic Computer, Design of Accumulator Logic.

Micro programmed Control: Control Memory, Address Sequencing, Micro program Example, Design of Control Unit.

Central Processing Unit: Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer (RISC), Architecture and Programming of 8085 Microprocessor

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISK Pipeline, Vector Processing, Array Processors.

Input/output Organization: Peripheral Devices, I/O interface, Asynchronous data transfer, Modes of transfer, priority Interrupt, Direct memory access, Input-Output Processor (IOP), Serial Communication.

Memory Organization: Memory Hierarchy, Main memory, Auxiliary memory, Associate Memory, Cache Memory, and Virtual memory, Memory Management Hardware.

Text Books

1. Computer System Architecture, M. Morris Mano, Prentice Hall of India Pvt. Ltd., ThirdEdition, Sept.2008.
2. Computer Architecture and Organization, P.Chakraborty.
3. Microprocessor Architecture, Programming and Applications with the 8085by RameshS Gaonkar

Reference Books

1. Computer Architecture and Organization, William Stallings, PHI Pvt. Ltd., EasternEconomy Edition, Sixth Edition, 2003.
2. Computer Organization and Architecture, Linda Null, Julia Lobur, Narosa PublicationsISBN81- 7319-609-5
3. Computer System Architecture", John. P.Hayes.

AI2103 PROBABILITY, STATISTICS AND QUEUING THEORY

Course objectives

- To provide foundations of probabilistic and statistical analysis
- To provide an understanding on concepts of probability, random variables, probability distributions, sampling, estimation, hypothesis testing, regression, correlation, multiple regression, hypothesis testing, sample test, queuing methods
- To explore applications of probabilistic and statistical tools to solve real world problems.

Course outcomes

After completion of the course the student should be able to:

- Define and explain basic concepts in probability theory and how to translate real-world problems into probability models
- Solve standard problems that include random variables, discrete and continuous probability distributions
- Perform Test of Hypothesis and construct a confidence interval to estimate population parameters
- Compute and interpret the results of Correlation Analysis, Multivariate Regression, Chi-Square test for Independence and Goodness of Fit
- Explain basic concepts in Markov processes, M/M/1 and M/M/C queueing systems.

SYLLABUS

Probability: Definitions of probability, Addition theorem, Conditional probability, Multiplication theorem, Bayes Theorem of Probability and Geometric Probability.

Random variables and their properties: Discrete Random Variable, Continuous Random Variable, Probability Distribution, Joint Probability Distributions their Properties, Transformation Variables, Mathematical Expectations, Probability Generating Functions.

Probability Distributions: Discrete Distributions: Binomial, Poisson Negative Binominal Distributions and Their Properties; **Continuous Distributions:** Uniform, Normal, Exponential Distributions And Their Properties.

Multivariate Analysis: Correlation, Correlation Coefficient, Rank Correlation, Regression Analysis, Multiple Regression, Attributes, Coefficient Of Association, Chi Square Test For Goodness Of Fit, Test For Independence.

Estimation: Sample, Populations, Statistic, Parameter, Sampling Distribution, Standard Error, Un-biasedness, Efficiency, Maximum Likelihood Estimator, Notion & Interval Estimation.

Testing of Hypothesis: Formulation of Null hypothesis, critic al region, level of significance, power of the test;

Sample Tests: Small Sample Tests: Testing equality of means, testing equality of variances, test of correlation coefficient, test for Regression Coefficient; Large Sample tests: Tests based on normal distribution

Queuing Theory: Queue description, characteristics of a queuing model, study state solutions of M/M/1: Model, M/M/1; N Model, M/M/C: Model, M/M/C: N Model, Case studies.

Text Books

1. Probability & Statistics for Engineers and Scientists, Walpole, Myers, Myers, Ye. Pearson Education.
2. Probability, Statistics and Random Processes T.Veerarajan Tata McGraw – Hill

Reference Book

1. Probability & Statistics with Reliability, Queuing and Computer Applications, Kishor S. Trivedi, Prentice Hall of India ,1999

AI2104 OPERATING SYSTEMS

Course objectives:

- To understand evolution of Operating System.
- To understand operating system as a layer of abstraction above physical hardware that facilitates usage convenience and efficient resource management of computer system resources.
- To learn design and implementation of policies and mechanisms for OS subsystem.
- To investigate case studies to understand the design philosophies / paradigm for popularmultiuser or single user operating system.

Course Outcomes:

- The student understands OS evolution, its structure and services provided by it.
- Learn process life cycle, process scheduling objectives, policies and mechanisms, process synchronization, inter process communication, deadlocks and other process subsystem related concepts.
- Learn memory hierarchy, allocation and deallocation policies and mechanism for main and auxiliary memory, file system design and implementation issues.
- investigate UNIX/ LINUX and Windows OS platforms w.r.t similarities and differences in design philosophies.

SYLLABUS

Introduction to Operating Systems: Over View of Operating Systems, Types of Operating Systems, Operating System Structures, Operating System Services, System Calls, Virtual Machines, Operating System Design and Implementation.

Process Management: Process Concepts, Operations on Processes, Cooperating Processes, Threads, Inter Process Communication, Process Scheduling, Scheduling Algorithms, Multiple- Processor Scheduling, Thread Scheduling.

Process Synchronization: The Critical Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classical Problems of Synchronization, Critical Regions, Monitors.

Deadlocks: System Model, Deadlock Characterization, Methods For Handling Deadlocks, Deadlock Prevention, Avoidance, Deadlock Detection, Recovery from Deadlocks.

Memory Management: Logical versus Physical Address, Swapping, contiguous memory allocation, paging, structure of the page table, segmentation, Virtual Memory, Demand Paging, Page Replacement, Allocation of Frames, Thrashing, Memory-Mapped files.

File Systems, Implementation, and Secondary-storage Structure: Concept of a file, Access Methods, Directory Structure, Protection, File System Structure, Allocation Methods, Free Space Management, Directory Management, Device Drivers, overview of Mass-storage structure, Disk structure, disk attachment, disk scheduling, swap-space management.

Case study: Overview of LINUX, Windows Operating systems.

Text Book:

1. Operating Systems, Abraham Silberschatz, Peter Baer Galvin, and Greg Gagne, John Wiley Publ., Seventh Edition.
2. Operating Systems; A Practical Approach. Rajiv Chopra.

Reference Books:

1. Modern Operating Systems, Andrew S. Tanenbaum, ,2nd edition, 1995, PHI.
2. Operating Systems, William Stallings 5th Edition -PHI
3. Operating Systems: A Design-Oriented Approach', Charles Crowley, 'Tata Hill Co.,1998 edition.

AI2105 OBJECT ORIENTED PROGRAMMING THROUGH JAVA

Course Objectives:

- This subject will help to improve the analytical skills of object-oriented programming
- Overall development of problem solving and critical analysis
- Formal introduction to Java programming language

Course Outcome:

On successful completion of this course, the student should be able to:

- Show competence in the use of the Java programming language in the development of small to medium-sized application programs that demonstrate professionally acceptable coding and performance standard
- Understand the basic principles of the object-oriented programming
- Demonstrate an introductory understanding of graphical user interfaces, multi-threaded programming, and event-driven programming.

SYLLABUS

Introduction to Java: Basics of Java programming, Data types, Variables, Operators, Control structures including selection, Looping, Java methods, Overloading, Math class, Arrays in java.

Objects and Classes: Basics of objects and classes in java, Constructors, Finalizer, Visibility modifiers, Methods and objects, Inbuilt classes like String, Character, StringBuffer, File, this reference

Inheritance and Polymorphism: Inheritance in java, Super and sub class, Overriding, Object class, Polymorphism, Dynamic binding, Generic programming, Casting objects, Instance of operator, Abstract class, Interface in java, Package in java, UTIL package.

Event and GUI programming: Event handling in java, Event types, Mouse and key events, GUI Basics, Panels, Frames, Layout Managers: Flow Layout, Border Layout, Grid Layout, GUI components like Buttons, Check Boxes, Radio Buttons, Labels, Text Fields, Text Areas, Combo Boxes, Lists, Scroll Bars, Sliders, Windows, Menus, Dialog Box, Applet and its life cycle, Introduction to swing

I/O programming: Text and Binary I/O, Binary I/O classes, Object I/O, Random Access Files.

Multithreading in java: Thread life cycle and methods, Runnable interface, Thread synchronization, Exception handling with try-catch-finally, Collections in java, Introduction to JavaBeans and Network Programming.

Java Database Connectivity (JDBC): JDBC Product, Types of Drivers, Two-Tier Client/Server Model, Three-Tier Client/Server Model, Basic Steps of JDBC, Creating andExecuting SQL Statement, The Result Set Object, Working with Database MetaData Interface

Reference Books:

1 Introduction to Java Programming (Comprehensive Version), Daniel Liang, Seventh Edition, Pearson.

2 Programming in Java, Sachin Malhotra & Saurabh Chaudhary, Oxford University Press.

3 Murach's Beginning Java 2, Doug Lowe, Joel Murach and Andrea Steelman, SPD.

4 Core Java Volume-I Fundamentals, Eight Edition, Horstmann & Cornell, Pearson Education.

5 The Complete Reference, Java 2 (Fourth Edition), Herbert Schild, TMH.

6 Java Programming, D. S. Malik, Cengage Learning.

AI2106 COMPUTER ORGANIZATION & ARCHITECTURE LAB

Course Objectives

- to design and analyse the operational behaviour of IC gates, multiplexers, decoders,flip-flops, counters, shift registers, binary adders and subtractors and ALU.
- to implement assembly language programming using various trainers.
- to make students familiar with Pentium class PC architecture.

Course Outcomes

After completion of the course the student should be able to:

- analyse the operational behaviour of various digital logic units such as multiplexers, decoders, flip-flops, counters, shift registers, binary adders and subtractors and ALU.
- write assembly language code using various trainers.
- understand Pentium class PC architecture.

SYLLABUS

I - Cycle: Digital Logic Design
ExperimentsTTL Characteristics and TTL
IC Gates Multiplexers & Decoders
Flip-Flops
Counters
Shift Registers
Binary Adders &
SubtractorsA L U

II - CYCLE: 8085 Assembly Language Programming
8085 Assembly Language Programming according to theory course microprocessors-I usingthe following trainers:
Keyboard Monitor of 8085µP Trainer
Serial Monitor of 8085µP Trainer with Terminal
8085 Line Assembler of 8085µP Trainer with PC as Terminal
8085 Cross Assembler using In-Circuit Emulator (ICE) with 8085µP Trainer and PC asTerminal
Graded Problems are to be used according to the syllabus of computer organization
Pentiumclass pc architecture familiarization hardware & software parts demonstration

Reference Books

1. Computer System Architecture, M. Morris Mano, Prentice Hall of India Pvt. Ltd., ThirdEdition, Sept.2008
2. Microprocessor Architecture, Programming and Applications with the 8085 by RameshS Gaonkar.

AI2107 OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB

Course Objectives:

- To develop programs using basic OOPS concepts such as classes and objects.
- To implement programs using Inheritance concepts.
- To implement programs using Exception handling.
- To develop programs using operator overloading concepts.

Course Outcomes:

- Student will be able to use OOPs concepts.
- Ability to apply Inheritance concepts to several problems.
- Ability to use Exception Handling concepts.

List of Programs:

1. Program to define a structure of a basic JAVA program
2. Program to define the data types, variable, operators, arrays and control structures.
3. Program to define class and constructors. Demonstrate constructors.
4. Program to define class, methods and objects. Demonstrate method overloading.
5. Program to define inheritance and show method overriding.
6. Program to demonstrate Packages.
7. Program to demonstrate Exception Handling.
8. Program to demonstrate Multithreading.
9. Program to demonstrate I/O operations.
10. Program to demonstrate Network Programming.
11. Program to demonstrate Applet structure and event handling.
12. Program to demonstrate Layout managers.

AI2108 OPERATING SYSTEMS LAB

Course Objectives:

- To learn about UNIX/LINUX operating system environment.
- To learn about system calls for UNIX/LINUX Operating System.
- To understand resource management policies and mechanisms and their performance evaluation.

Course Outcomes:

- The student learns about multiprogramming, and multitasking capabilities of UNIX/LINUX.
- The student develops skill in writing C programs using system calls for process management, inter process communication and other aspects.
- The student learns to simulate OS resource management aspects like process scheduling, page replacement, disk scheduling, free space management and others to evaluate performance.

Syllabus

Module I

1. OS lab familiarization, Home Assignment on Unix commands, Vi editor
2. Simple shell programming exercises
3. Shell programming using decision making constructs, loop constructs, file anddirectory manipulation
4. Simple C programs using command line arguments, system calls, library function calls,make utility
5. C programs using system call to create processes and study parent, child process mechanism
6. C programs to create process chaining, spawning
7. C programs to error handling using errno(), perror() function
8. C programs to use pipe system call for inter process communication

Module II

1. C programs to study process scheduling implementing FCFS, Shortest Job First, andRound Robin algorithms
2. C programs to study page replacement implementing FIFO, Optimal, and LRU pagereplacement algorithms
3. C programs to study deadlock avoidance and detection
4. C Programs to simulate free space management (first fit, best fit, worst fit).
5. C programs to study disk scheduling algorithms (i.e., SCAN, SSTF, LOOK, etc.,)

References:

1. Unix concepts and applications by Sumitabha Das, TMH Publications.
2. Unix programming by Stevens, Pearson Education.
3. Shell programming by Yashwanth Kanetkar.
4. Operating System Concepts by Silberschatz, and Peter Galvin.

AI2109 INTELLECTUAL PROPERTY RIGHTS

Course Objective:

- To introduce the students to Intellectual Property Rights (IPR) which is a key component in modern knowledge management processes
- To create consciousness on IPR in students at an early stage of their education so that they develop an appreciation for ethical and rightful use of existing knowledge
- To make them understand how to take ownership of knowledge they may develop as a result of their creative innovations, take ownership and either drive themselves inbecoming entrepreneurs or become responsible knowledge users in society
- To expose students some of the recent debates on the societal implications of IPR and its role in national/international trade and socio-economic development.

Course outcome:

Learners will be able to

- identify the types of intellectual property protection available for their research outcome
- conduct patent search and analyse patentability of the invention
- understand the basic structure of Patent document
- understand the registration and prosecution of different IPs
- understand the basics of IP commercialization and techno/commercial/legal issues in IPR commercialization

SYLLABUS

Introduction: Concept of property, Intellectual Property (IP) and Intellectual Property Rights (IPR), Importance of IP, Value creation through IP, Advantages of IP protection, Competitive advantage, Promotion of social good, Prevention of duplicates, counterfeit products and IP.

Evolution of IP system: Historical view of IP system in India and abroad, Legal basis and rationale behind development of IP system, WTO and TRIPS agreement, Role of WIPO.

Types of IPR: Major forms of IP in India and globally, Acts enacted in India related to IP.

Patent: Concept, Life of patent, Rights of Patentee, Criteria of patentability- novelty, non- obviousness, and utility, Non-patentable inventions.

Patent filing and prosecution: Prior art search, Process of obtaining a patent in India, Provisional and complete specification, Convention application, Patent Cooperation Treaty(PCT), Patent Infringement and Enforcement.

Trademark: Types of trademarks, Trademark and Brand, Trademark Registration, Trademark Infringement.

Copyright: Copyrights and related rights, Copyright registration, Copyright infringement, Section 52 of Indian Copyright Act.

Industrial Design: What is Industrial design, Design registration, Design infringement.

Trade Secret: What are Trade Secrets, How trade secrets are maintained in trade and business.

Other forms of IP: Semiconductor Integrated Circuits Layout Design, Geographical Indications, Protection of Plant Varieties & Farmers' right, Traditional knowledge.

IP commercialization: Licensing & Royalty; Technology Transfer; IP assignment, Compulsory License.

Emerging areas: Pat informatics, IP and bank loan, IP insurance, IP audit, IP valuation, IP management, Use of artificial intelligence in IP enforcement, Open innovation.

Text Books

1. Ganguli Prabuddha, Gearing up for Patents The Indian Scenario", Universities Press (1998)
2. Ganguli Prahuddha "Intellectual Property Rights-Unleashing the Knowledge Economy". Tata McGraw Hill (2001)
3. Geographical Indications of Goods Act 1990 Ganguli Piabaddha "Geographical Indications-its evolving contours accessible in http ips. nminsoda/files/2012/05/main book pdf (2009)

Reference Books

1. Ganguli Prabuddha and Jahade Siddharth, "Nanotechnology Intellectual Property Rights Research, Design, and Commercialisation", CRC Press, Taylor and Francis Group, USA (2012)
2. Beyond Intellectual Property: Toward Traditional Resource Rights for Indigenous Peoples and Local Communities [Paperback J,Darrell A. Posey and Graham Dotfield, IDRC Books; annotated edition (June (1996)
3. Netancl Neil Weinstock, Copyright's Paradox, Oxford University Press (2010)
4. The Indian Patents Act 1970 (as amended in 2005)
5. The Indian Copyright Act 1950 as amended in 2017)
6. Indian Trademarks Act 1999
7. The Indian Industrial Designs Act 2000
8. The Protection of Plant Varieties and Farmers' Right Act 2001
9. Inventing the Future: An Introduction to Patents for small and medium sized enterprises, WIPO publication No 917 www.wipo.int/ebookshop
10. Looking Good: An Introduction to Industrial Designs for Small and Medium sized Enterprises; WIPO publication No.498 www.wipo.int/ebookshop

AI2110 ENVIRONMENTAL SCIENCE

Course Objectives

The objectives of the Environmental Science course are to

- Familiarize the fundamental aspects of environment and the environmentalmanagement'
- Provide information of some of the important international conventions which will beuseful during the future endeavours after graduation.
- Make realize the importance of natural resources management for the sustenance of thelife and the society.
- Apprise the impact of pollution getting generated through the anthropogenic activitieson the environment
- Provide the concept of Sustainable Development, energy and environmentalmanagement
- Impart knowledge on the new generation waste like e-waste and plastic waste.

Course Outcomes

After completion of the course the students will have

- Knowledge on the fundamental aspects of environment and the environmentalmanagement
- The knowledge on the salient features of the important international conventions
- Understanding of the importance of natural resources management for the sustenanceof the life and the society.
- Familiarity on various forms of pollution and its impact on the environment.
- Understand the elements of Sustainable Development, energy and environmentalmanagement
- Knowledge on the new generation waste like e-waste and plastic waste.

SYLLABUS

Introduction: Structure and functions of Ecosystems-Ecosystems and its Dynamics-Value of Biodiversity-impact of loss of biodiversity, Conservation of bio-diversity. Environmental indicators - Global environmental issues and their impact on the ecosystems. Salient featuresof international conventions on Environment: Montreal Protocol, Kyoto protocol, Ramsar Convention on Wetlands, Stockholm Convention on Persistent Organic Pollutants, United Nations Framework Convention on Climate Change (UNFCCC),

Natural Resources Management: Importance of natural resources management-Land as resource, Land degradation, Soil erosion and desertification, Effects of usage of fertilizer, herbicides and pesticide-watershed management.

Forest resources: Use and over-exploitation, Mining and dams – their effects on forest ecosystems and the living beings.

Water resources: Exploitation of surface and groundwater, Floods, droughts, Dams: benefits and costs.

Mineral Resources: Impact of mining on the environment and possible environmental management options in mining and processing of the minerals. Sustainable resource management (land, water, and energy), and resilient design under thechanging environment.

Environmental Pollution: Local and Global Issues. Causes, effects and control measures. Engineering aspects of environmental pollution control systems.

Air pollution: impacts of ambient and indoor air pollution on human health. Water pollution: impacts water pollution on human health and loss of fresh water resources. Soil pollution andits impact on

environment. Marine pollution and its impact on blue economy. Noise pollution.

Solid waste management: Important elements in solid waste management- Waste to energy concepts. Air (prevention and control of pollution) Act, Water (prevention and control of pollution) Act and their amendments. Salient features of Environmental protection Act, 1986.

Sustainable Development: Fundamentals of Sustainable Development– Sustainability Strategies and Barriers – Industrialization and sustainable development. Circular economy concepts in waste (solid and fluid) management.

Energy and Environment: Environmental Benefits and challenges, Availability and need of conventional energy resources, major environmental problems related to the conventional energy resources, future possibilities of energy need and availability. Solar Energy: process of photovoltaic energy conversion, solar energy conversion technologies and devices, their principles, working and applications, disposal of solar panel after their usage. Biomass energy:
Concept of biomass energy utilization, types of biomass energy, conversion processes, Wind Energy, energy conversion technologies, their principles, equipment and suitability in context of India.

Management of plastic waste and E-waste: Sources, generation and characteristics of various e- and plastic wastes generated from various industrial and commercial activities; Waste management practices including onsite handling, storage, collection and transfer. E-waste and plastic waste processing alternatives. E-Waste management rules and Plastic waste management rules, 2016 and their subsequent amendments.

Text Books:

1. Bharucha,Erach (2004). Textbook for Environmental Studies for Undergraduate Courses of all Branches of Higher Education, University Grants Commission, New Delhi.
2. Basu, M., Xavier, S. (2016). Fundamentals of Environmental Studies, Cambridge University Press, India
3. Masters, G. M., &Ela, W. P. (1991). Introduction to environmental engineering and science. Englewood Cliffs, NJ: Prentice Hall.
4. Enger, E. and Smith, B., Environmental Science: A Study of Interrelationships, Publisher: McGraw-Hill Higher Education; 12th edition, 2010.

Reference Books:

1. Sharma, P. D., & Sharma, P. D. (2005). Ecology and environment. Rastogi Publications
2. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
3. Clark R.S. (2001). Marine Pollution, Clanderson Press Oxford (TB)
4. Jadhav, H & Bhosale, V.M. (1995). Environmental Protection and Laws. Himalaya Pub. House, Delhi 284 p.
5. MoEF&CC, Govt. of India, CPCB: E-waste management rules, 2016 and its amendments 2018.
6. MoEF&CC, Govt. of India, CPCB: Plastic waste management rules, 2016.

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ANDHRA UNIVERSITY

DEPARTMENT OF COMPUTER SCIENCE AND SYSTEM ENGINEERING

SCHEME AND SYLLABI

(With effect from 2022-23 admitted batch)

B. TECH Computer Science and Engineering (Artificial Intelligence and Machine Learning)

(Common with CSE and IT)

II Year - II Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
AI2201	ES	Microprocessors	4	0	30	70	100	3
AI2202	PC	Design and Analysis of Algorithms	4	0	30	70	100	3
AI2203	PC	Database Management Systems	4	0	30	70	100	3
AI2204	PC	Formal Languages & Automata Theory	4	0	30	70	100	3
AI2205	HSS	Managerial Economics	4	0	30	70	100	3
AI2206	PC	Algorithms Lab through CPP.	0	3	50	50	100	1.5
AI2207	PC	Database Management Systems Lab	0	3	50	50	100	1.5
AI2208	SC	Web Technologies	1	2	50	50	100	2
AI2209	MC	Professional Ethics& Universal Human Values	0	0	0	100	100	0
AI2210	MC	NCC/NSS	0	2	-	-	-	0
Total credits								**20**
Internship-I								

AI2201 MICROPROCESSORS

Course Objectives:

- To discuss the architectures of 8085, 8086 microprocessors, their instruction sets and related ALP programs.
- To discuss interfacing semiconductor memories, interfacing peripheral to Intel 8086.
- To study interfacing data converters to 8086 and discuss about micro controller 8051 architecture.

Course Outcomes:

- Understand the basic architectures of 8085 and 8086 microprocessors.
- Ability to write ALP programs using instruction sets.
- Understand the various interfacing concepts and micro controllers.

SYLLABUS

Introduction to Microprocessors and Microcomputers: A Brief Architecture and Programming of 8085Microprocessor.

Architecture: Instruction Set and Programming of 8086Microprocessor

Interfacing Semiconductor Memories and I/O Devices: Semiconductor Memories: Classification Internal Organization& Functional Description, Interfacing SRAMs and EPROMs to8086, Interfacing Characteristics of I/Devices, I/O Device addressing methods, I/O Device Programming Methods.

Interfacing Peripherals to Intel8086 -1: Parallel I/O Interface- 8255, Serial I/O Interface – 8251, Timer Interface -8253/8254

Interfacing Peripheral to Intel 8086 - 2: Keyboard / Display Interface – 8279, Interrupt Controller Interface – 8259

Interfacing Data Converters to 8086: D/A Conversion Methods, A/D Conversion methods, Interfacing DAC, Interfacing ADC.

Introduction to Micro controllers: Intel 8051Architecture and Programming

Text Books:

1. Microprocessor Architecture, Programming, and Applications with the 8085 RameshS.Gaonkar, 4thEdition, PenramInternational,1999
2. The 80x86 Family, Design, Programming and Interfacing, John E.Uffenbeck,3rdEdition,Pearson Education Inc.,2002
3. KennethJ.Ayala, 8051 Microcontroller Architecture, Programming And Applications,2ndEdition, Penram International Publications,1999

Reference Books:

1. BARRYB.BREY, The Intel Microprocessors 8086 / 8088, 80186 / 80188, 80286, 80386 and 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium4, Architecture, Programming and Interfacing, 8th Edition, Pearson Education Inc.,2009
2. Walter A. Tribeland, Avtar Singh, The 8088 and 8086 Microprocessors, Programming, interfacing, Software, Hardware, and Applications, 4thEdition, Pearson Education Inc.,20033. Microprocessors and Interfacing, Programming and Hardware, 2ndEdition, Douglass V. Hall, TMH Edition,1999
3. Sanjay K Bose, Hardware and Software of Personal Computers, New AgeInternational (P)Ltd.,1991 Myke Predko, Programming and Customizing the 8051 Microcontroller, TMH,1999

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AI2202 DESIGN AND ANALYSIS OF ALGORITHMS

Course Objectives:

Upon completion of this course, students will be able to do the following:

- Analyse the asymptotic performance of algorithms.
- Write rigorous correctness proofs for algorithms.
- Demonstrate a familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations

Course Outcomes:

Students who complete the course will have demonstrated the ability to do the following:

- Argue the correctness of algorithms using inductive proofs and invariants.
- Analysis worst-case running times of algorithms using asymptotic analysis.
- Describe the divide-and-conquer paradigm and explain when an algorithmicdesign situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and conquer algorithms. Derive and solve recurrencesdescribing the performance of divide and-conquer algorithms.
- Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic programming algorithms, and analysis them.
- Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms, and analysis them.

SYLLABUS

Introduction: What is an Algorithm, Algorithm Specification, Pseudocode Conventions Recursive Algorithm, Performance Analysis, Space Complexity, Time Complexity, Amortized Complexity, Amortized Complexity, Asymptotic Notation, Practical Complexities, Performance Measurement.

Divide and Conquer: General Method, Defective Chessboard, Binary Search, Finding the Maximum and Minimum, Merge Sort, Quick Sort, Performance Measurement, Randomized Sorting Algorithms.

The Greedy Method: The General Method, Knapsack Problem, Job Sequencing with Deadlines, Minimum-cost Spanning Trees, Prim's Algorithm, Kruskal's Algorithms, An Optimal Randomized Algorithm, Optimal Merge Patterns, Single Source Shortest Paths.

Dynamic Programming: All - Pairs Shortest Paths, Multistage graphs, optimal binary search tree, String editing, 0/1 Knapsack, Reliability Design.

Backtracking: The General Method, The 8-Queens Problem, Sum of Subsets, Graph Colouring, Hamiltonian Cycles, Knapsack problem

Branch and Bound: Least cost (LC) Search, The 15-Puzzle, Control Abstraction for LC- Search, Bounding, FIFO Branch-and-Bound, LC Branch and Bound, 0/1 Knapsack Problem, LC Branch-and Bound Solution, FIFO Branch-and-Bound Solution, Traveling Salespersonproblem.

Limitations of Algorithm Power: Lower-Bound Arguments, Decision Trees, P, NP and NP – complete problems – Challenges of Numerical Algorithms. Limitations of Algorithms Power: Backtracking – Branch-and Bound– Approximation Algorithms for NP-hard Problems – Algorithms for solving Nonlinear Equations.

Text Books:

1. Fundamentals of computer algorithms E. Horowitz S. Sahni, Sanguthevar Rajasekaran, University Press.
2. Introduction to Algorithms by Thomas H. Corman, Charles E. Leiserson, Ronald R.Rivest & Clifford Stein, Prentice Hall of India, New Delhi, New Delhi.

Reference Books:

1. Data structures and algorithm analysis in C++ / Mark Allen Weiss, FloridaInternational University. — Fourth edition.
2. Introduction to Design & Analysis of Algorithms by Anany Levitin, PearsonEducation, New Delhi, 2003
3. Introduction to Algorithms by Thomas H. Corman, Charles E. Leiserson, Ronald R.Rivest & Clifford Stein, Prentice Hall of India, New Delhi, New Delhi.
4. The Design and Analysis of Computer Algorithms, Alfred V. Aho, John E.Hopcroft, Jeffrey D. Ullman

AI2203 DATABASE MANAGEMENT SYSTEMS

Course Objectives:

- To learn the evolution of DBMS Versus File systems, data models, and layers of abstraction.
- To understand conceptual and physical aspects of database design.
- To learn formal and commercial query language specifications.
- To understand concurrency control, recovery management, and other related issues.

Course Outcomes:

- The student will understand ER-modelling for conceptual database design and relational model.
- The student is introduced to formal and commercial query languages: RelationalAlgebra, calculus and SQL.
- The student will learn schema refinement and normalization.
- The student understands locking protocols concurrency control, and crash recoverymethods.

SYLLABUS

Introduction: File system versus a DBMS, Advantages of a DBMS, Describing and Storing Data in a DBMS, The Relational model, Levels of abstraction, Data Independence, Transaction management, Structure of a DBMS.

Introduction to Database Design and The Relational Model: Database Design and ER Diagrams, Entities, Attributes and Entity Sets, Relationships & Relationship Sets, Additional Features of the ER Model, Conceptual Design with ER Model, Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity Constraints, Querying Relational Data, Logical Database Design: ER to Relational, Introduction to Views,Destroying/ Altering Tables and Views.

Relational Algebra and SQL: Preliminaries, Relational Algebra, The form of a Basic SQL Query, UNION, INTERSECT and EXCEPT, Nested Queries, Aggregate Operators, Null Values, Complex Integrity Constraints in SQL, Triggers and Active Databases, Embedded SQL, Dynamic SQL, JDBC.

Database Design: Schema Refinement and Normal Forms, Introduction to Schema Refinement, Functional Dependencies, Reasoning about FD's, Normal Forms, Properties of Decomposition, Normalization, Other kinds of Dependencies.

Transaction Management: The ACID Properties, Transactions & Schedules, Concurrent Execution of Transactions, Lock-Based Concurrency Control.

Concurrency Control: 2PL, Serializability and Recoverability, Introduction to Lock Management, Lock Conversions, Dealing with Deadlocks, Specialized Locking Techniques, Concurrency Control without Locking.

Crash Recovery: Introduction to ARIES, The Log, Other Recovery-Related Structures, The Write-Ahead Log Protocol, Check pointing, Recovering from a System Crash, Media Recovery.

Text Books:

1. Database Management Systems; Raghu Ramakrishnan, Johannes Gehrke 4th Edition,McGraw-Hill.

Reference:

1. Database System Concepts; A. Silberschatz, H. Korth 5th Edition, McGraw-Hill

AI2204 FORMAL LANGUAGES AND AUTOMATA THEORY

Course objectives:

- To introduce the concepts in automata theory and theory of computation to design grammars and recognizers for different formal languages.
- To employ finite state machines to solve problems in computing.
- To introduce finite state machines, context free grammars and Turing Machines and their properties as the basis for the formal expressivity of computer languages for solving linguistic decision problems.
- To understand the concepts of tractability and decidability, the concepts of NP- completeness and NP-hard problem and also the challenges for Theoretical Computer Science and its contribution to other sciences.

Course outcomes:

- Ability to think analytically and intuitively for problem-solving situations in related areas of theory in computer science
- Ability to describe the language accepted by an automata or generated by a regular expression or a context-free grammar;
- Ability to Understand the functioning of Finite-State Machines, Deterministic Finite- State Automata, Nondeterministic Finite-State Automata and Pushdown Automata and Turing Machines.

SYLLABUS

Introduction to Grammars and Languages: Definitions of alphabet, strings, language, grammar, types of grammar, types of machines, generation of languages from grammar, construction of grammar from the given description of languages, Chomsky Hierarchy oflanguages.

Finite State Machine (FSM): Definition of finite state machine, Representation of FSMs. Classification of FSM's and their construction, Conversion from NFA to DFA, Elimination of ε – transitions from NFA, Equivalence of two FSM's, optimization of finite state machine (Equivalence theorem method and Table filling method), Finite state machine with output: Moore and Mealy machines. Applications of FSM.

Regular Expression and Languages: Regular Expression, Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Properties of Regular Languages: Pumping Lemma for regular Languages, Application ofPumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, Equivalence and Minimization of Automata.

Context Free Grammars and Languages: Context Free Grammars, Parse Trees, Applications of Context-Free Grammars, Ambiguity in Grammars and Languages, Normal Forms, Pumping Lemma for CFL, Closure properties of CFL, Decision properties for CFL.

Push down Automata: Definition of push down automata, The Languages of a PDA, push down automata, Equivalence of PDA's and CFG's, push down automata to context free grammar, context free grammar to push down automata, Deterministic Pushdown Automata.

Turing Machines: The Definition of Turing Machine, Turing Machine Model, Representation of Turing Machines, Language Acceptability by Turing Machines, Design of Turing Machines, Description of Turing Machines, Techniques for TM Construction, Variants of Turing Machines, Turing Machines and Type 0 Grammars.

Undecidability: A Language That Is Not Recursively Enumerable, An Undecidable Problem That Is RE, Undecidable Problems About Turing Machines, Decidable & Undecidable Problems, Post Correspondence Problem.

Text books:

1. Introduction to automata theory, languages and computation, John.E.H.P croft/ RajeevMotwani & JD Ullman—pearson education- III edition
2. Theory of computation, K.L.P.Mishra and N.Chandrasekhar, PHI

Reference Books:

1. Theory of computation, formal languages and automata theory, G P Saradhi Varma,B.Thirupathi Rao –Sci Tech publications.

AI2205 MANAGERIAL ECONOMICS

Course Objectives:

- To bring about an awareness about the nature of Managerial Economics and its linkageswith other disciplines.
- To understand the Micro and Macro Environment of Business.
- To familiarize the prospective engineers with the concepts and tools of Managerial Economics with an objective to understand the real world of business.

Course Outcomes:

After completion of the course, student will be able to:

- Understand the various economic activities in business and industry.
- Analyse the real-world business problems.
- Make optimal business decisions for the effective and efficient management ofOrganisations.

SYLLABUS

Significance of Economics and Managerial Economics:

Economics: Definitions of Economics- Wealth, Welfare and Scarcity definitions Classification of Economics- Micro and Micro Economics.

Managerial Economics: Definition, Nature and Scope of Managerial Economics, Differences between Economics and Managerial Economics, Main areas of Managerial Economics, Managerial Economics with other disciplines.

Demand and Utility Analysis:

Demand - Definition, Meaning, Nature and types of demand, Demand function, Law of demand - Assumptions and limitations. Exceptional demand curve.

Elasticity of demand - Definition, Measurement of elasticity, Types of Elasticity (Price, Income, Cross and Advertisement), Practical importance of Price elasticity of demand, Role of income elasticity in business decisions, Factors governing Price Elasticity of demand.

Utility Analysis: Utility- Meaning, Types of Economic Utilities, Cardinal and Ordinal Utility, Total Utility, Marginal Utility, The law of Diminishing Marginal Utility and its Limitations.

Theory of Production and Cost analysis:

Production - Meaning, Production function and its assumptions, use of production function in decision making; **Cost analysis** - Nature of cost, Classification of costs - Fixed vs. Variable costs, Marginal cost, Controllable vs. Non - Controllable costs, Opportunity cost, Incremental vs. Sunk costs, Explicit vs. Implicit costs, Replacement costs, Historical costs, Urgent vs. Postponable costs, Escapable vs. Unavoidable costs, Economies and Diseconomies of scale.

Market Structures: Definition of Market, Classification of markets; Salient features or conditions of different markets - Perfect Competition, Monopoly, Duopoly , Oligopoly, Importance of kinked demand curve ;Monopolistic Competition.

Pricing and Business Cycles:

Pricing Analysis: Pricing – Significance; Different Pricing methods- Cost plus pricing, Target pricing, Marginal cost pricing, Going -rate pricing, Average cost pricing, Peak load pricing , Pricing of joint Products, Pricing over the life cycle of a Product, Skimming pricing Penetration pricing, Mark- up and

Mark- down pricing of retailers.

Business cycles - Definition, Characteristics, Phases, Causes and Consequences; Measures to solve problems arising from Business cycles.

Text Books:

1. Sankaran,S., Managerial Economics, Marghan Publications, 2015, Chennai.
2. Aryasri, A.R., Managerial Economics and Financial Analysis, MC Graw HillEducation, New Delhi,2015.

Reference Books:

1. Dwivedi, D.N., Managerial Economics, Vikhas Publishing House Pvt. Ltd. 6thEdition, New Delhi,2004.
2. Dewett, K.K., Modern Economic Theory, S.Chand & Company Ltd., New Delhi,2005.

AI2206 ALGORITHMS LAB Through C++

Course objectives:

- The laboratory component will emphasize two areas:
- Implementation of algorithms covered in class: This will involve running the algorithms under varying input sets and measuring running times, use of different data structures for the same algorithm (wherever applicable) to see its effect on time and space, comparison of different algorithms for the same problem etc.
- Design of Algorithms: This will involve design and implementation of algorithms for problems not covered in class but related to topics covered in class.
- The exact set of algorithms to design and implement is to be decided by the instructor.In addition, there will be at least one significantly large design project involving some real world application. An efficient design of the project should require the use of multiple data structures and a combination of different algorithms/techniques.

Course Outcomes:

The student should be able to:

- Design algorithms using appropriate design techniques (brute-force, greedy, dynamic programming, etc.)
- Implement a variety of algorithms such assorting, graph related, combinatorial, etc., in ahigh level language.
- Analyze and compare the performance of algorithms using language features.
- Apply and implement learned algorithm design techniques and data structures to solvereal-world problems.

Programs List:

1. a) Create a CPP class called Student with the following details as variables within it.
   (i) Register_number
   (ii) Student_name
   (iii) Programme_name
   (iv) Phone _number
   Write a program to create nStudent objects and print the Register_number, Student_name, Programme_name, and Phone_number of these objects with suitable headings.

   b). Write a program to implement the Stack using arrays. Write Push (), Pop(), andDisplay() methods to demonstrate its working.

2. a). Design a superclass called Staff with details as StaffId, Name, Phone, Salary. Extend this class by writing three subclasses namely Teaching (domain, publications), Technical (skills), and Contract (period). Write a CPP program to read and display at least 3 staff objects of all three categories.

   b). Write a class called Customer to store their name and date_of_birth. The date_of_birth format should be dd/mm/yyyy. Write methods to read customer data as and display as using StringTokenizer class considering the delimiter character as "/".

3. a). Write a program to read two integers a andb. Compute a/b and print, when b is not zero. Raise an exception when b is equal to zero.

   b). Write a program that implements a multi-thread application that has three threads. First thread generates a random integer for every 1 second; second thread computes the square of the number

and prints; third thread will print the value of cube of the number.

4. Sort a given set of n integer elements using Quick Sort method and compute its time complexity. Run the program for varied values of n> 5000 and record the time taken to sort. Plot a graph of the time taken versus non graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using CPP how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.
5. Sort a given set of n integer elements using Merge Sort method and compute its time complexity. Run the program for varied values of n> 5000, and record the time takento sort. Plot a graph of the time taken versus non graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using CPP how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.
6. Implement the Knapsack problem using (a) Dynamic Programming method (b) Greedy method.
7. Write a program-from a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm..
8. Find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal's algorithm. Use Union-Find algorithms in your program.
9. Find Minimum Cost Spanning Tree of a given connected undirected graph using Prim's algorithm.
10. Write programs to
    (a) Implement All-Pairs Shortest Paths problem using Floyd's algorithm.
    (b) Implement Travelling Sales Person problem using Dynamic programming.
11. Design and implement in CPP, to find a subset of a given set S = {Sl, S2,.... ,Sn} of n positive integers whose SUM is equal to a given positive integer d. For example, if S ={1, 2, 5, 6, 8} and d= 9, there are two solutions {1,2,6}and {1,8}. Display a suitablemessage, if the given problem instance doesn't have a solution.
12. Design and implement in CPP to find all Hamiltonian Cycles in a connected undirectedGraph G of n vertices using backtracking principle.

REFERENCES:

1. T. H. Cormen, C. L. Leiserson, R. L. Rivest, and C. Stein, Introduction to Algorithms, MIT Press.
2. J. Kleinberg and E. Tardos, Algorithm Design, Addison-Wesley.
3. Harry R. Lewis and Larry Denenberg, Data Structures and Their Algorithms, Harper Collins.
4. A. Gibbons, Algorithmic Graph Theory, Cambridge University Press.
5. Michael T. Goodrich and Roberto Tamassia, Algorithm Design: Foundations, Analysis,and Internet Examples, John Wiley.
6. R. Sedgewick, Algorithms in C (Parts 1-5), Addison Wesley.
7. M. H. Alsuwaiyel, Algorithm Design Techniques and Analysis, World Scientific.
8. Gilles Brassard and Paul Bratley, Algorithmics: theory and practice, Prentice-Hall.
9. Udi Manber, Introduction to Algorithms: A Creative Approach, Addison-Wesley.
10. Sara Baase and Allen Van Gelder, Computer Algorithms: Introduction to Design andAnalysis, Addison-Wesley.

AI2207 DATABASE MANAGEMENT SYSTEMS LAB

Course Objectives

- To introduce to a commercial DBMS such as ORACLE.
- To learn and practice SQL commands for schema creation, data manipulation.
- To learn conceptual and physical database design based on a case study.
- To apply database design stages by studying a case study.

Course Outcomes

By the end of the course, the student should be able to:

- The student is exposed to a commercial RDBMS environment such as ORACLE.
- The student will learn SQL commands for data definition and manipulation.
- The student understands conceptual through physical data base design.
- The student takes up a case study and applies the design steps.

SYLLABUS

Features of a commercial RDBMS package such as ORACLE/DB2, MS Access, MYSQL & Structured Query Language (SQL) used with the RDBMS.

I. Laboratory Exercises Should Include:

a. Defining Schemas for Applications,
b. Creation of Database,
c. Writing SQL Queries,
d. Retrieve Information from Database,
e. Creating Views
f. Creating Triggers
g. Normalization up to Third Normal Form
h. Use of Host Languages,
i. Interface with Embedded SQL,
j. Use of Forms
k. Report Writing

II. Some sample applications are given below:

1. Accounting Package for Shops
2. Database Manager for Magazine Agency or Newspaper Agency,
3. Ticket Booking for Performances,
4. Preparing Greeting Cards & Birthday Cards
5. Personal Accounts - Insurance, Loans, Mortgage Payments, Etc.,
6. Doctor's Diary & Billing System
7. Personal Bank Account
8. Class Marks Management
9. Hostel Accounting
10. Video Tape Library,
11. History of Cricket Scores,
12. Cable TV Transmission Program Manager,
13. Personal Library.
14. Sailors Database
15. Suppliers and Parts Database

Reference Books

1. Database Management Systems; Raghu Ramakrishnan, Johannes Gehrke 4th Edition,McGraw Hill
2. Database System Concepts; A. Silberschatz, H. Korth 5th Edition, McGraw-Hill

AI2208 ` WEB TECHONOLOGIES

Course objectives

- To facilitate the graduates with the ability to visualize, gather information, articulate, analyze, solve complex problems, and make decisions. These are essential to address the challenges of complex and computation intensive problems increasing their productivity.
- To facilitate the graduates with the technical skills that prepare them for immediate employment and pursue certification providing a deeper understanding of thetechnology in advanced areas of computer science and related fields, thus encouraging to pursue higher education and research based on their interest.
- To facilitate the graduates with the soft skills that include fulfilling the mission, setting goals, showing self-confidence by communicating effectively, having a positive attitude, get involved in team-work, being a leader, managing their career and their life.

Course outcomes

- Able to understand the working principles of the computer system and its components, apply the knowledge to build, asses, and analyze the software and hardware aspects of it.
- Develops comprehensive skills of Programming Languages, Software process models, methodologies, and able to plan, develop, test, analyze, and manage the software and hardware intensive systems in heterogeneous platforms individually or working in teams.
- Able to use the professional, managerial, interdisciplinary skill set, and domain specific tools in development processes, identify the research gaps, and provide innovative solutions to them.

Syllabus

1. Design the following static web pages required for an online book store web site.
   a) HOME PAGE: The static home page must contain three frames.
   b) LOGIN PAGE
   c) CATOLOGUE PAGE: The catalogue page should contain the details of all thebooks available in the web site in a table.
   d) REGISTRATION PAGE

2. Write JavaScript to validate the following fields of the Registration page.
   a) First Name (Name should contains alphabets and the length should not be less than6 characters).
   b) Password (Password should not be less than 6 characters length).
   c) E-mail id (should not contain any invalid and must follow the standard pattern name@domain.com)
   d) Mobile Number (Phone number should contain 10 digits only).
   e) Last Name and Address (should not be Empty).

3. Develop and demonstrate the usage of inline, internal and external style sheet using CSS

4. Develop and demonstrate JavaScript with POP-UP boxes and functions for the following problems:
   a) Input: Click on Display Date button using onclick( )
   functionOutput: Display date in the textbox
   b) Input: A number n obtained using promptOutput: Factorial of n number using alert
   c) Input: A number n obtained using prompt

Output: A multiplication table of numbers from 1 to 10 of n using alert
d) Input: A number n obtained using prompt and add another number using confirm
Output: Sum of the entire n numbers using alert

5. Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next in the list. Add CSS to customize the properties of the font of the capital (colour, bold and font size).
6. Write an HTML page including any required JavaScript that takes a number from text field in the range of 0 to 999 and shows it in words. It should not accept four and above digits, alphabets and special characters.
7. Develop and demonstrate PHP Script for the following problems:
   a) Write a PHP Script to find out the Sum of the Individual Digits.
   b) Write a PHP Script to check whether the given number is Palindrome or not
8. Create an XML document that contains 10 users information. Write a Java Program, which takes User Id as input and returns the user details by taking the user information from XML document using DOM parser or SAX parser.
9. Implement the following web applications using (a) PHP (b) Servlets (c) JSP
   a) A web application that takes a name as input and on submit it shows a hello page where name is taken from the request. It shows the start time at the right top corner of the page and provides a logout button. On clicking this button, it should show a logout page with Thank You message with the duration of usage (hint: Use session to store name and time).
   b) Write a PHP Program to display current Date, Time and Day.
   c) A web application that takes name and age from an HTML page. If the age is less than 18, it should send a page with "Hello, you are not authorized to visit the site" message, where should be replaced with the entered name. Otherwise, it should send "Welcome to this site" message.
   d) A web application that lists all cookies stored in the browser on clicking "List Cookies" button. Add cookies if necessary.
10. Implement the web applications with Database using (a) PHP, (b) Servlets and (c) JSP.
11. Modify the above PHP program to use an xml instead of database
12. Write a program to design a simple calculator using
    (a) JavaScript
    (b) PHP
    (c) Servlet and
    (d) JSP.

References:

1. Internet and Web Technologies by Raj Kamal, Tata McGraw-Hill.
2. Programming the World Wide Web by Robert W. Sebesta, Pearson Education.

AI2209 PROFESSIONAL ETHICS AND UNIVERSAL HUMAN VALUES

Course Objectives:

- To recognize the moral values that should guide the Engineering profession.
- To resolve moral issues concerning one's profession.
- To develop and exhibit a set of moral beliefs and attitudes that engineers should inculcate.
- To inculcate social values and morality in one's life.
- To develop awareness about Professional/Engineering Ethics and Human Values.

Learning Outcomes:

Students will be able to:

- Apply the conceptual understanding of ethics and values into everyday practice.
- Understand the importance of moral awareness and reasoning in life.
- Acquire professional and moral etiquette that an engineer requires.
- Develop the acumen for self-awareness and self-development.
- Develop cultural tolerance and integrity.
- Tackle real-life challenges with empathy.

SYLLABUS

HUMAN VALUES

Values - Respect - Caring - Sharing - Honesty- Courage - Self confidence - CommunalHarmony Morals - Virtues

PROFESSIONAL VALUES

Integrity - Discipline - Valuing time - Cooperation - Commitment - Code of conduct -Challenges in the workplace

PROFESSIONAL ETHICS

Overview - Engineering ethics - Moral issues - Profession - Models of professional roles - Responsibility

RESPONSIBILITIES AND RIGHTS

Safety and risk - Collegiality and loyalty - Confidentiality - Occupational crime - Humanrights - Employee rights - Intellectual property rights

GLOBAL ISSUES

Globalization - Environmental ethics - Computer ethics - Code of ethics - Multinationalcorporations - Engineers as advisors in Planning and Policy making

Textbook:

1. R.S. Nagarazan. *A Textbook on Professional Ethics and Human Values.* New AgeInternational Publishers. 2006.

Reference Books:

1. Premvir Kapoor. *Professional Ethics and Human Values.* Khanna Publishing House. 2019.
2. B.S. Raghavan. *Human Values and Professional Ethics.* S.Chand Publications. 2012.
3. R.R. Gaur & Others. *A Foundation Course in Human Values and Proff. Ethics*. ExcelBooks. 2009.
4. A. N. Tripathi. *Human Values*. New Age International (P) Limited. 2009
5. R. Subramanian. *Professional Ethics*. OUP India. 2013.

ANDHRA UNIVERSITY

DEPARTMENT OF COMPUTER SCIENCE AND SYSTEMS ENGINEERING

SCHEME AND SYLLABI

(With effect from 2022-23 admitted batch)

B. TECH Computer Science and Engineering (Artificial Intelligence and Machine Learning)

III Year - I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
AI3101	PC	Data Warehousing and Data Mining	4	0	30	70	100	3
AI3102	PC	Artificial Intelligence	4	0	30	70	100	3
AI3103	PC	Machine Learning Techniques	4	0	30	70	100	3
AI3104	PE	Professional Elective-I	4	0	30	70	100	3
AI3105	OE	Open Elective-I	4	0	30	70	100	3
AI3106	PC	Data Warehousing and Data Mining Lab	0	3	50	50	100	1.5
AI3107	PC	Machine Learning Techniques Lab	0	3	50	50	100	1.5
AI3108	SC	Skill Development Course-I: (Continuous Integration and Continuous Delivery using DevOps)	1	3	50	50	100	2
AI3109	INT	Internship-I	0	0	50	50	100	2
Summer Internship 2 Months (Mandatory) after 2nd year (to be evaluated during III year I Semester								
Total credits								**22**

AI3101 Data Warehousing and Data Mining

Prerequisites:

- Basic knowledge of probability and statistics.
- Basic Mathematics like Linear algebra.
- Knowledge of database management systems.

Course objectives:

The main objective of the course is to

- To understand the evolution of data warehousing and data mining systems
- To provide an understanding of data objects, similarity and dissimilarity metrics and
- preprocessing techniques.
- To impart knowledge about the basics of data warehousing and modelling using data
- cubes, OLAPs, AOI.
- To familiarize the concepts of mining frequent patterns based on Associations.
- To discuss about pattern mining using classification and clustering methods.

Course Outcomes:

By the end of the course student will be able to

- Understands data objects, attribute types, metrics, cleaning and transformation of data.
- Ability to represent and comprehend information with data warehousing technologies for multi dimensional modelling and generalization using Cubes, OLAPS and AOI.
- Grasp the concepts of Association mining using Apriori and FP- Growth.
- Learn about various approaches to supervised learning like classification approach.
- Learn about various approaches to unsupervised learning like clustering approach.

SYLLABUS

Introduction to Data Mining: Importance of Data Warehousing and Data Mining, Kinds of data, Kinds of patterns, Technologies, Applications, Major Issues in Data Mining Getting to know your data: Data Objects and Attributes Types, Statistical Descriptions of Data, Estimating Data Similarity and Dissimilarity, Data Visualization.

Data Preprocessing: Quality data, Data Cleaning, Data Integration, Data Reduction, Data Transformation, Discretization and Concept Hierarchy Generation.

Data Warehouse and OLAP Technology: Basic Concepts of Data warehouse, Data Modelling using Cubes and OLAP, DWH Design and usage, Implementation using Data Cubes and OLAPs, Data Generalization with AOI.

Mining Frequent Patterns Based on Associations and Correlations: Basic Concepts, Frequent Item set Mining Methods: Apriori Algorithm, Association Rule Generation, Improvements to A Priori, FP- Growth Approach, Pattern Evaluation Methods.

Classification and Prediction: Basic Concepts, Decision Tree Induction, Bayes Classification, Rule- Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy, Classification by Back Propagation, K-nearest neighbour classifier.

Cluster Analysis: Basic Concepts and issues in clustering, Requirements for Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density Based Methods, Grid Based Methods, Evaluation of Clustering Solutions.

Text Books:

1. Data Mining- Concepts and Techniques by Jiawei Han, Micheline Kamber and Jian
2. Pei–Morgan Kaufmann publishers –--3rd edition
3. Data Mining Techniques, A.K.Pujari, University Press.

References Books:

1. Data mining concepts byTan, Steinbech, and Vipin Kumar - Pearson Edu

AI3102 ARTIFICIAL INTELLIGENCE

Prerequisites: Discrete Mathematics, Data Structures and Algorithms

Course Objectives:

- To learn about AI problems, techniques and their modelling as state space search, problem characteristics, Production System categories.
- To learn different uninformed and heuristic search strategies for solving AI problems with examples
- To learn theorem proving with predicate logic, resolution, rule-based inference with forward and backward chaining
- Inheritable knowledge representation using slot-filler structures and dealing with different forms of uncertain and implicit knowledge
- To introduce essential concepts of plan generation, Natural Language understanding and Expert Systems.

Course Outcomes:

- By the end of the course the student understands, applies, evaluates and creates AI solutions as they are
- able to characterize and model AI problems in a state space search framework and identify appropriate production system category to solve them
- able to understand and evaluate pros & cons of different heuristic search strategies and apply appropriate heuristic search for specific problem solving scenario.
- able to represent domain knowledge in the form of predicates / rules and applies logic and inference for deducing the validity of a given assertion.
- able to create problem specific slot-filler knowledge structures and apply statistical, fuzzy and non-monotonic reasoning methods aptly to solve real world problems involving any type of uncertainty.
- able to understand basic concepts and approaches to natural language processing, plan generationand expert system development.

SYLLABUS

Introduction to Artificial Intelligence: Artificial Intelligence, AI Problems, AI Techniques, Defining the Problem as a State Space Search, Production Systems, control strategies, Uninformed search using BFS and DFS, Heuristic search, Problem Characteristics, Production system categories for AI problem solving

Heuristic Search Techniques: Issues in The Design of Search Programs, Generate-And- Test, Hill Climbing and its variants, Best-First Search, A* Algorithm, Problem Reduction, AO*Algorithm, Constraint Satisfaction, Means-Ends Analysis.

Knowledge Representation using Predicate Logic and Rules: Propositional Logic, First Order Predicate Logic: Representing Instance and is-a Relationships, Computable Functions and Predicates, Resolution in propositional logic, Resolution in predicate logic with Clause form, Unification & Resolution algorithm, Question answering, Procedural Vs Declarative Knowledge, Logic programming with Prolog, Forward Vs Backward Reasoning and combining them, Matching Techniques, Matching with variables, RETE Algorithm, Conflict resolution

Reasoning under Uncertainty: Introduction to Non-Monotonic Reasoning, Logics for Non monotonic reasoning, Depth first search with Dependency-directed backtracking, Justification based Truth Maintenance System, Statistical Reasoning: Bayes Theorem for probabilistic inference, Certainty Factors and Rule-Based Systems, Bayesian Belief Networks, Dempster Shafer Theory, Fuzzy Logic

Structured Representations of Knowledge: Semantic Nets, representing non-binary predicates, Partitioned Semantic Nets, Frames as sets and instances, Slots as full-fledged Objects, Property Inheritance through tangled hierarchies, Conceptual Dependency, Conceptual Dependency Graphs, Scripts, examples in natural language understanding, merits and demerits of strong slot filler structures.

Natural Language Processing: Steps in Natural Language Processing, Syntactic Processing and Augmented Transition Nets, Semantic Analysis and grammars, Discourse and pragmatic processing; Planning: Components of a Planning System, Goal Stack Planning, Non-linear Planning using Constraint Posting, Hierarchical Planning, Reactive Systems.

Experts Systems: Overview of an Expert System, Applications of expert systems, Components of an Expert Systems, Expert system development, Types of Expert Systems: Rule Based, Frame Based, NeuralNetwork based, Black Board Architectures, Case studies of successful expert systems, Expert System Shells, Knowledge Acquisition and Validation Techniques.

Text Books:

1. Artificial Intelligence, Elaine Rich and Kevin Knight, Tata McGraw -Hill Publications
2. Introduction To Artificial Intelligence & Expert Systems, Patterson, PHI publications

References:

1. Artificial Intelligence, George F Luger, Pearson Education Publications
2. Artificial Intelligence : A modern Approach, Russell and Norvig, Prentice Hal

AI3103 MACHINE LEARNING TECHNIQUES

Course Objectives:

- Identify problems that are amenable to solution by ANN methods, and which ML methods may be suited to solving a given problem.
- Formalize a given problem in the language/framework of different ANN methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, as a Markov decision process, etc).

Course Outcomes: After the completion of the course, student will be able to

- Explain the fundamental usage of the concept Machine Learning system
- Demonstrate on various regression Technique
- Analyze the Ensemble Learning Methods
- Illustrate the Clustering Techniques and Dimensionality Reduction Models in Machine Learning.
- Discuss the Neural Network Models and Fundamentals concepts of Deep Learning

Introduction- Artificial Intelligence, Machine Learning, Deep learning, Types of Machine Learning Systems, Main Challenges of Machine Learning.

End-to-End Machine Learning Project: Problem formulation, data collection, data visualization and preparation, selection and training a model, fine-tuning the model and launching the ML system. Dimensionality Reduction: the curse of dimensionality, main approaches for dimensionality reduction, principal component analysis, incremental, randomized, and kernel PCA algorithms.

Supervised Learning (Regression/Classification): Basic Methods: Distance based Methods, Nearest Neighbours, Decision Trees, Naive Bayes, Linear Models: Linear Regression, Logistic Regression, Generalized Linear Models, Support Vector Machines, Binary Classification: Multiclass/Structured outputs, MNIST.

Ensemble Learning and Random Forests: Introduction, Voting Classifiers, Bagging and Pasting, Random Forests, Boosting, Stacking.

Support Vector Machine: Linear SVM Classification, Nonlinear SVM Classification, SVM Regression, Naïve Bayes Classifiers.

Dimensionality Reduction: The Curse of Dimensionality, Main Approaches for Dimensionality Reduction, PCA, Using Scikit-Learn, Randomized PCA, Kernel PCA.

Neural Networks and Deep Learning: Introduction to Artificial Neural Networks with Keras, Implementing MLPs with Keras, Installing TensorFlow 2, Loading and Preprocessing Data with TensorFlow.

Text Books:

1. Aurélien Géron, “Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow,” 3rd Edition, O’Reilly Publications, 2022.

Reference Books:

1. Tom M. Mitchell, "Machine Learning", McGraw Hill Edition, 2013.
2. Machine Learning Probabilistic Approach, Kevin P. Murphy, MIT Press, 2012.

AI3106 Data Warehousing and Data Mining Lab

Course Objectives: The main objective of the course is to

- To understand the mathematical basics quickly and covers each and every condition of data mining in order to prepare for real-world problems.
- The various classes of algorithms will be covered to give a foundation to further apply knowledge to dive deeper into the different flavors of algorithms.
- Emphasize hands-on experience working with all real data sets.
- Test real data sets using popular data mining tools such as WEKA, Python Libraries
- Develop ability to design various algorithms based on data mining tools.

Course Outcomes: By the end of the course student will be able to

- Extract knowledge using data mining techniques and enlist various algorithms used in information analysis of Data Mining Techniques.
- Perform various data preprocessing tasks on different datasets.
- Demonstrate the working of algorithms for data mining tasks such as association rule mining, classification for realistic data.
- Identify clusters for the realistic data using K-Means Clustering algorithm in Weka tool/Python.
- Implement and Analyze on knowledge flow application on data sets and Apply the suitable visualization techniques to output analytical results.

Software Requirements: WEKA Tool/Python.

List of Experiments

1. Explore machine learning tool "WEKA"
   - Explore WEKA Data Mining/Machine Learning Toolkit.
   - Downloading and/or installation of WEKA data mining toolkit.
   - Understand the features of WEKA toolkit such as Explorer, Knowledge Flow interface, Experimenter, command-line interface.
   - Navigate the options available in the WEKA (ex. Select attributes panel, Preprocess panel, Classify panel, Cluster panel, Associate panel and Visualize panel)
   - Study the arff file format Explore the available data sets in WEKA. Load a data set (ex. Weather dataset, Iris dataset, etc.)
   - Load each dataset and observe the following:
     1. List the attribute names and they types
     2. Number of records in each dataset
     3. Identify the class attribute (if any)
     4. Plot Histogram
     5. Determine the number of records for each class.

2. Visualize the data in various dimensions. Perform data preprocessing tasks and Demonstrate performing association rule mining on data sets

- Explore various options available in Weka for preprocessing data and apply Unsupervised filters like Discretization, Resample filter, etc. on each dataset
- Load weather. nominal, Iris, Glass datasets into Weka and run Apriori Algorithm with different support and confidence values.
- Study the rules generated. Apply different discretization filters on numerical attributes and run the Apriori association rule algorithm. Study the rules generated.
- Derive interesting insights and observe the effect of discretization in the rule generation process.

3. Demonstrate performing classification on data sets
   - Load each dataset into Weka and run 1d3, J48 classification algorithm. Study the classifier output. Compute entropy values, Kappa statistic.
   - Extract if-then rules from the decision tree generated by the classifier, Observe the confusion matrix.
   - Load each dataset into Weka and perform Naïve-bayes classification and k-Nearest Neighbour classification. Interpret the results obtained.
   - Plot RoC Curves
   - Compare classification results of ID3, J48, Naïve-Bayes and k-NN classifiers for each dataset, and deduce which classifier is performing best and poor for each dataset and justify.

4. Demonstrate performing clustering of data sets
   - Load each dataset into Weka and run simple k-means clustering algorithm with different values of k (number of desired clusters).
   - Study the clusters formed. Observe the sum of squared errors and centroids, and derive insights.
   - Explore other clustering techniques available in Weka.
   - Explore visualization features of Weka to visualize the clusters. Derive interesting insights and explain.

5. Demonstrate knowledge flow application on data sets
   - Develop a knowledge flow layout for finding strong association rules by using Apriori, FP Growth algorithms
   - Set up the knowledge flow to load an ARFF (batch mode) and perform a cross validation using J48 algorithm
   - Demonstrate plotting multiple ROC curves in the same plot window by using j48 and Random forest tree

6. Illustrate Exploratory Data Analysis for Classification using Pandas or Matplotlib: Getting a quick statistical summary of the dataset, Checking Missing Values, Removing Duplicates, Showing Correlations, and Looking for Outliers using BoxPlots.

7. Implement and test Principle Component Analysis in Python

8. Write a program to implement Categorical Encoding: One-hot/Label/Ordinal Encodings.
9. Use sklearn to build a decision tree for IRIS data set and visualize the decision tree. Use the decision tree built to classify a new data point using both predict and predict_proba methods.

Need to demonstrate your understanding of sklearn's decision tree classifier by using both entropy and Gini-index.

10. Write a program of Naive Bayesian classification using Python programming language.
11. Write a Python program to generate frequent item sets / association rules using Apriori algorithm
12. Write a program of cluster analysis using simple k-means algorithm Python programming language.

AI3107 **Machine Learning Techniques Lab**

Prerequisites:

The students should have basic knowledge of Machine Learning and Python Programming

Course objectives:

- This course will enable students to learn and understand different data sets and machine learning algorithms

Course Outcomes:

1. Implement procedures for the machine learning algorithms
2. Develop Python programs for machine learning algorithms
3. Apply appropriate data sets to machine learning algorithms
4. Apply sklearn library to solve real world problems

List of Programs

1. Illustrate Exploratory Data Analysis for Classification using Pandas or Matplotlib: Getting a quick statistical summary of the dataset, Checking Missing Values, Removing Duplicates, Showing Correlations, and Looking for Outliers using BoxPlots.
2. Write a program to implement Categorical Encoding: One-hot/Label/Ordinal Encodings.
3. Use sklearn to build a decision tree for IRIS data set and visualize the decision tree. Use the decision tree built to classify a new data point using both predict and predict_proba methods. Need to demostrate your understanding of sklearn's decision tree classifier by using both entropy and Gini-index.
4. Use sklearn's k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions. You need to print the attributes values for wrong predictions.
5. Implement and test Principle Component Analysis in Python (not allowed to use sklearn's PCA classes).
6. Solve real-world problems using Linear Regression.
7. Solve real-world problems using Logistic Regression.
8. Implement a binary classifier using stochastic gradient descent (SGD) to classify MNIST digits as SIX and Not-SIX.
9. Implement, visualize and test Support Vector Machines in Python (not allowed to use sklearn's Support Vector classes).
10. Develop a program for Bias, Variance, and Cross Validation. Run decision tree classification and random forest algorithms on a dataset and confirm that ensembling indeed improves performance significantly reducing the variance component. Also, print feature importances as found by the random forest classifier.
11. Use sklearn’s GradientBoostingRegressor and demonstrate the use of early stopping to find the optimal number of trees in the GBRT ensemble.
12. Apply expectation-maximization (EM) algorithm to cluster a Heart Disease Data Set. Use the same data set for clustering using the k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering.

Text Book:

1. Aurélien Géron, “Hands-On Machine Learning with Scikit-Learn, Keras, and
2. TensorFlow,” 3rd Edition, O’Reilly Publications, 2022.

AI3108 Continuous Integration and Continuous Using Delivery Devops (Skill Development Course-I)

Prerequisite: Create account in GitHub

Course objectives:

- Understand DevOps Principles and Culture
- Define Continuous Integration (CI) and Continuous Delivery (CD) concepts
- Introduce build automation tools (e.g., Jenkins, GitLab CI/CD) and their features
- Discuss the importance of automated testing in CI/CD pipelines

Course Outcomes: At the end of the Course, Student will be able to:

- Understand the why, and how of DevOps doption
- Attain literacy on Devops
- Align capabilities required in the team what
- Create an automated CICD pipeline using a stack of tools

SYLLABUS

1. Explore Git and GitHub commands
2. Configure the web application and Version control using Git using Git commands and version controloperations.
3. Jenkins installation and setup ,explore the environment
4. Demonstrate continuous integration and development using Jenkins
5. Create and Build Web Application Using Jenkins
6. Create a pipeline project to demonstrate PostBuild actions using pipeline script.
7. Write a build script to build the application using a build automation tool like Maven and deploy the application to a web application server like Tomcat.
8. Explore Docker commands for content management
9. Develop a simple containerized application using Docker
10. Integrate Kubernetes and docker
11. Automate the process of running containerized application developed in experiment-9 using Kubernetes

Reference Books:

1. Learning Continuous Integration with Jenkins: A beginner's guide to implementing ContinuousIntegration and Continuous Delivery using Jenkins - Nikhil Pathania ,Packt publication[https://www.amazon.in/Learning-Continuous-Integration-Jenkins-Pathania/dp/1785284835]
2. Jenkins 2 – Up and Running: Evolve Your Deployment Pipeline for Next Generation Automation -Brent Laster, O'Reilly publication [https://www.amazon.in/Jenkins-2-Running-Brent-Laster/dp/ 1491979593]

Web Links:

(Courses mapped to Infosys Springboard platform)

1. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_01338269041100390473 5_shared/overv iew [Software Engineering and Agile software development]
2. https://infyspringboard.onwingspan.com/en/viewer/html/lex_auth_013501578194976768 10467 [Development & Testing with Agile: Extreme Programming]
3. https://infyspringboard.onwingspan.com/en/viewer/html/lex_auth_01353898917192499226_shared [DevOps CICD]

ANDHRA UNIVERSITY

DEPARTMENT OF COMPUTER SCIENCE AND SYSTEMS ENGINEERING

SCHEME AND SYLLABI

(With effect from 2022-23 admitted batch)

B. TECH Computer Science and Engineering (Artificial Intelligence and Machine Learning)

III Year - II Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
AI3201	PC	Computer Networks	4	0	30	70	100	3
AI3202	PC	Deep Learning Techniques	4	0	30	70	100	3
AI3203	PC	Big Data and Hadoop	4	0	30	70	100	3
AI3204	PE	Professional Elective-II	4	0	30	70	100	3
AI3205	OE	Open Elective-II	1	3	30	70	100	3
AI3206	PC	Computer Networks Lab						1.5
AI3207	PC	Deep Learning Lab	0	3	50	50	100	1.5
AI3208	PC	Big Data and Hadoop Lab	0	3	50	50	100	1.5
AI3209	SC	Skill Development Course-II: MEAN Stack Technologies	1	3	50	50	100	2
Total credits								**21.5**
Internship-II								

AI3201 Computer Networks

Prerequisite:

- Basics of Data communications and Networks

Course objectives:

- Understand state-of-the-art in network protocols, architectures, and applications.
- Process of networking research
- Constraints and thought processes for networking research
- Problem Formulation—Approach—Analysis—

Course Outcomes:

On completion of the course, the students will be able to:

- Understand OSI and TCP/IP models
- Analyze MAC layer protocols and LAN technologies
- Design applications using internet protocols
- Understand routing and congestion control algorithms
- Understand how internet works

SYLLABUS

Introduction: Network Topologies WAN, LAN, MAN. Reference models- The OSI Reference Model- the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models

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Physical Layer - Fourier analysis – Bandwidth Limited Signals – The Maximum Data Rate of a Channel - Guided Transmission Media, Digital Modulation and Multiplexing: Frequency Division Multiplexing, Time Division Multiplexing, Code Division Multiplexing

Data link layer: Design issues, Framing: fixed size framing, variable size framing, flow control, error control, error detection and correction codes, CRC, Checksum: idea, one's complement internet checksum, services provided to Network Layer, Elementary Data Link Layer protocols: simplex protocol, Simplex stop and wait, Simplex protocol for Noisy Channel. Sliding window protocol: One bit, Go back N, Selective repeat-Stop and wait protocol, Data link layer in HDLC: configuration and transfer modes, frames, control field, point to point protocol (PPP): framing Transition phase, multiplexing, multi link PPP.

Media Access Control: Random Access: ALOHA, Carrier sense multiple access (CSMA), CSMA with Collision Detection, CSMA with Collision Avoidance, Controlled Access: Reservation, Polling, Token Passing, Channelization: frequency division multiple Access (FDMA), time division multiple access(TDMA), code division multiple access(CDMA).Wired LANs: Ethernet, Ethernet Protocol, Standard Ethernet, Fast Ethernet(100 Mbps), Gigabit Ethernet,10 Gigabit Ethernet., Wireless Lans-The 802.11 Architecture and Protocol Stack- The 802.11 Frame Structure-Services.

Design Issues-The Network Layer Design Issues – Store and Forward Packet Switching-Services Provided to the Transport layer- Implementation of Connectionless Service-Implementation of Connection Oriented Service-Comparison of Virtual Circuit and Datagram Networks, Routing Algorithms-The Optimality principle-Shortest path Algorithm, Congestion Control Algorithms-

Approaches to Congestion Control-Traffic Aware Routing-Admission Control-Traffic Throttling-Load Shedding

Transport Layer – The Internet Transport Protocols: Udp, the Internet Transport Protocols: Tcp **Application Layer –**The Domain Name System: The DNS Name Space, Resource Records, Name Servers, Electronic Mail: Architecture and Services, The User Agent, Message Formats, Message Transfer, Final Delivery

Text Book:

1. Tanenbaum and David J Wetherall, Computer Networks, 5th Edition, Pearson Edu, 2010
2. Computer Networks: A Top Down Approach, Behrouz A. Forouzan, FirouzMosharraf, McGraw Hill Education

Reference Books:

1. Larry L. Peterson and Bruce S. Davie, “Computer Networks - A Systems Approach” (5thed), Morgan Kaufmann/ Elsevier, 2011

AI3202 Deep Learning Techniques

Prerequisite: Basic Knowledge on Artificial Intelligence and Machine Learning

Course objectives:

- To identify problems that are amenable to solution by ANN methods.
- To formalize a given problem in the language/framework of different ANN methods.
- To apply deep learning techniques to various learning problems.
- To provide a basic exposition to the goals and methods of deep learning.

Course Outcomes:

- Understand the basic principles of artificial neural networks.
- Apply various techniques to address many issues in training deep neural networks.
- Apply deep learning models to computer vision problems and time series analysis.
- Understand various models of generative deep learning.
- Apply deep learning techniques in reinforcement learning.

SYLLABUS

Introduction to ANNs with Keras: Biological and artificial neurons, implementing multilayer perceptrons with Keras, fine-tuning neural network hyperparameters.

Training Deep Neural Networks: The vanishing/exploding gradients problems, Glorot and He initializations, batch normalization, reusing pretrained models, faster optimizers, avoiding overfitting through regularization.

Deep Computer Vision Using CNNs: The architecture of the visual cortex, convolutional layers, pooling layers, famous CNN architectures, object detection, fully convolutional networks, YOLO, semantic segmentation.

Time Series Analysis Using RNNs: Recurrent neurons and layers, training RNNs, forecasting a time series, stacking recurrent layers, using bidirectional RNNs, handling long sequences using LSTMs and GRUs.

Generative deep learning: Efficient data representations, stacked, convolutional, recurrent, denoising, sparse and variational autoencoders, generative adversarial networks.

Deep Reinforcement Learning: Essential theory of reinforcement learning, Markov decision processes, the optimal policy, essential theory of deep Q-learning networks, defining a DQN agent.

Text Books:

1. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow," 3rd Edition, O'Reilly Publications, 2022.
2. Krohn et al, "Deep Learning Illustrated: A Visual, Interactive Guide to Artificial Intelligence," Pearson Education 2020.

Reference Books:

1. Francois Chollet, "Deep Learning with Python," 2nd Edition, Manning Publications, 2021.

AI3203 Big Data and Hadoop

Prerequisite:

- Students should have knowledge about basic programming languages
- Students should have knowledge about basic mathematics

Course Objectives:

- To optimize business decisions and create competitive advantage with Big Data analytics
- To learn to analyze the big data using intelligent techniques
- To introduce programming tools PIG & HIVE in Hadoop echo system

Course Outcomes:

At the end of the course, the students will be able to

- Illustrate big data challenges in different domains including social media, transportation, finance and medicine
- Use various techniques for mining data stream
- Design and develop Hadoop
- Identify the characteristics of datasets and compare the trivial data and big data for various applications
- Explore the various search methods and visualization techniques

SYLLABUS

Introduction: Introduction to big data: Introduction to Big Data Platform, Challenges of Conventional Systems, Intelligent data analysis, Nature of Data, Analytic Processes and Tools, Analysis vs Reporting.

Introduction to Hadoop: Hadoop: History of Hadoop, the Hadoop Distributed File System, Building blocks of Hadoop (Namenode, Datanode, Secondary Namenode, Job Tracker, Task Tracker), Design of HDFS, Developing a Map Reduce Application, How Map Reduce Works, Anatomy of a Map Reduce Job run, Shuffle and Sort, Task execution, Map Reduce Types and Formats

Writing MapReduce Programs: A Weather Dataset, Understanding Hadoop API for MapReduce Framework (Old and New), Basic programs of Hadoop MapReduce: Driver code, Mapper code, Reducer code, RecordReader, Combiner, Partitioner

Pig: Hadoop Programming Made Easier

Admiring the Pig Architecture, Going with the Pig Latin Application Flow, Working through the ABCs of Pig Latin, Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin.

Introduction to Hive, data types and file formats, HiveQL data definition, HiveQL data manipulation, Logical joins, Window functions, Optimization, Table partitioning, Bucketing, Indexing, Join strategies.

Apache spark- Advantages over Hadoop, lazy evaluation, In memory processing, DAG, Spark context, Spark Session, RDD, Transformations- Narrow and Wide, Actions, Spark RDD's operations-Count,

foreach(), Collect, join, Cache(), Data frames ,RDD to Data frames, Catalyst optimizer, Data Frame Transformations, Working with Nulls in Data, Working with Complex Types, Grouping.

Text Books:

1. Hadoop: The Definitive Guide by Tom White, 3rd Edition, O'reilly
2. Hadoop for Dummies by Dirk deRoos, Paul C.Zikopoulos, Roman B.Melnyk,Bruce Brown, Rafael Coss
3. SPARK: The Definitive Guide, Bill Chambers & Matei Zaharia, O'Reilley, 2018 Edition

Reference Books:

1. Programming Hive, O'Reilley, E. Capriolo, D. Wampler, and J. Rutherglen, 2012
2. Programming Pig, O'Reilley, Alan Gates, 2011

AI3206 Computer Networks Lab

Prerequisites: Basic Knowledge on C Programming
Basic Knowledge on Mathematics, Basic Networks Concepts

Course Objectives:

- Learn basic concepts of computer networking and acquire practical notions of protocols with the emphasis on TCP/IP.
- A lab provides a practical approach to Ethernet/Internet networking: networks are assembled, and experiments are made to understand the layered architecture and how do some important protocols work.

Course Outcomes: By the end of the course student will be able to

- Know how reliable data communication is achieved through data link layer.
- Suggest appropriate routing algorithm for the network.
- Provide internet connection to the system and its installation.
- Work on various network management tools

List of Experiments:

1. Study of Network devices in detail and connect the computers in Local Area Network.
2. Write a Program to implement the data link layer farming methods such as
    i. i) Character stuffing ii) bit stuffing.
3. Write a Program to implement data link layer farming method checksum.
4. Write a program for Hamming Code generation for error detection and correction.
5. Write a Program to implement on a data set of characters the three CRC polynomials – CRC12, CRC16 and CRC CCIP.
6. Write a Program to implement Sliding window protocol for Go back N.
7. Write a Program to implement Sliding window protocol for Selective repeat.
8. Write a Program to implement Stop and Wait Protocol.
9. Write a program for congestion control using leaky bucket algorithm
10. Write a Program to implement Dijkstra‘s algorithm to compute the Shortest path through a graph.
11. Write a Program to implement Distance vector routing algorithm by obtaining routing table at each node (Take an example subnet graph with weights indicating delay between nodes).
12. Write a Program to implement Broadcast tree by taking subnet of hosts.
13. Wireshark
    i. Packet Capture Using Wire shark
    ii. Starting Wire shark
    iii. Viewing Captured Traffic
    iv. Analysis and Statistics & Filters.
14. How to run Nmap scan
15. Operating System Detection using Nmap
16. Do the following using NS2 Simulator
    i. NS2 Simulator-Introduction

ii. Simulate to Find the Number of Packets Dropped
iii. Simulate to Find the Number of Packets Dropped by TCP/UDP
iv. Simulate to Find the Number of Packets Dropped due to Congestion
v. Simulate to Compare Data Rate& Throughput.

Text Book:

1. Tanenbaum and David J Wetherall, Computer Networks, 5th Edition, Pearson Edu, 2010
2. Computer Networks: A Top Down Approach, Behrouz A. Forouzan, FirouzMosharraf, McGraw Hill Education

Reference Books:

1. Larry L. Peterson and Bruce S. Davie, "Computer Networks - A Systems Approach" (5thed), Morgan Kaufmann/ Elsevier, 2011

AI3207 Deep Learning Techniques Lab

Prerequisites:

The students should have basic knowledge of Machine Learning and Python Programming

Course objectives:

- Learn deep recurrent and memory networks,
- Apply such deep learning mechanisms to various learning problems.
- Know the open issues in deep learning, and have a grasp of the current research directions.

Course Outcomes:

- Implement deep neural networks to solve real world problems.
- Apply convolution neural networks to solve computer vision problems.
- Apply recurrent neural networks to solve time series problems.
- Choose appropriate pre-trained model to solve real time problems.
- Interpret the results of different deep learning models.

List of Programs

1. Implement multilayer perceptron algorithm for MNIST Hand written Digit Classification.
2. Design a neural network for classifying movie reviews (Binary Classification) using IMDB dataset.
3. Design a neural Network for classifying news wires (Multiclass classification) using Reuters dataset.
4. Design a neural network for predicting house prices using Boston Housing Price dataset.
5. Build a Convolution Neural Network for MNIST Hand written Digit Classification.
6. Build a Convolution Neural Network for simple image (dogs and Cats) Classification
7. Use a pre-trained convolution neural network (VGG16) for image classification.
8. Implement a deep Recurrent Neural Network for a time series analysis.
9. Implement a deep LSTM Network for a time series analysis.
10. Implement a deep GRU Network for a time series analysis.
11. Implement dimensionality reduction using an autoencoder.
12. Implement LSTM from scratch in Python.

AI3208 Big Data and Hadoop Lab

Prerequisite:

- Students should have knowledge about basic programming languages
- Students should have knowledge about basic mathematics

Course Objective

- This subject aims to introduce students to learn java collections and Hadoop mapreduce technique.
- Upon successful completion of this lab the students should be able to learn java collections framework, installing Hadoop in various modes, installing pig and hive, how to execute map reduce programs and how to write map reduce code to different applications and how to analyze structured and unstructured data using pig and hive

Course Outcomes:

- The students will learn to write, compiling & execute Map reduce programs.
- The student will learn pig latin scripts to sort, filter, group and join data.
- The student will be able to create tables indexes, functions, drop and alter table etc using hive.
- The student will be able to learn pyspark RDD, Transformations
- The student will be able to learn build Machine Learning model using pyspark ml library

SYLLABUS

Week-1 Implement the following file management tasks in Hadoop:

i) Adding files and directories.
ii) Retrieving files.
iii) Deleting files
iv)

Week-2 Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.
Week-3 Write a Map Reduce program that mines weather data.
Week-4 Compute Average Salary and Total Salary by Gender for an Enterprise.
Week-5 Write a pig latin scripts to wordcount
Week-6 Write a pig latin scripts to sort, group, join, filter your data.
Week-7 Run Hive then use Hive to create, alter, and drop databases, tables
Week-8 i) Creating hive tables (External and internal)
(ii) Loading data to external hive tables from sql tables(or)Structured c.s.v using scoop
Week-9 (iii) Performing hive operations like filterations and updations
(iv) Performing Join (inner, outer etc)
Week-10 Implement the following pyspark operations

i) SparkSession
ii) SparkContext
iii) ways to Create RDD

Week-11 Perform the following pyspark transformations

i) Convert RDD to DataFrame
ii) PySpark Read CSV file into DataFrame
iii) drop() & dropDuplicates()
iv) PySpark orderBy() and sort()

v) map and flatMap
vi) PySpark Groupby, sort and join,

Week-12: Build any Machine Learning model using pyspark ml library.

Text Books:

1. Hadoop: The Definitive Guide by Tom White, 3rd Edition, O'reilly
2. Hadoop for Dummies by Dirk deRoos, Paul C.Zikopoulos, Roman B.Melnyk,Bruce Brown, Rafael Coss
3. SPARK: The Definitive Guide, Bill Chambers & Matei Zaharia, O'Reilley, 2018 Edition

Reference Books:

1. Programming Hive, O'Reilley, E. Capriolo, D. Wampler, and J. Rutherglen, 2012
2. Programming Pig, O'Reilley, Alan Gates, 2011

AI3209 **Mean Stack Technologies**
(Skill Development Course-II)

Prerequisite:

- Understanding of HTML and CSS for building static web pages.
- Understanding of JavaScript fundamentals for both frontend (Angular) and backend (Node.js) development.
- Basic knowledge of databases, including an understanding of tables, records, and basic CRUD operations.

Course objectives:

- Understand the concept of full-stack development
- Identify the key components of the MEAN Stack: MongoDB, Express.js, AngularJS (or Angular), and Node.js.
- Implement routes, middleware, and error handling in an Express.js application.
- Implement CRUD operations to interact with the database.
- Implement dynamic and interactive user interfaces using Angular.

Course Outcomes:

- Build a basic web server using Node.js and work with Node Package Manager (NPM).
- Build a web server using Express.js
- Make use of Typescript to optimize JavaScript code by using the concept of strict type checking.
- Develop JavaScript applications using typescript and work with document database using MongoDB.
- Utilize Angular JS to design dynamic and responsive web pages.
- Apply the acquired knowledge and skills to complete a comprehensive MEAN Stack project.

SYLLABUS

1	**Course Name: Node.js**
	a. **Module Name:** How to use Node.js
	Verify how to execute different functions successfully in the Node.js platform.
	b. **Module Name:** Create a web server in Node.js
	Write a program to show the workflow of JavaScript code executable by creating web server in Node.js.
	c. **Module Name:** Modular programming in Node.js
	Write a Node.js module to show the workflow of Modularization of Node application.
	d. **Module Name:** Restarting Node Application
	Write a program to show the workflow of restarting a Node application.
	e. **Module Name:** File Operations
	Create a text file src.txt and add the following data to it. Mongo, Express, Angular, Node.
2	**Course Name: Express.js**
	a. **Module Name:** Defining a route, Handling Routes, Route Parameters, Query Parameters

	Implement routing for the AdventureTrails application by embedding the necessary code in the routes/route.js file.
	b. **Module Name:** How Middleware works, Chaining of Middlewares, Types of Middlewares
	In myNotes application: (i) we want to handle POST submissions. (ii) display customized error messages. (iii) perform logging.
	c. **Module Name:** Connecting to MongoDB with Mongoose, Validation Types and Defaults
	Write a Mongoose schema to connect with MongoDB.
	d. **Module Name:** Models
	Write a program to wrap the Schema into a Model object.
3	**Course Name: Express.js**
	a. **Module Name:** CRUD Operations
	Write a program to perform various CRUD (Create-Read-Update-Delete) operations using Mongoose library functions.
	b. **Module Name:** API Development
	In the myNotes application, include APIs based on the requirements provided. (i) API should fetch the details of the notes based on a notesID which is provided in the URL. Test URL - http://localhost:3000/notes/7555 (ii) API should update the details bas
	c. **Module Name:** Why Session management, Cookies
	Write a program to explain session management using cookies.
	d. **Module Name:** Sessions
	Write a program to explain session management using sessions.
	e. **Module Name:** Why and What Security, Helmet Middleware
	Implement security features in myNotes application
4	**Course Name: Typescript**
	a. **Module Name:** Basics of TypeScript
	On the page, display the price of the mobile-based in three different colors. Instead of using the number in our code, represent them by string values like GoldPlatinum, PinkGold, SilverTitanium.
	b. **Module Name:** Function
	Define an arrow function inside the event handler to filter the product array with the selected product object using the productId received by the function. Pass the selected product object to the next screen.
	c. **Module Name:** Parameter Types and Return Types
	Consider that developer needs to declare a function - getMobileByVendor which accepts string as input parameter and returns the list of mobiles.
	d. **Module Name:** Arrow Function
	Consider that developer needs to declare a manufacturer's array holding 4 objects with id and price as a parameter and needs to implement an arrow function - myfunction to populate the id parameter of manufacturers array whose price is greater than or equ
	e. **Module Name:** Optional and Default Parameters
	Declare a function - getMobileByManufacturer with two parameters namely manufacturer and id, where manufacturer value should passed as Samsung and id parameter should be optional while invoking the function, if id is passed as 101 then this function should

5	**Course Name: Typescript**
	a. **Module Name:** Rest Parameter
	Implement business logic for adding multiple Product values into a cart variable which is type of string array.
	b. **Module Name:** Creating an Interface
	Declare an interface named - Product with two properties like productId and productName with a number and string datatype and need to implement logic to populate the Product details.
	c. **Module Name:** Duck Typing
	Declare an interface named - Product with two properties like productId and productName with the number and string datatype and need to implement logic to populate the Product details.
	d. **Module Name:** Function Types
	Declare an interface with function type and access its value.
6	**Course Name: Typescript**
	a. **Module Name:** Extending Interfaces
	Declare a productList interface which extends properties from two other declared interfaces like Category,Product as well as implementation to create a variable of this interface type.
	b. **Module Name:** Classes
	Consider the Mobile Cart application, Create objects of the Product class and place them into the productlist array.
	c. **Module Name:** Constructor
	Declare a class named - Product with the below-mentioned declarations: (i) productId as number property (ii) Constructor to initialize this value (iii) getProductId method to return the message "Product id is <<id value>>".
	d. **Module Name:** Access Modifiers
	Create a Product class with 4 properties namely productId, productName, productPrice, productCategory with private, public, static, and protected access modifiers and accessing them through Gadget class and its methods.
7	**Course Name: Typescript**
	a. Module Name: Properties and Methods
	Create a Product class with 4 properties namely productId and methods to setProductId() and getProductId().
	b. Module Name: Creating and using Namespaces
	Create a namespace called ProductUtility and place the Product class definition in it. Import the Product class inside productlist file and use it.
	c. Module Name: Creating and using Modules
	Consider the Mobile Cart application which is designed as part of the functions in a module to calculate the total price of the product using the quantity and price values and assign it to a totalPrice variable.
	d. Module Name: What is Generics, What are Type Parameters, Generic Functions, Generic Constraints
	Create a generic array and function to sort numbers as well as string values.
8	**Course Name: Angular JS**
	a. Module Name: Angular Application Setup

	Observe the link http://localhost:4200/welcome on which the mCart application is running. Perform the below activities to understand the features of the application.
	b. Module Name: Components and Modules
	Create a new component called hello and render Hello Angular on the page
	c. Module Name: Elements of Template
	Add an event to the hello component template and when it is clicked, it should change the courseName.
	d. Module Name: Change Detection
	progressively building the PoolCarz application
9	**Course Name: Angular JS**
	a. Module Name: Structural Directives – ngIf
	Create a login form with username and password fields. If the user enters the correct credentials, it should render a "Welcome <<username>>" message otherwise it should render "Invalid Login!!! Please try again..." message
	b. Module Name: Custom Attribute Directive
	Create an attribute directive called 'showMessage' which should display the given message in a paragraph when a user clicks on it and should change the text color to red.
10	**Course Name: Angular JS**
	a. Module Name: Attribute Directives – ngStyle
	Apply multiple CSS properties to a paragraph in a component using ngStyle.
	b. Module Name: ngClass
	Apply multiple CSS classes to the text using ngClass directive.
	c. Module Name: Custom Attribute Directive
	Create an attribute directive called 'showMessage' which should display the given message in a paragraph when a user clicks on it and should change the text color to red.
11	**Course Name: Angular JS**
	a. Module Name: Property Binding
	Binding image with class property using property binding.
	b. Module Name: Attribute Binding
	Binding colspan attribute of a table element to the class property.
	c. Module Name: Style and Event Binding
	Binding an element using inline style and user actions like entering text in input fields.
12	**Course Name: Angular JS**
	a. Module Name: Built in Pipes
	Display the product code in lowercase and product name in uppercase using built-in pipes.
	b. Module Name: Passing Parameters to Pipes
	Apply built-in pipes with parameters to display product details.
	c. Module Name: Nested Components Basics
	Load CourseslistComponent in the root component when a user clicks on the View courses list button.
13	**Course Name: Angular JS**
	a. Module Name: Passing data from Container Component to Child Component
	Create an AppComponent that displays a dropdown with a list of courses as values in it. Create another component called the CoursesList component and load it in

	AppComponent which should display the course details. When the user selects a course from the
	b. Module Name: Passing data from Child Component to ContainerComponent
	Create an AppComponent that loads another component called the CoursesList component. Create another component called CoursesListComponent which should display the courses list in a table along with a register .button in each row. When a user clicks on th
	c. Module Name: Shadow DOM
	Apply ShadowDOM and None encapsulation modes to components.
	d. Module Name: Component Life Cycle
	Override component life-cycle hooks and logging the corresponding messages to understand the flow.
14	**Course Name: Angular JS**
	a. Module Name: Template Driven Forms
	Create a course registration form as a template-driven form.
	b. Module Name: Model Driven Forms or Reactive Forms
	Create an employee registration form as a reactive form.
	c. Module Name: Custom Validators in Reactive Forms
	Create a custom validator for an email field in the employee registration form (reactive form)
15	**Course Name: Angular JS**
	a. Module Name: Custom Validators in Template Driven forms
	Create a custom validator for the email field in the course registration form.
	b. Module Name: Services Basics
	Create a Book Component that fetches book details like ID and name and displays them on the page in a list format. Store the book details in an array and fetch the data using a custom service.
	c. Module Name: RxJS Observables
	Create and use an observable in Angular.
16	**Course Name: Angular JS**
	a. Module Name: Server Communication using HttpClient
	Create an application for Server Communication using HttpClient
	b. Module Name: Communicating with different backend services using Angular
	HttpClient
	Create a custom service called ProductService in which the Http class is used to fetch data stored in the JSON files.
17	**Course Name: Angular JS**
	a. Module Name: Routing Basics, Router Links
	Create multiple components and add routing to provide navigation between them.
	b. Module Name: Route Guards
	Considering the same example used for routing, add a route guard to BooksComponent. Only after logging in should the user be able to access BooksComponent. If the user tries to give the URL of the Books component in another tab or window or if the user tries
	c. Module Name: Asynchronous Routing
	Apply lazy loading to BookComponent. If lazy loading is not added to the demo, it

	has loaded in 1.14 s. Observe the load time at the bottom of the browser console. Press F12 in the browser click the Network tab, and check the Load time
	d.Module Name: Nested Routes
	Implement Child Routes to a submodule.
18	**Course Name: MongoDB Essentials - A Complete MongoDB Guide**
	a. Module Name: Installing MongoDB on the local computer, Create MongoDB Atlas Cluster
	Install MongoDB and configure ATLAS
	b. Module Name: Introduction to the CRUD Operations
	Write MongoDB queries to perform CRUD operations on documents using insert(), find(), update(), remove()
19	**Course Name: MongoDB Essentials - A Complete MongoDB Guide**
	a. Module Name: Create and Delete Databases and Collections
	Write MongoDB queries to Create and drop databases and collections.
	b. Module Name: Introduction to MongoDB Queries
	Write MongoDB queries to work with records using find(), limit(), sort(), createIndex(), aggregate().

Text Book:

1. Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson.
2. Pro Mean Stack Development, 1st Edition, ELadElrom, Apress O'Reilly.
3. Full Stack JavaScript Development with MEAN, Colin J Ihrig, Adam Bretz, 1st edition, SitePoint, SitePoint Pty. Ltd., O'Reilly Media

Reference Books:

1. Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, 1st Edition, Dream Tech.
2. An Introduction to Web Design, Programming, 1st Edition, Paul S Wang, Sanda S Katila, Cengage Learning.

Web Links:

1. https://infyspringboard.onwingspan.com/en/app/toc/lex_17739732834840810000_shared/overvie w (HTML5)
2. https://infyspringboard.onwingspan.com/en/app/toc/lex_18109698366332810000_shared/overvie w (Javascript)
3. https://infyspringboard.onwingspan.com/en/app/toc/lex_32407835671946760000_shared/overvie w (Node.js & Express.js)
4. https://infyspringboard.onwingspan.com/en/app/toc/lex_9436233116512678000_shared/overview (Typescript)
5. https://infyspringboard.onwingspan.com/en/app/toc/lex_20858515543254600000_shared/overview (Angular JS)
6. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_01317716929471283211 3_shared/ove rview (MongoDB)

ANDHRA UNIVERSITY

DEPARTMENT OF COMPUTER SCIENCE AND SYSTEMS ENGINEERING

SCHEME AND SYLLABI

(With effect from 2022-23 admitted batch)

B. TECH Computer Science and Engineering (Artificial Intelligence and Machine Learning)

IV Year - I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
AI4101	PE	Professional Elective-III	4	0	30	70	100	3
AI4102	PE	Professional Elective-IV	4	0	30	70	100	3
AI4103	PE	Professional Elective-V	4	0	30	70	100	3
AI4104	OE	Open Elective-III	4	0	30	70	100	3
AI4105	OE	Open Elective-IV	4	0	30	70	100	3
AI4106	HSSE	HSSE Elective	4	0	30	70	100	3
AI4107	SC	Natural Language Processing Lab	1	3	50	50	100	2
AI4108	INT	Internship-II	0	0	50	50	100	2
Summer Internship 2 Months (Mandatory) after 3rd year (to be evaluated during IV year I Semester)								
Total Credits								**22**

AI4107 Natural Language Processing Lab

Prerequisite:

- Students should have knowledge about mathematics concepts
- Students should have knowledge about python programming and Machine Learning concepts

Course objectives

- To learn the fundamentals of natural language processing.
- To understand the use of CFG and PCFG in NLP.
- To understand the role of semantics of sentences and pragmatics.
- To apply the NLP techniques to IR applications

Course Outcomes: At the end of the Course, the Student will be able to:

- Use the NLTK and spaCy toolkit for NLP Programming.
- Analyze various corpora for developing programs.
- Develop various pre-processing techniques for a given corpus.
- Develop programming logic using NLTK functions.
- Build applications using various NLP techniques for a given corpus.

LIST OF PROGRAMS

1. Installation and exploring features of NLTK and spaCy tools. Download Word Cloud and few corpora.

2. (i) Write a program to implement word Tokenizer, Sentence and Paragraph Tokenizers.
   (ii) Check how many words are there in any corpus. Also check how many distinct words are there?

3. (i) Write a program to implement both user-defined and pre-defined functions to generate
   (a) Uni-grams
   (b) Bi-grams
   (c) Tri-grams
   (d) N-grams
   (ii) Write a program to calculate the highest probability of a word (w2) occurring after another word(w1).

4. (i) Write a program to identify the word collocations.
   (ii) Write a program to print all words beginning with a given sequence of letters.
   (iii) Write a program to print all words longer than four characters.

5. (i) Write a program to identify all antonyms and synonyms of a word.
   (ii) Write a program to find hyponymy, homonymy, polysemy for a given word.

6. (i) Write a program to find all the stop words in any given text.
   (ii) Write a function that finds the 50 most frequently occurring words of a text thatare not stop words.
7. Write a program to implement various stemming techniques and prepare a chart with the performance of each method

8. Write a program to implement various lemmatization techniques and prepare a chart with the performance of each method.

9. (i) Write a program to implement Conditional Frequency Distributions (CFD) for any corpus.
   (ii) Find all the four-letter words in any corpus. With the help of afrequency distribution (FreqDist), show these words in decreasing order of frequency.
   (iii) Define a conditional frequency distribution over the names corpus that allows you to see which initial letters are more frequent for males versus females.

10. (i) Write a program to implement Part-of-Speech (PoS) tagging for any corpus.
    (ii) Write a program to identify which word has the greatest number of distinct tags? What are they, and what do they represent?
    (iii) Write a program to list tags in order of decreasing frequency and what do the 20 most frequent tags represent?
    (iv) Write a program to identify which tags are nouns most commonly found after? Whatdo these tags represent?

11. Write a program to implement TF-IDF for any corpus.

12. Write a program to implement chunking and chinking for any corpus.

13. (i) Write a program to find all the mis-spelled words in a paragraph.
    (ii) Write a program to prepare a table with frequency of mis-spelled tags for any given text.

14. Write a program to implement all the NLP Pre-Processing Techniques required to perform further NLP tasks.

Case Studies: (At Least any one Case Study has to be performed)

Case Study-1. Write a program to implement Named Entity Recognition (NER) for any corpus.
Case Study-2. Write a program to perform Auto-Correction of spellings for any text.

Reference Books:

1. Toolkit Steven Bird, Ewan Klein, and Edward Loper, “Natural Language Processing with Python– Analyzing Text with the Natural Language”.

Web References:

1. http://www.nptelvideos.in/2012/11/natural-languageprocessing.html

Software Engineering
Professional Elective
Syllabus

Prerequisite:

- Basic knowledge of Computer Science, C and Object-Oriented Programming.

Course objectives:

- To understand the phases of Software Development common process models.
- To obtain hands-on experience with elements of the agile process.
- To understand requirements engineering, analysis and design principles in a solicited manner.
- To study fundamental concepts in software testing, including software testing objectives, process, criteria, strategies, and methods.
- To discuss various software testing issues and solutions in unit, integration, regression, and system testing.
- To learn how to planning a test project, design test cases and data, conduct testing operations, manage software problems and defects, generate a testing report.
- To understand software test automation problems and solutions.

Course Outcomes:

By the end of the course, the student should:

- Transform an Object-Oriented Design into high quality, executable code
- Compare conventional and agile software methods and produce the requirements in a suitable manner
- Produce the analysis and design for any real-time project and implement the basic testing procedures to generate test cases
- Test the applications manually by applying different testing methods and automation tools.
- Apply tools to resolve the problems in Real time environment

SYLLABUS

Introduction to Software Engineering: The Nature of Software, The Unique Nature of WebApps, Software Engineering, The Software Process, Software Engineering Practice, Software Myths. A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Technology.

Agile Process: Agility, Agility and the Cost of Change, Agile Process, Extreme Programming (XP), Other Agile Process Models, A Tool Set for the Agile Process, Software Engineering Knowledge, Core Principles,

Requirements Engineering and Design: Requirements Engineering, Eliciting Requirements, Developing Use Cases, Building the Requirements Model.
The Design Process, Design Concepts, The Design Model, Software Architecture, Architectural Genres, Architectural Styles, Assessing Alternative Architectural Designs, Architectural Mapping Using Data Flow, Components, Designing Class-Based Components, Conducting Component-Level Design, Component-Level Design for WebApps.

Software Testing: Introduction, Evolution, Myths & Facts, Goals, Psychology, Definition, Model for testing, Effective Vs Exhaustive Software Testing. Software Testing Terminology and Methodology: Software Testing Terminology, Software Testing Life Cycle, relating test life cycle to development life cycle Software Testing Methodology.

Automation and Testing Tools: need for automation, categorization of testing tools, selection of testing tools, Cost incurred, Guidelines for automated testing, overview of some commercial testing tools. Testing Web based Systems: Challenges in testing for web-based software, quality aspects, web engineering, testing of web-based systems, Testing mobile systems.

Text Book:

1. Software Engineering a practitioner's approach, Roger S. Pressman, Seventh Edition, McGraw Hill Higher Education.
2. Software Testing: Principles and Practices - Naresh Chauhan, Oxford.

Reference Books:

1. Software Engineering, Ian Sommerville, Ninth Edition, Pearson.
2. Software testing techniques – Boris Beizer, Dreamtech, second edition.

Reinforcement Learning
Professional Elective
Syllabus

Prerequisite:

- Basics of optimization process and knowledge of dynamic programming.
- Basics of Machine learning and deep learning techniques.

Course Objectives:

By the end of the class students should be able to:

- Define the key features of reinforcement learning that distinguishes it from AI and non-interactive machine learning.
- Knowledge on fundamentals of reinforcement learning and the methods used to create agents that can solve a variety of complex tasks

Course Outcomes

- Understand basics of RL.
- Understand RL Framework and Markov Decision Process.
- Analysing through the use of Dynamic Programming and Monte Carlo.
- Understand TD (0) algorithm, TD(λ) algorithm.
- Recognize current advanced techniques and applications in RL

SYLLABUS

Elements of Reinforcement Learning and scope, Tic-Tac-Toe, Multi-arm Bandits: n-Armed Bandit Problem. Incremental Implementation, Tracking Nonstationary Problem, Optimistic Initial Values, Upper-Confidence-Bound Action Selection, Gradient Bandit, Associative Search

Markov Decision Problem, policy, and value function, Reward models (infinite discounted, total, finite horizon, and average), Episodic & continuing tasks, Bellman's optimality operator, and Value iteration & policy iteration

Reinforcement Learning prediction and control problems, Model-based algorithm. Monte Carlo-Prediction, Estimation of Action Values, Control, Control without Exploring Start, Temporal-Difference learning: TD Prediction, Advantages of TD Prediction Methods

Bootstrapping; TD(0) algorithm; Convergence of Monte Carlo and batch TD(0) algorithms; Model-free control: Q-learning, Sarsa, Expected Sarsa

Eligibility Traces: n-Step TD Prediction, Forward and Backward View of TD(λ), Equivalences of Forward and Backward Views, saras(λ), Watkin's Q(λ), Off-policy Eligibility Traces using Important Sampling, Variable λ.

Planning and Learning with Tabular Methods: Models and Planning, Integrating Planning, Acting and Learning, Prioritized Sweeping, Full vs. Sample Backups, Trajectory Sampling, Heuristic Search, Monte Carlo Tree Search.

Text Books:

1. “Reinforcement learning: An introduction,” First Edition, Sutton, Richard S., and Andrew G. Barto, MIT press 2020.
2. Boris Belousov, Hany Abdulsamad, Pascal Klink, Simone parisi, Reinforcement Learning Algorithms: Analysis and Applications, 1st Edition, Springer, 2021.

Reference Books:

1. “Bandit algorithms,” First Edition, Lattimore, T. and C. Szepesvári. Cambridge University Press. 2020
2. Phil Winder, Reinforcement Learning: Industrial Applications of Intelligent Agent, 1st Edition, O’Reilly, 2020.

Modern Cryptography & Network Security
Professional Elective
Syllabus

Prerequisite: Basics Computer Networks and Security

Course Objectives:

- identify security risks and take preventive steps
- understand the forensics fundamentals
- The main objectives of this course are to explore the working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests.
- Public key algorithms, design issues and working principles of various authentication protocols and various secure communication standards including Kerberos, IPSec, and SSL/TLS.

Course Outcomes: At the end of the course, student will be able to

- Explain the Cybercrime Fundamentals
- Describe the types of attacks on networks
- Explain different security threats and countermeasures and foundation course of cryptography mathematics.
- Classify the basic principles of symmetric key algorithms and operations of some symmetric key algorithms and asymmetric key cryptography
- Revise the basic principles of Public key algorithms and Working operations of some Asymmetric key algorithms such as RSA, ECC and some more
- Design applications of hash algorithms, digital signatures and key management techniques
- Determine the knowledge of Application layer, Transport layer and Network layer security Protocols such as PGP, S/MIME, SSL, TSL, and IPSec .

SYLLABUS

Introduction to Cybercrime: Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Cybercriminals, Classifications of Cybercrime, Cyber stalking, Cyber cafe and Cybercrimes, Bonnets. Attack Vector, Proliferation of Mobile and Wireless Devices, Security Challenges Posed by Mobile Devices, Attacks on Mobile/Cell Phones, Network and Computer Attacks.

Basic Principles: Security Goals, Cryptographic Attacks, Services and Mechanisms, Mathematics of Cryptography.

Symmetric Encryption: Mathematics of Symmetric Key Cryptography, Introduction to Modern Symmetric Key Ciphers, Data Encryption Standard, Advanced Encryption Standard.

Asymmetric Encryption: Mathematics of Asymmetric Key Cryptography, Asymmetric Key Cryptography

Data Integrity: Digital Signature Schemes & Key Management: Message Integrity and Message Authentication, Cryptographic Hash Functions, Digital Signature, Key Management.

Network Security-I: Security at application layer: PGP and S/MIME, Security at the Transport Layer: SSL and TLS**, Network Security-II** : Security at the Network Layer: IPSec, System Security

Text Books:

1. Cryptography and Network Security, 3rd Edition Behrouz A Forouzan, Deb deep Mukhopadhyay, McGraw Hill,2015
2. Cryptography and Network Security,4th Edition, William Stallings, (6e) Pearson,2006
3. Sunit Belapure Nina God bole "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", WILEY, 2011.

Reference Books:

1. Network Security and Cryptography, 1st Edition, Bernard Ménages, Cengage Learning,2018
2. Michael T. Simpson, Kent Backman and James E. Corley, "Hands on Ethical Hacking and Network Defence", Cengage, 2019.

Security and Privacy in Cloud
Professional Elective
Syllabus

Prerequisite:

- Students will have the skills to describe the architecture of cloud systems, understand the role of virtualization
- Students will be able to define cloud computing, describe its evolution, identify its essential characteristics
- Students will understand the principles of business continuity planning and disaster recovery within the cloud computing context.

Course Objectives

- Understand the Fundamentals of Cloud Computing:
- Explore Cloud Architecture and Technologies:
- Grasp Cloud Security and Privacy:
- Learn about Cloud Business Continuity and Disaster Recovery

Course Outcomes

- Demonstrate Understanding of Cloud Computing Concepts
- Apply Knowledge of Cloud Architecture and Virtualization
- Analyze and Implement Cloud Security Measures
- Plan for Business Continuity and Disaster Recovery in the Cloud
- Navigate Cloud Compliance and Security Standards

SYLLABUS

Cloud Computing Fundamentals- Definition, Evolution, Essential characteristics, Cloud Deployment Models, Cloud Service Models, Benefits, Cloud Architecture, Virtualization in Cloud, Cloud Data Centre, SLA, Cloud Applications.

Cloud Security Challenges, Cloud Information Security Objectives, Cloud Security Services, Secure Cloud Software Requirements, Cloud Security Policy Implementation, Infrastructure Security, Data Security and Storage, Privacy in Cloud.

Threats and Vulnerabilities to Infrastructure, Data, and Access Control; Risk Management and Risk Assessment in Cloud, Cloud Service Provider Risks, Virtualization Security Management in the Cloud, Trusted Cloud Computing, Identity Management and Access Control.

Cloud Computing and Business Continuity Planning/Disaster Recovery, Cloud Audit and Compliance: Internal Policy Compliance, Regulatory/External Compliance, Cloud Security Alliance.

Standards for Security: SAML OAuth, OpenID, SSL/TLS, Encrypting Data and Key Management, Creating a Cloud Security Strategy, The Future of Security in Cloud Computing.

Text Book:

1. Ronald L. Krutz, Russell Dean Vines, "Cloud Security: A Comprehensive Guide to Secure Cloud Computing", Wiley Publishing, 2010.

Reference Books:

1. Tim Mather, SubraKumaraswamy, and ShahedLatif, ” Cloud Security and Privacy", Published by O’Reilly Media, Inc., 2009
2. Vacca, J. R. (Ed.). (2016). Cloud computing security: Foundations and challenges. Boca Raton, FL: CRC Press, Taylor and Francis Group.ISBN-13: 978-1482260953

Compiler Design
Professional Elective
Syllabus

Prerequisites:

- Proficiency in programming languages.
- Knowledge of data structures and algorithms.
- Understanding of discrete mathematics.
- Familiarity with computer architecture.
- Understanding of programming language theory.

Course objectives:

- To explain the basic understanding of grammars and language definition and introducing various phases of designing a compiler.
- To make the student to understand the concepts underlying the design and implementation of language processors and its mechanisms.
- To extend the knowledge of parser by parsing LL parser and LR parser.
- To enrich the knowledge in various phases of compiler ant its use, code optimization techniques, loop optimization techniques, machine code generation, and use of symbol table.

Course outcomes:

- Ability to understand grammars, language definitions and various phases of designing a compiler.
- Ability to understand Language processors and different parsers.
- Ability to learn the new code optimization techniques to improve the performance of a program in terms of speed & space.
- Ability to do usage of registers in efficient manner during the program execution.
- Ability to acquire the knowledge of modern compiler & its features.

Introduction: Introduction to Compilers and Language processors, Programming Language basics, Structure & Different Phases of a Compiler, Review of Compiler Structure, Structure of Optimizing Compilation, Compiler construction tools, Boot strapping, Cross compilers.

Finite Automata & Lexical Analysis: Introduction to Lexical Analysis, Lexical Analyzers, Approaches to design Lexical Analysers, Language for specifying lexical analyzers, Introduction to Finite automata, Regular Expressions & Languages, Recognition of Tokens, Transition Diagrams, Implementation of lexical analyzers, Lexical Analyzer Generator LEX.

Syntax Analysis: Syntactic Specification of Programming Languages, Context Free Grammars & Languages, Introduction to Parsers. Top-down parsing techniques: Brute force parsing, Recursive Descent Parsing, Predictive Parsing, Bottom–up Parsing: Shift reduce parsing, Operator parsing, LR (k) parsing.

Semantic Analysis and Intermediate Code Generation: Semantic Actions, Syntax Directed

Translations, Translation on the parse Tree, Implementation of Syntax Directed Translator, Intermediate Codes, Syntax Directed translation to Postfix code, Syntax Trees, Intermediate Code Generation, Three Addr5ess Code-Translation of Expressions, Type Checking & Type Conversions.

Code Optimization: Principal sources of Code Optimization, Loop Optimization, Basic Blocks & Flow Graphs, DAG Representation of Basic Blocks, Applications of DAG, Local Optimization, Unreachable Code Elimination, Dead Code Elimination, Data Flow Analysis, Data Flow Equations & Computations, Peep-Hole Optimization. Machine Dependent Optimizations, Overview of Informal Compiler Algorithm

Notation (ICAN), If Simplification, Loop Simplification, Loop Inversion, Branch Optimization and Prediction

Code Generation and Code Scheduling: Issues in Code Generation, Input to Code Generator, Instruction Selection, Register Allocation, Simple Target Machine Model, Program and Instruction Costs,Register allocation & Assignments, Code Generation Algorithm, Code Generators, Optimal Code Generation for Expressions, Code Generation From DAG.

Symbol Tables, Runtime Environment and Error Handling: Contents of a Symbol Table, Data Structures for Symbol Tables; Run time Environments, Implementation of a simple Stack allocation, Heap Management, Block Structured Languages; Error Detection & Recovery, Lexical Phase Errors, Syntactic & Semantic Errors, Error Handling Routines.

Text Books:

1. Principles of Compiler Design by Aho.D. Ullman, Lam and Ravi Sethi, Pearson Education Second Edition
2. Advanced Compiler Design and Implementation, Steven Muchnic, Elsevier Publications.

Reference Books:

1. Compiler Construction by Kenneth. C. Louden, Vikas Pub. House.
2. Compiler Design, A.A. Pentambekar, Technical Publications
3. Modern Compiler Design, Grune.D, Van Reeuwijk K, Bal H.E, Jacobs C J H, Lan gendoen K, Springer,

Augmented Reality and Virtual Reality
Professional Elective
Syllabus

Prerequisites: Mathematics, Physics, Programming and Problem Solving, Engineering Graphics, Solid Modeling and Drafting, Numerical & Statistical Methods, Mechatronics, Artificial Intelligence &Machine Learning, Computer Aided Engineering

Course Objectives:

- Learn the fundamental Computer Vision, Computer Graphics and Human-Computer interaction
- Techniques related to VR/AR
- Review the Geometric Modeling Techniques
- Review the Virtual Environment
- Discuss and Examine VR/AR Technologies
- Use of various types of Hardware and Software in Virtual Reality systems
- Simulate and Apply Virtual/Augmented Reality to varieties of Applications

Course Outcomes:
On completion of the course the learner will be able to;

- UNDERSTAND fundamental Computer Vision, Computer Graphics and Human Computer Interaction Techniques related to VR/AR
- UNDERSTAND Geometric Modeling Techniques
- UNDERSTAND the Virtual Environment
- ANALYZE and EVALUATE VR/AR Technologies
- APPLY various types of Hardware and Software in Virtual Reality systems
- DESIGN and FORMULATE Virtual/Augmented Reality Applications

SYLLABUS

Unit 1 Introduction to Virtual Reality (VR):
Virtual Reality and Virtual Environment, Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, benefits of virtual reality, Historical development of VR, Scientific Landmark.

Unit 2 Computer Graphics and Geometric Modelling
The Virtual world space, positioning the virtual observer, the perspective projection, human vision,stereo perspective projection, Color theory, Conversion From 2D to 3D, 3D space curves, 3D boundary representation, Simple 3D modelling, 3D clipping, Illumination models, Reflection models, Shading algorithms, Geometrical Transformations: Introduction, Frames of reference, Modelling transformations, Instances, Picking, Flying, Scaling the VE, Collision detection.

Unit 3 Virtual Environment
Input/Output Devices: Input (Tracker, Sensor, Digital Gloves, Movement Capture, Video based Input, 3D Menus & 3D Scanner, etc.), Output (Visual/Auditory/Haptic Devices)
Generic VR system: Introduction, Virtual environment, Computer environment, VR technology, Model of interaction, VR Systems,

Animating the Virtual Environment: Introduction, The dynamics of numbers, Linear and Nonlinear interpolation, the animation of objects, linear and non-linear translation, shape & object in between, free from deformation, particle system
Physical Simulation: Introduction, Objects falling in a gravitational field, Rotating wheels,
Elastic collisions, projectiles, simple pendulum, springs, Flight dynamics of an aircraft.

Unit 4 Augmented Reality (AR)
Taxonomy, Technology and Features of Augmented Reality, AR Vs VR, Challenges with AR, AR systems and functionality, Augmented Reality Methods, Visualization Techniques for Augmented Reality, Enhancing interactivity in AR Environments, Evaluating ARsystems.

Unit 5 Development Tools and Frameworks
Human factors: Introduction, the eye, the ear, the somatic senses
Hardware: Introduction, sensor hardware, Head-coupled displays, Acoustic hardware, Integrated VR systems
Software: Introduction, Modelling virtual world, Physical simulation, VR toolkits, Introduction to VRML

Unit 6 AR / VR Applications
Introduction, Engineering, Entertainment, Science, Training, Game Development

Text Books:

1. Coiffet, P., Burdea, G. C., (2003), "Virtual Reality Technology," Wiley-IEEE Press, ISBN: 9780471360896
2. Schmalstieg, D., Höllerer, T., (2016), "Augmented Reality: Principles & Practice," Pearson, ISBN: 9789332578494

References Books:

1. Norman, K., Kirakowski, J., (2018), " Wiley Handbook of Human Computer Interaction," Wiley-Blackwell, ISBN: 9781118976135
2. LaViola Jr., J. J., Kruijff, E., McMahan, R. P., Bowman, D. A., Poupyrev, I., (2017), "3D User Interfaces: Theory and Practice," Pearson, ISBN: 9780134034324
3. Fowler, A., (2019), "Beginning iOS AR Game Development: Developing Augmented Reality Apps with Unity and C#," Apress, ISBN: 9781484246672
4. Hassanien, A. E., Gupta, D., Khanna, A., Slowik, A., (2022), "Virtual and Augmented Reality for Automobile Industry: Innovation Vision and Applications," Springer, ISBN: 9783030941017

Object-Oriented Analysis and Design
Professional Elective
Syllabus

Prerequisite:

- Basics of Software Engineering
- Basics of Objects Oriented Programming Concepts.

Course objectives:

Become familiar with all phases of OOAD.

- Master the main features of the UML.
- Master the main concepts of Object Technologies and how to apply them at work and develop the ability to analyse and solve challenging problem in various domains.
- Learn the Object design Principles and understand how to apply them towards Implementation

Course Outcomes:

- Analyze the nature of complex system and its solutions.
- Illustrate & relate the conceptual model of the UML, identify & design the classes and relationships
- Analyze &Design Class and Object Diagrams that represent Static Aspects of a Software System and apply basic and Advanced Structural Modeling Concepts for designing real time applications.
- Analyze & Design behavioral aspects of a Software System using Use Case, Interaction and Activity Diagrams.
- Analyze & Apply techniques of State Chart Diagrams and Implementation Diagrams to model behavioral aspects and Runtime environment of Software Systems

SYLLABUS

Introduction: The Structure of Complex systems, The Inherent Complexity of Software, Attributes of Complex System, Organized and Disorganized Complexity, Bringing Order to Chaos, Designing Complex Systems. Case Study: System Architecture: Satellite-Based Navigation.

Introduction to UML: Importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture, and Software Development Life Cycle. **Basic Structural Modeling**: Classes, Relationships, common Mechanisms, and diagrams. Case Study: Control System: Traffic Management.

Class & Object Diagrams: Terms, concepts, modeling techniques for Class & Object Diagrams**. Advanced Structural Modeling:** Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages. Case Study: AI: Cryptanalysis.

Basic Behavioral Modeling-I: Interactions, Interaction diagrams Use cases, Use case Diagrams, Activity Diagrams. Case Study: Web Application: Vacation Tracking System

Advanced Behavioral Modeling: Events and signals, state machines, processes and Threads, time and space, state chart diagrams. **Architectural Modeling**: Component, Deployment, Component diagrams and Deployment diagrams Case Study: Weather Forecasting.

Text Book:

1. Grady BOOCH, Robert A. Maksimchuk, Michael W. ENGLE, Bobbi J. Young, Jim Conallen, Kellia Houston , "Object- Oriented Analysis and Design with Applications", 3rd edition, 2013, PEARSON.
2. Grady Booch, James Rumbaugh, Ivar Jacobson: The Unified Modeling Language User Guide, Pearson Education.

Reference Books:

1. Meilir Page-Jones: Fundamentals of Object Oriented Design in UML, Pearson Education.
2. Pascal Roques: Modeling Software Systems Using UML2, WILEY- Dreamtech India Pvt. Ltd.
3. Atul Kahate: Object Oriented Analysis & Design, The McGraw-Hill Companies.
4. Appling UML and Patterns: An introduction to Object – Oriented Analysis and Design and Unified Process, Craig Larman, Pearson Education.

Image and Video Analytics
Professional Elective
Syllabus

Prerequisite:

- Students should have knowledge about Machine Learning concepts
- Students should have knowledge about Mathematics, Image Processing and Deep Learning concepts

Course objectives:

- To understand the basics of image processing techniques for computer vision.
- To learn the techniques used for image pre-processing.
- To discuss the various object detection techniques.
- To understand the various Object recognition mechanisms.
- To elaborate on the video analytics techniques

Course Outcomes:

At the end of this course, the students will be able to:

- Understand the basics of image processing techniques for computer vision and video analysis.
- Explain the techniques used for image pre-processing.
- Develop various object detection techniques.
- Understand the various face recognition mechanisms.
- Elaborate on deep learning-based video analytics.

SYLLABUS

Computer Vision: Image representation and image analysis tasks – Image representations -digitization – properties – color images – Data structures for Image Analysis – Levels of image data representation – Traditional and Hierarchical image data structures.

Image pre-processing: Local pre-processing – Image smoothing – Edge detectors – Zero-crossings of the second derivative – Scale in image processing – Canny edge detection – Parametric edge models – Edges in multi-spectral images – Local pre-processing in the frequency domain – Line detection by local pre-processing operators – Image restoration.

Object detection using Deep Learning: Object detection– Object detection methods – Deep Learning framework for Object detection–bounding box approach-Intersection over Union (IoU)

Deep Learning Architectures: R-CNN-Faster-R-CNN-You Only Look Once(YOLO)-Salient features-Loss Functions-YOLO architectures

Face recognition and **gesture** recognition**:** Face Recognition-Introduction-Applications of Face Recognition-Process of Face Recognition DeepFace solution by Facebook-FaceNet for Face Recognition- Implementation using FaceNet-Gesture Recognition.

Video analytics: Video Processing – use cases of video analytics-Vanishing Gradient and exploding gradient problem-RestNet architecture-RestNet and skip connections-Inception Network-GoogleNet architecture-Improvement in Inception v2-Video analytics-RestNet and Inception v3.

Text Book:

1. Milan Sonka, Vaclav Hlavac, Roger Boyle, "Image Processing, Analysis, and Machine Vision", 4nd edition, Thomson Learning, 2013(UNIT-I and II)
2. Vaibhav Verdhan,(2021, Computer Vision Using Deep Learning Neural Network Architectures with Python and Keras, Apress 2021 (UNIT-III,IV, V and VI)

Reference Books:

1. Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer Verlag London Limited,2011.
2. Caifeng Shan, FatihPorikli, Tao Xiang, Shaogang Gong, "Video Analytics for Business Intelligence", Springer, 2012.
3. D. A. Forsyth, J. Ponce, "Computer Vision: A Modern Approach", Pearson Education, 2003.
4. E. R. Davies, (2012), "Computer & Machine Vision", Fourth Edition, Academic Press.

Digital and Mobile Forensics
Professional Elective
Syllabus

Prerequisite:

- A foundational knowledge of cybersecurity concepts, understanding of computer networks, operating systems (including mobile platforms like Android and iOS), digital forensics tools and techniques, familiar mobile device architecture

Course objectives:

- To understand basic digital forensics and techniques.
- To understand digital crime and investigation.
- To understand how to be prepared for digital forensic readiness.
- To understand and use forensics tools for iOS devices.
- To understand and use forensics tools for Android devices.

Course outcomes:

On completion of the course, the students will be able to:

- Have knowledge on digital forensics.
- Know about digital crime and investigations.
- Be forensic ready.
- Investigate, identify and extract digital evidence from iOS devices.
- Investigate, identify and extract digital evidence from Android devices.

SYLLABUS

Introduction To Digital Forensics Forensic Science – Digital Forensics – Digital Evidence – The Digital Forensics Process – Introduction – The Identification Phase – The Collection Phase – The Examination Phase – The Analysis Phase – The Presentation Phase

Digital Crime And Investigation Digital Crime – Substantive Criminal Law – General Conditions – Offenses – Investigation Methods for Collecting Digital Evidence – International Cooperation to Collect Digital Evidence

Digital Forensic Readiness Introduction – Law Enforcement versus Enterprise Digital Forensic Readiness – Rationale for Digital Forensic Readiness – Frameworks, Standards and Methodologies – Enterprise Digital Forensic Readiness – Challenges in Digital Forensics

Ios Forensics Mobile Hardware and Operating Systems - iOS Fundamentals – Jailbreaking – File System – Hardware – iPhone Security – iOS Forensics – Procedures and Processes – Tools – Oxygen Forensics – MobilEdit – iCloud

Android Forensics Android basics – Key Codes – ADB – Rooting Android – Boot Process – File Systems – Security – Tools – Android Forensics – Forensic Procedures – ADB – Android Only Tools – Dual Use Tools – Oxygen Forensics – MobilEdit – Android App Decompiling

Text books:

1. Andre Arnes, “Digital Forensics”, Wiley, 2018.
2. Chuck Easttom, “An In-depth Guide to Mobile Device Forensics”, First Edition, CRC Press, 2022.

Reference Books:

1. Vacca, J, Computer Forensics, Computer Crime Scene Investigation, 2nd Ed, Charles River Media, 2005, ISBN: 1-58450-389.

Soft Computing
Professional Elective
Syllabus

Prerequisite: A strong mathematical background, Proficiency with algorithms, Programming skills in C, C++, or Java, MATLAB, etc., Critical thinking and problem solving skills.

Course objectives:

- To explain the role of Soft Computing in addressing the imprecision anduncertainty in real world scenarios.
- To explain fuzzy systems, fuzzy logic and its applications.
- To explain Artificial Neural Networks and various categories of ANN.
- Design hybrid system to revise the principles of soft computing in various applications.
- To explain Genetic algorithms and rough set

Course Outcomes:

On completion of the course, the students will be able to:

- Ability to represent Uncertainty / imprecision data.
- Understand perceptrons and counter propagation networks.
- Ability to select a suitable method of Soft Computing to solve a particularproblem.
- Ability to build hybrid systems using Soft Computing techniques.
- Analyze the genetic algorithms and their applications.

SYLLABUS

Soft Computing: Introduction to Fuzzy Computing, Neural Computing, Genetic Algorithms, Associative Memory, Adaptive Resonance Theory, Different Tools and Techniques, Usefulnessand Applications.

Fuzzy Sets and Fuzzy Logic: Introduction, Fuzzy Sets Versus Crisp Sets, Operations on FuzzySets, Extension Principle, Fuzzy Relations and Relation Equations, Fuzzy Numbers, Linguistic Variables, Fuzzy Logic, Linguistic Hedges, Applications,

Interference in fuzzy logic: fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzifications and Defuzzificataions, Fuzzy Controller, Fuzzy Controllers, Fuzzy Pattern Recognition, Fuzzy Image Processing, Fuzzy Database.

Artificial Neural Network: Introduction, Artificial Neuron and its model, activation functions,Neural network architecture: single layer and multilayer feed forward networks, re-current networks. Various learning techniques, perception and convergence rule, Auto-associative and hetro-associative memory, Hebb's Learning, Adaline, Perceptron.

Multilayer Feed Forward Network: Back Propagation Algorithms, Different Issues Regarding Convergence of Multilayer Perceptron, Competitive Learning, Self-Organizing, Feature Maps, Adaptive Resonance Theory, Associative Memories, Applications.

Evolutionary and Stochastic Techniques: Genetic Algorithm (GA), Genetic Representations, (Encoding) Initialization and Selection, Different Operators of GA, Analysis of SelectionOperations, Hypothesis of Building Blocks, Schema Theorem and Convergence of Genetic Algorithm, Simulated Annealing and Stochastic Models, Boltzmann Machine, Applications.

Rough Set: Introduction, Imprecise Categories Approximations and Rough Sets, Reduction of Knowledge, Decision Tables and Applications. Hybrid Systems: Neural Network-Based Fuzzy Systems, Fuzzy Logic-Based Neural Networks, Genetic Algorithm for Neural Network Design and Learning, Fuzzy Logic and Genetic Algorithm for Optimization, Applications

Text Books:

1. Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications, S.Rajsekaran and G.A. VijayalakshmiPai, Prentice Hall of India.
2. Rough Sets, Z.Pawlak, Kluwer Academic Publisher, 1991.
3. Intelligent Hybrid Systems, D. Ruan, Kluwer Academic Publisher, 1997

References:

1. Artificial Intelligence and Intelligent Systems, N.P.Padhy, Oxford University Press.
2. Neural Fuzzy Systems, Chin-Teng Lin & C. S. George Lee, Prentice Hall PTR.Addison-Wesley
3. Learning and Soft Computing, V. Kecman, MIT Press, 2001
4. Fuzzy Sets and Fuzzy Logic, Klir& Yuan, PHI, 1997

Software Project Management
Professional Elective
Syllabus

Prerequisite:

- Students should have knowledge about Software Engineering concepts
- Students should have knowledge about basic mathematics and programming concepts

Course Objectives:

At the end of the course, the student shall be able to:

- To understand the Software Project Planning and Evaluation techniques.
- To plan and manage projects at each stage of the software development life cycle (SDLC).
- To learn about the activity planning and risk management principles.
- To manage software projects and control software deliverables.
- To develop skills to manage the various phases involved in project management and people management.
- To deliver successful software projects that support organization ‘s strategic goals.

Course outcomes:

Upon the completion of the course students will be able to:-

- Understand Project Management principles while developing software.
- Gain extensive knowledge about the basic project management concepts, framework and the process models.
- Obtain adequate knowledge about software process models and software effort estimation techniques.
- Estimate the risks involved in various project activities.
- Define the checkpoints, project reporting structure, project progress and tracking mechanisms using project management principles.
- Learn staff selection process and the issues related to people management

SYLLABUS

Introduction to Software Project Management: Introduction to Project and Project Management, Reasons for IT project failure, Triple constraint of IT project management, Management spectrum of project, Overview of project life cycle models, Project manager skills and job description conceptualization and initiation of IT project, Business case.

Project Charter: Introduction, Project management process and their correlation with project life cycle phases, Introduction to Project Integration management and seven processes, Project Charter.

Project Scope Management: Introduction, Processes of scope management.

Project Human Resource Management: Introduction, Organizational structure – Function, Project and Matrix, Keys to managing people motivation theories and improving effectiveness, Project team selection.

Project Time and Cost Management: Introduction, Development of project schedule, CPM

and PERT, Activities their sequencing and dependencies, Project network diagrams, Development of Gantt Charts, Earned Value Management, Introduction to Constructive Cost Model (COCOMO).

Project Risk Management: Introduction, Risk Management Process, Risk Identification for IT projects, Qualitative and Quantitative approaches to Risk Analysis, Risk Strategies, Risk Monitoring and Control, Risk Response and Evaluation Project Quality Management.

Project Communication Management: Introduction, Project Communication Plan, Project metrics, Information distribution, Performance Reporting. Project Change Management: Introduction, Impact of change, Change as a process, Change Management plan, Dealing with resistance and conflict, Configuration management.

Project Procurement Management: Introduction, Processes Planning Purchases and Acquisition, Contracting, Request Seller Responses, Select Sellers, Contract Administration, Contract Closure, Outsourcing of products and services.

Project Leadership and Ethics: Introduction, Project Leadership, Modern approaches, Styles of leadership, Ethical leadership, Making sound ethical decisions in the situations of conflict. Closure of a Project: Introduction, Project implementation, Administrative closure, Project Evaluation.

Text Book:

1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition, Tata McGraw Hill, New Delhi, 2012.

References:

1. Robert K. Wysocki ―Effective Software Project Management – Wiley Publication, 2011.
2. Walker Royce: ―Software Project Management- Addison-Wesley, 1998.
3. opalaswamy Ramesh, ―Managing Global Software Projects – McGraw Hill Education (India), Fourteenth Reprint 2013

Ethical Hacking
Professional Elective
Syllabus

Prerequisite:

- Students should have an understanding of computer networking, operating systems (especially Linux and Windows), programming languages (such as Python, C, or Java), and cybersecurity fundamentals

Course Objectives:

- The aim of the course is to introduce the methodologies and framework of ethical hacking for enhancing the security.
- The course includes-Impacts of Hacking; Types of Hackers; Information Security Models, Information Security Program, Business Perspective, Planning a Controlled Attack
- Framework of Steps (Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Deliverable and Integration)

Course Outcomes:

At the end of this course, the students will be able:

- To express knowledge on basics of computer based vulnerabilities
- To gain understanding on different foot printing, reconnaissance and scanning methods.
- To demonstrate the enumeration and vulnerability analysis methods
- To gain knowledge on hacking options available in Web and wireless applications.
- To acquire knowledge on the options for network protection. To use tools to perform ethical hacking to expose the vulnerabilities

SYLLABUS

Introduction to Hacking: Hacking, Types and phases of hacking, **Introduction to Ports & Protocols**: Ports, Protocols, Primary Network Types, **Virtualization & Introduction to Kali Linux:** Virtualization, Virtualization software, supported platforms, **Introduction to Penetration Testing:** Penetration test, Categories and Types of Penetration tests, Structure of Penetration Test Report

Footprinting: Footprinting, Types, Using ping and ns Lookup commands in Windows command line, **Scanning:** Scanning, Basics of Scanning, Basic Techniques of Scanning, Enumerating DNS using dns enum, Performing flag scan using hping3.

Hacking into System: System Hacking, Password Cracking, Default password databases, Manual and Automated Password Cracking, Process of System Hacking, Using Keyloggers, **Trojans & Backdoors:** Trojans, Working of Trojan, Infection Techniques, Attack, Lifecycle and Classification of Virus, Worms, Virus Construction Kit.

Sniffing, Packet Analysis & Session Hijacking: Sniffing, Packet Analysis, Types of Sniffing, Active and Passive Sniffing Techniques, Session Hijacking, **Social Engineering:** Social Engineering, Process, Identity Theft, Human and Computer Based Social Engineering

Cryptography: Cryptography, Digital Signature, Hash Functions, **Steganography:** Steganography Process, watermarking, Steganography Methods and Attacks, Steganography tools, **Vulnerability Assessment:** Vulnerability, The Open Web Application Security Project (OWASP), Prevention, Damn Vulnerable Web Application (DVWA), installation and testing of DVWA

Text Books:

1. Hacking: Be a Hacker with Ethics, Harsh Bothra, Khanna Publications, 2019
2. Ethical Hacking and Penetration Testing Guide, Rafay Baloch, 2014

Reference Books:

1. Kali Linux Wireless Penetration Testing Beginner's Guide, Vivek Ramachandran, Cameron Buchanan, Packt Publishing, 2015
2. SQL Injection Attacks and Defense, 1st Edition, Justin Clarke-Salt, Syngress Publication
3. Mastering Modern Web Penetration Testing, Prakhar Prasad, Packt Publishing, October 2016

Quantum Computing
Professional Elective
Syllabus

Prerequisite: Basic quantum mechanics, Linear algebra, Basic group theory (and generally basic abstract algebra), Basic probability and stochastic processes, Fourier transforms, Design and Analysis of Algorithms, Cryptography.

Course objectives:

- To know the background of classical computing and quantum computing.
- To learn the fundamental concepts behind quantum computation.
- To study the details of quantum mechanics and its relation to Computer Science.
- To gain knowledge about the basic hardware and mathematical models of quantum computation.
- To learn the basics of quantum information and the theory behind it.

Course Outcomes:

On completion of the course, the students will be able to:

- Explain the basic concepts of quantum computing and the background of Quantum Mechanics.
- Illustrate in-depth overview of what matrices and operators perform operations on vectors, focusing on their applications in quantum.
- Model the circuits using quantum computation environments and frameworks.
- Demonstrate the quantum operations such as Tensor Products, Multi-Qubit Systems and error–correction.
- Choose effective quantum and cryptography algorithms operating on a fault-tolerant quantum computer can solve all kinds of quantum and classical problems.

SYLLABUS

Quantum Computing Basic Concepts: Introduction - Complex Numbers, Vector Space, and Dirac Notation, Inner Product, Linearly Dependent and Independent Vectors, Dual Vector. Basics of Quantum Mechanics - Limitations of Classical Physics, Photoelectric Effect, Classical Electromagnetic Theory, Postulates of Quantum Mechanics

Matrices and Operators: Matrices, Square Matrices, Diagonal (or Triangular) Matrix, Operators, Linear Operator, Commutator, Matrix Representation of a Linear Operator, Symmetric Matrix, Transpose Operation, Orthogonal Matrices, Identity Operator, Adjoint Operator, Hermitian Operator, Unitary Operators, Properties of Unitary Operators, Projection Operator.

Boolean Algebra, Logic Gates, and Quantum Information Processing: Boolean Algebra, Classical Circuit Computation Model, Universal Logic Gates, Quantum Computation, The Quantum Bit and Its Representations, Superposition in Quantum Systems, Quantum Register

Quantum Gates and Circuits: X Gate, Y Gate, Z Gate, (Square Root of NOT) Gate, Hadamard Gate, Phase Gate, T Gate, Reversible Logic, CNOT Gate, Controlled-U Gate, and Reversible Gates.

Tensor Products, Superposition: Tensor Products, Multi-Qubit Systems, Superposition

Quantum Error Correction: Classical Error-Correcting Codes, Quantum Error-Correcting Codes, Shor's 3-Qubit Bit-Flop Code, Error Correction, Bit-Flip Error Correction, Phase Error Correction, Shor's 9 Qubit Code.

Quantum Algorithms: Deutsch's Algorithm, Deutsch–Jozsa Algorithm, Grover's Search Algorithm, Details of Grover's Algorithm, Shor's Factoring Algorithm

Quantum Cryptography: Principles of Information Security, One-Time Pad, Public Key Cryptography, RSA Coding Scheme, Quantum Cryptography, Quantum Key Distribution.

Text Book:

1. Parag K Lala, Mc Graw Hill Education, First edition (2020), "Quantum Computing, A Beginners Introduction". Price: 1000
2. Chris Bernhardt, The MIT Press; Reprint edition (2020), "Quantum Computing for Everyone". Price: 1000

Reference Books:

1. Michael A. Nielsen, Issac L. Chuang, "Quantum Computation and Quantum Information", Tenth Edition, Cambridge University Press, 2010. Price: 1000
2. Scott Aaronson, "Quantum Computing Since Democritus", Cambridge University Press, 2013.
3. N. David Mermin, "Quantum Computer Science: An Introduction", Cambridge University Press, 2007.

Computer Vision
Professional Elective
Syllabus

Prerequisite: Machine Learning, Deep Learning

Course objectives:

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- To enable students to study about computer vision on dealing with real world images and videos
- identify basic concepts, terminology, theories, models, and methods in the field of computer vision
- describe basic methods of computer vision related to multi-scale representation, edge detection and detection of other primitives, motion, and object recognition.
- suggest a design of a computer vision system for a specific problem.

Course Outcomes:

- Identify basic concepts, terminology, theories, models, and methods in the field of computer vision.
- Describe basic methods of computer vision related to multi-scale representation, edge detection and detection of other primitives, stereo, motion, and object recognition.
- Choose appropriate computer vision methods for edge detection, object recognition, filtering etc.
- Develop and apply computer vision techniques for solving practical problems.
- Experiment with images in computer vision.

SYLLABUS

Introduction to Computer Vision: Introduction to Computer vision, Real time computer vision applications, Image representation and analysis.

Feature Engineering: Edges - Canny, LOG, DOG; Line detectors (Hough Transform), Corners - Harris and Hessian Affine, Orientation Histogram, SIFT, SURF, HOG, GLOH, Scale-Space Analysis- Image Pyramids and Gaussian derivative filters, Gabor Filters and DWT.

Feature modeling and analysis: Background Subtraction and Modeling, Optical Flow, KLT, Spatio-Temporal Analysis, Dynamic Stereo; Motion parameter estimation.

Computer Vision applications: Classifiers – Deep Neural Network (DNN), Object tracking, Model based vision, Finding Templates and Recognition, Case study 1: Face recognition system, Case Study 2: Vehicle anomaly detection in video surveillance.

Feature detection and matching: Points and patches, Edges and contours , Contour tracking , Lines and vanishing points, Segmentation, Image alignment and stitching- Pairwise alignment, Image stitching, Global alignment , Compositing

Textbook:

1. Szeliski, Richard. Computer vision: algorithms and applications. Springer Nature, Second Edition, 2022.
2. E. R. Davies**,** Computer Vision Principles, Algorithms, Applications, Learning, Elsevier, 5th Edition, 2017.

Reference Books:

1. Rafael C. Gonzales, Richard E. Woods, "Digital Image Processing", Fourth Edition, Pearson Education, 2018.
2. Richard Szeliski ,"Computer Vision: Algorithms and Applications" , Springer 2015

Cloud Computing
Professional Elective
Syllabus

Prerequisite:

- Students should have knowledge about networking concepts
- Students should have knowledge about security concepts

Course objectives:

- To define Cloud Computing and expose the students to the frontier areas of Cloud Computing
- To provide an in-depth and comprehensive knowledge of the Cloud Computing fundamental issues, technologies, applications and implementations.
- To introduce various levels of services that can be achieved by cloud.
- To gain knowledge on virtualization techniques.
- To understand the working methodology of existing clouds, such as, Amazon, Google and Azure

Course Outcomes:

- Articulate the main concepts, key technologies, strengths, and limitations of cloud computing and the possible applications for state-of-the-art cloud computing
- Identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc.
- Classify the Levels of Virtualization and mechanism of tools and Analyse Cloud Architectures.
- Assess Control Storage Systems.
- Get an idea and set up Private Clouds.

SYLLABUS

History of Computing Paradigms - Overview of Distributed Computing, Cluster computing, Grid computing, Ubiquitous Computing, Peer-to-Peer Computing. Distributed system Models and enabling Technologies.

Introduction to Cloud Computing - Cloud Computing and Service Models- Public, Private, and Hybrid Clouds, Cloud Ecosystem and Enabling Technologies, Infrastructure-as-a-Service (IaaS, Platform-as-a-Service (PaaS) and Software-as-a-Service (SaaS).

Virtual Machines and Virtualization - Implementation Levels of Virtualization, VMM Design Requirements and Providers, Virtualization Support at the OS Level, Middleware Support for Virtualization, Virtualization Structures/Tools and Mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management

Public Cloud Platform- Architectures and Programming: Google App Engine (GAE), Amazon Web Services (AWS), Microsoft Windows Azure. Service Oriented Architecture: REST, Publish Subscribe Model.

Storage Systems - Storage Models, File Systems, and Databases, Distributed File Systems, General Parallel File System, Google File Systems, Apache Hadoop, Locks and Chubby: A Locking Service, Transaction Processing and NoSQL Databases, Big Table, Mega Store.

Case Studies – The GrepTheWeb Application, Aneka Application of Maya Rendering Case Study.

Text Book:

1. Kai Hwang, Geoffrey C. Fox, Jack K. Dongarra, Distributed and Cloud Computing: From parallel processing to Internet of Things, Morgen Kauffmann 2013.
2. Cloud Computing Theory and Practice, Dan C. Marinescu.

Reference Books:

1. Cloud Computing: A Practical Approach Anthony T.Velte Toby J.Velte, Ph.D. Robert Elsenpeter
2. Cloud Computing Bible, Barrie Sosinsk.
3. Cloud computing - Course (nptel.ac.in)

Natural Language Processing
Professional Elective
Syllabus

Prerequisites:

- Programming Language Basics
- Basics in Mathematics
- Statistics

Course Objectives:

- Students will gain an in-depth understanding of the computational properties of natural languages and the commonly used algorithms for processing linguistic information.
- The course examines text representations and NLP algorithms using both the traditional symbolic and the more recent statistical and distributional approaches.
- Enable students to develop NLP models for text classification, information extraction, and dialog systems
- Provides a comprehensive study on NLP applications in a wide variety of domains

Course Outcomes:

- Understand the basic concepts and challenges of NLP and different stages of NLP Pipeline
- Understand and analyze various representational approaches starting from vectorization-based to distribution-based embeddings for processing natural language text
- Build and interpret machine learning and deep learning models for Text Classification
- Understand basic concepts of information extraction for building different variants of NER systems and the concepts and challenges underlying the development of dialog systems / chatbots
- Understand the approach and analyze the effectiveness of NLP applications in different domains.

SYLLABUS

INTRODUCTION TO NLP and NLP Pipeline:

NLP tasks and applications, building blocks of language, NLP challenges, Basic approaches to NLP-Heuristics based NLP, Machine Learning for NLP, Deep Learning forNLP. NLP Pipeline- Data Acquisition, Text Extraction and Cleanup, Pre-processing, Feature Engineering, Building the model, Evaluation.

TEXT REPRESENTATION

Vector space models, Basic Vectorization approaches, Distributed representations, Distributed representations beyond words and characters, Universal Text Representations, visualizing embeddings.

TEXT CLASSIFICATION:

Applications of text classification, Pipeline for building Text classification systems, One pipeline-many classifiers- Naïve Bayes, Logistic regression, SVM, Using Neural Embeddings in Text Classification, Deep Learning for Text Classification, Interpreting text classification models, Learning with no or less data and adapting to new domains, case study on corporate ticketing.

INFORMATION EXTRACTION:

Information Extraction-IE Applications, IE Tasks, General IE Pipeline, Keyphrase Extraction,Named Entity Recognition, Building an NER System, Building an NER System usingexisting library, using active learning, Named Entity Disambiguation and Linking, Relationship Extraction and other IE tasks

CHATBOTS:

Chatbots- Applications, Taxonomy of Chatbots, Pipeline for building Dialog Systems, Components of a Dialog system, other dialog pipelines with end-to-end approach, Deep Reinforcement learning for dialog generation, human-in-the-loop, case study on recipe recommender, open-ended generative chatbots

BRIEF OVERVIEW ON NLP APPLICATIONS:

Search and Information Retrieval- Components of Search Engine, Topic Modeling, Text Summarization, Recommender Systems for textual data, Machine Translation, Question- Answering Systems.

NLP APPLIED TO SOCIAL MEDIA AND E-COMMERCE:

Applications and challenges of NLP for Social Media, Issues related to NLP for social media data, NLP for supporting e-commerce acivities, Search in E-commerce, Building E-commerce catalog, Review analysis, recommendations for e-commerce

Text Books:

1. Sowmya Vajjala, Bodhisattwa Majumder, Anuj Gupta and Harshit Surana, "*PracticalNatural Language Processing*", O'Reilly Media Inc., 2021, ISBN: 978-93- 8588-918-9.

Reference Books:

1. Lewis Tunstall, Leandro von Werra, Thomas Wolf, "*Natural Language Processing with Transformers: Building Language Applications with Hugging Face*", O'Reilly Media Inc., 2022
2. Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, 2ndEdition, Daniel Jurafsky, James H. Martin -Pearson Publication,2014.

Python for Data Science
Open Elective
Syllabus

Prerequisites:

- Programming Language Basics
- Basics in Mathematics
- Statistics

Course Objectives:

- Provide you with the knowledge and expertise to become a proficient data scientist.
- Demonstrate an understanding of statistics and machine learning concepts that are vital for data science.
- Produce Python code to statistically analyze a dataset.
- Critically evaluate data visualizations based on their design and use for communicating stories from data.

Course Outcomes:

- After the completion of the course, student will be able to
- Explain how data is collected, managed and stored for data science.
- Understand the key concepts in data science, including their real-world applications and the toolkit used by data scientists.
- Implement data collection and management scripts using Python Pandas.
- Illustrate various plotting and Visualization techniques

SYLLABUS

Introduction to Data Science – Evolution of Data Science – Data Science Roles – Stages in a Data Science Project – Applications of Data Science in various fields – Data Security Issues.
Overview of Python and Data Structures: Basics of Python including data types, variables, expressions, objects and functions. Python data structures including String, Array, List, Tuple, Set, Dictionary and operations them.

Numpy: The NumPy ndarray, A Multidimensional Array Object- Creating ndarrays, Data Types for ndarrays, Arithmetic with NumPy Arrays, Basic Indexing and Slicing, Boolean Indexing, Fancy Indexing, Transposing Arrays and Swapping Axes , Pseudorandom Number Generation, Universal Functions: Fast Element-Wise Array Functions, Array-Oriented Programming with Arrays-Expressing Conditional Logic as Array Operations, Mathematical and Statistical Methods, Methods for Boolean Arrays, Sorting, Unique and Other Set Logic, File Input and Output with Arrays, Linear Algebra, Example: Random Walks- Simulating Many Random Walks at Once

Pandas: Introduction to pandas Data Structures- Series, DataFrame, Index Objects, Essential Functionality- Reindexing, Dropping Entries from an Axis, Indexing, Selection, and Filtering, Arithmetic and Data Alignment, Function Application and Mapping, Sorting and Ranking, Axis Indexes with Duplicate Labels, Summarizing and Computing Descriptive Statistics-Correlation and Covariance, Unique Values, Value Counts, and Membership.

Plotting and Visualization: A Brief matplotlib API Primer- Figures and Subplots, Colors, Markers, and Line Styles Ticks, Labels, and Legends Annotations and Drawing on a Subplot**,** Saving Plots to

File**,** matplotlib Configuration**,** Plotting with pandas and seaborn**-** Line Plots**,** Bar Plots**,** Histograms and Density Plots Scatter or Point Phots**,** Facet Grid's and Categorical Data**,** Other Python Visualization Tools

Data Preprocessing: Data Loading, Storage, and File Formats - Reading and Writing data in text format, binary data formats, interacting with html and web api, interacting with databases; Data Wrangling: Clean, Transform, Merge, Reshape - Combining and Merging Data Sets, Reshaping and Pivoting, Data Transformation, String Manipulation; Data Aggregation and Group Operations – Group by Mechanics, Data Aggregation, Groupby Operations and and Transformations, Pivot Tables and Cross Tabulation

Text Books:

1. Python For Data Analysis (O Reilly, Wes Mckinney)
2. Learning Python , OReilly, Mark Lutz

Reference Books:

1. Python: The Complete Reference, Martin C. Brown, McGraw Hill Education
2. Head First Python, Paul Barry, O′Reilly

Renewable Energy Sources
Open Elective
Syllabus

Prerequisite:
This course presents the various sources of renewable energy such as solar, wind, geothermal energy,biomass & other potential energy and contribution towards energy profile of the nation.

Course Objectives:

- To study the solar radiation data, equivalent circuit of PV cell and its I-V & P-V characteristics.
- To understand the concept of Wind Energy Conversion & its applications.
- To study the principles of biomass and geothermal energy.
- To understand the principles of Ocean Thermal Energy Conversion (OTEC), motion of waves andpower associated with it.
- To study the various chemical energy sources such as fuel cell and hydrogen energy along withtheir operation and equivalent circuit.

Course Outcomes:
After the completion of the course the student should be able to:

- Analyze Solar radiation data, extra-terrestrial radiation, radiation on earth's surface and solarEnergy Storage.
- Illustrate the components and working of Wind energy systems.
- Describe the biomass conversion technologies and working of Biomass plants.
- Outline the principle and working of Geothermal Energy.
- Explain the principle of Energy production from OTEC, Tidal and Waves.
- Summarize the concepts of Fuel cells and Hydrogen Energy.

SYLLABUS

Solar Energy: Introduction - Renewable Sources - prospects, Solar radiation at the Earth Surface - Equivalent circuit of a Photovoltaic (PV) Cell - I-V & P-V Characteristics - Solar Energy Collectors: Flatplate Collectors, concentrating collectors - Solar Energy storage systems and Applications: Solar Pond - Solar water heating - Solar Green house.

Wind Energy: Introduction - Basic Principles of Wind Energy Conversion- Site selection considerations - Basic components of Wind Energy Conversion Systems (WECS) - Classification - Applications.

Biomass: Introduction - Biomass conversion technologies - Photosynthesis, factors affecting Bio digestion - classification of biogas plants - selection of site for a biogas plant

Geothermal Energy: Introduction, Geothermal Sources – Applications - operational and Environmentalproblems.

Energy From oceans, Waves & Tides:

Oceans: Introduction - Ocean Thermal Electric Conversion (OTEC) – methods - prospects of OTEC inIndia.
Waves: Introduction - Energy and Power from the waves - Wave Energy conversion devices.
Tides: Basic principle of Tide Energy -Components of Tidal Energy.
Chemical Energy Sources:
Fuel Cells: Introduction - Fuel Cell Equivalent Circuit - operation of Fuel cell - types of Fuel Cells -Applications.
Hydrogen Energy: Introduction - Methods of Hydrogen production - Storage and Applications.
.
Text Books:

1. B H Khan Non-Conventional Energy Resources, Mc Graw Hill,2017.
2. G.D.Rai, Non-Conventional Energy Sources, Khanna Publications, 2011.
3. John Twidell & Tony Weir, Renewable Energy Sources, Taylor & Francis, 2013.

Reference Books:

1. S.P.Sukhatme & J.K.Nayak, Solar Energy-Principles of Thermal Collection and Storage, TMH,2011.
2. John Andrews & Nick Jelly, Energy Science- principles, Technologies and Impacts, Oxford, 2nd edition, 2013.
3. Shoba Nath Singh, Non- Conventional Energy Resources, Pearson Publications, 2015.

Data Communications
Open Elective
Syllabus

Prerequisite: Basic knowledge about mathematics basis on logic circuits and their applications in digital system.

Course objectives:

- To introduce the fundamental various types of computer networks.
- To explore the communication protocols and layered network architectures
- To demonstrate the TCP/IP and OSI models with merits and demerits
- To introduce UDP and TCP Models.
- To explore the various application layer protocols

Course Outcomes:

On completion of the course, the students will be able to:

- Outline the functions of various layers of OSI/TCP reference model and functions of various Data communication Networks
- Understand about the various data link layer protocols.
- Explain the network layer protocols and demonstrate the mechanism of routing the data in network layer
- Explain significance of transport layer and know the various Flow control and Congestion control Mechanisms
- Understand the Functions of various Application layer Protocols**.**

SYLLABUS

Introduction to Data Communications: Components, Data Representation, Data Flow, Networks-Distributed Processing, Network Criteria, Physical Structures, Network Models, Categories of Networks Interconnection of Networks, The Internet - A Brief History, The Internet Today, Protocol and Standards - Protocols, Standards, Standards Organizations, Internet Standards. Network Models, Layered Tasks, OSI model, Layers in OSI model, TCP/IP Protocol Suite, Addressing Introduction, Wireless Links and Network Characteristics, WiFi: 802.11 Wireless LANs -The 802.11 Architecture,

Data Link Layer: Links, Access Networks, and LANs- Introduction to the Link Layer, The Services Provided by the Link Layer, Types of errors, Redundancy, Detection vs Correction, Forward error correction Versus Retransmission Error-Detection and Correction Techniques, Parity Checks, Check summing Methods, Cyclic Redundancy Check (CRC) , Framing, Flow Control and Error Control protocols , Noisy less Channels and Noisy Channels, HDLC, Multiple Access Protocols, Random Access ,ALOHA, Controlled access, Channelization Protocols. 802.11 MAC Protocol, IEEE 802.11 Frame.

The Network Layer: Introduction, Forwarding and Routing, Network Service Models, Virtual Circuit and Datagram Networks-Virtual-Circuit Networks, Datagram Networks, Origins of VC and Datagram Networks, Inside a Router-Input Processing, Switching, Output Processing, Queuing, The Routing Control Plane, The Internet Protocol(IP):Forwarding and Addressing in the Internet-Datagram format, Ipv4 Addressing, Internet Control Message Protocol(ICMP), IPv6

Transport Layer: Introduction and Transport Layer Services : Relationship Between Transport and Network Layers, Overview of the Transport Layer in the Internet, Multiplexing and Demultiplexing, Connectionless Transport: UDP -UDP Segment Structure, UDP Checksum, Principles of Reliable Data Transfer-Building a Reliable Data Transfer Protocol, Pipelined Reliable Data Transfer Protocols, Go-Back-N(GBN), Selective Repeat(SR), Connection Oriented Transport: TCP - The TCP Connection, TCP Segment Structure, Round-Trip Time Estimation and Timeout, Reliable Data Transfer, Flow Control, TCP Connection Management, Principles of Congestion Control - The Cause and the Costs of Congestion, Approaches to Congestion Control

Application Layer: Principles of Networking Applications – Network Application Architectures, Processes Communicating, Transport Services Available to Applications, Transport Services Provided by the File Transfer: FTP,- FTP Commands and Replies, Electronic Mail in the Internet- STMP, Comparison with HTTP, DNS-The Internet's Directory Service – Service Provided by DNS, Overview of How DNS Works, DNS Records and messages.

Text Book:

1. Computer Networking A Top-Down Approach – Kurose James F, Keith W, 6thEdition , Pearson,2017
2. Data Communications and Networking Behrouz A.Forouzan4th Edition McGraw Hill Education,2017.

Reference Books:

1. Data communication and Networks - Bhusan Trivedi, Oxford university press, 2016
2. Computer Networks -- Andrew S Tanenbaum, 4th Edition, Pearson Education, 2003.
3. Understanding Communications and Networks, 3rd Edition, W.A.Shay, Cengage Learning, 2003.

Block Chain Technologies
Open Elective
Syllabus

Prerequisite: Expertise in programming, basic knowledge of computer security, cryptography, networking, concurrent or parallel programming.

Course objectives:

- To understand the basic concepts block chain technology and to explore the driving force behind the crypto currency Bitcoin.
- To understand about the different methods of Decentralization using Block Chain and different Bitcoins and Alternative Coins.
- To understand about Ethereum and applications using Smart contracts and Block Chain Applications.
- To get familiarity with future currencies and to create own crypto token.

Course Outcomes:

After the completion of the course, student will be able to

- Explore the primitives of the distributed computing and cryptography related to blockchain
- Understand the types, benefits and limitation of block chain.
- Enumerate the Bitcoin features and its alternative options.
- Understand the modern currencies and its market usage.
- Implement and deploy the smart contracts in different environments like Ethereum.
- Usage of smart contracts in various real world application domains.

SYLLABUS

Block Chain and its History: History of blockchain, Types of blockchain, Blockchain Components – Permissioned Blockchain Permission less Blockchain – Consortium Blockchain – basics of Consensus Algorithms, Architecture & Properties of Blockchain.

Decentralization and Consensus Algorithms: Decentralization using blockchain, Methods of decentralization, Routes to decentralization, Decentralized organizations, Distributed systems, Distributedledger, Merkle tree, structure of a block, Consensus

Algorithms: Proof of Work, Proof of Stack, Proof of Burn, Proof of Elapsed Time, Proof of Activity, Proof of Concept.

Bitcoin and Alternative Coins: Bitcoin, Transactions, Bitcoin payments , Bitcoin properties – Transaction life cycle – creation of coin –sending payments – double spending using blockchain – bitcoin anonymity – Ether: Ethercoin properties, Alternative Coins, Bitcoin limitations, Namecoin, Litecoin, Primecoin, Zcash

Ethereum and smart contracts: Ethereum Architecture, solidity programming basics, Smart Contract, Deploying Smart Contracts, Integration with UI.

Blockchain Applications: Blockchain-Outside of Currencies: Internet of Things, Government,

Health, Finance, Media, Secure Voting and Digital Identity, Real Estate, Education

Text Book:

1. Mastering Blockchain - Distributed ledgers, decentralization and smart contracts explained, Author- Imran Bashir, Packt Publishing Ltd, Second Edition, ISBN 978-1- 78712-544-5, 2017
2. Bitcoin and Cryptocurrency Technologies, Author- Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder, Princeton University, 2016
3. Blockchain Technology, Author- Chandramouli Subramanian, Asha A George, Abhilash K A, Meena Karthikeyan, University Press (India) Private Limited, 2021

Reference Books:

1. Blockchain Basics: A Non-Technical Introduction in 25 Steps, Author- Daniel Drescher, Apress, First Edition, 2017

INTERNET OF THINGS
OPEN ELECTIVE
SYLLABUS

Course Objectives:

- Understand IoT conceptual framework and design standardization of IoT/M2M architectural layers and domains
- Learning the usage of messaging protocols between connected devices and the web
- Identify the functions and usage of data analytics and cloud services for IoT applications and business processes.
- Elucidate sensor technology for sensing the real world using analog and digital sensors
- Develop the codes, design and test the embedded devices for IoT and M2M using IDEs and development platforms

Course Outcomes:

At the end of the course, student will be able to

- Understand the IoT Standards and design principles.
- Understand various web-communication protocols and their practical usage.
- Able to use IoT cloud-based services using the Xively, Nimbits.
- Able to learn various types of sensors and actuators, interfacing and use in IoT environment.
- Able to use number of device platforms of IDEs, such as Arduino, Intel Galileo, RPi, BB and mBed, provide development tools, libraries and framework, and are used for the development ofembedded Software.

SYLLABUS:

The Internet of Things: An Overview of Internet of things, Internet of Things Conceptual Frame work, IoT architectural View, Technology behind IoT, Sources of IoT, M2M Communication, Examples of IoTs, Design Principles for Connected Devices Internet Connectivity: IoT/M2M System Layers and Design Standardization.

Design for Web Connectivity.: Web communication protocols for connected devices, Message Communication protocols for connected devices, Web Connectivity for Connected-Devices Network using Gateway, SOAP, REST, HTTP RESTFUL, and Web Sockets, Principles, Internet connectivity, Application Layer Protocols: HTTP, HTTPS, FTP, Telnet.

Data Acquiring, Organizing, Processing and Analytics: Data Acquiring and Storage, Organizing the Data, Transactions, Business Processes, Integration and Enterprise Systems. Analytics, Knowledge acquiring, managing and storing process.

Data Collection, Storage and Computing Using a Cloud Platform: Cloud Computing Paradigm for Data Collection, Storage and Computing. Everything as a service and Cloud Service Models, IOT cloud-based services using the Xively, Nimbits and other platforms.

Sensor, Participatory Sensing, RFID, Wireless Sensor Networks: Sensors Technology, ParticipatorySensing, Actuator, Sensor Data Communication Protocols, RFID, WSN.

Prototyping and Designing the Software for IoT Applications: Prototyping embedded device Software, Devices, Gateways, Internet and Web/Cloud Services Software Development, Prototyping

Online Component APIs and Web APIs.

IoT Case Studies: Design Layers, Design Complexity and Designing Using Cloud PaaS. IoT Applications for Smart Homes, Cities, Environmental Monitoring and Agriculture. Connected Car and Its applications.

Text Books:

1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education
2. Internet of Things, A.Bahgya and V.Madisetti, Univesity Press,2015

Reference Books:

1. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally,Wiley
2. Getting Started with the Internet of Things,CunoPfister , Oreilly

Introduction to Psychology
Open Elective
Syllabus

Prerequisite: The course is designed to provide the student a basic understanding of the psychology of human behaviour. The students will be given exposure to concepts, terminology, principles, and theories that comprise an introductory course in psychology.

Course objectives:

- To help the students know the sources and processes of development of modern scientific psychology.
- To help the students develop a scientific temperament in studying and understanding human behavior.

Course Outcomes:

Students will be able to

- Define the term psychology and demonstrate command of the basic terminology,
- concepts, and principles of the discipline.
- Gain knowledge of scientific methodology–the variety of ways in which psychological
- data are gathered and evaluated / interpreted.
- Identify and compare the major perspectives in psychology: Recognize how each
- approach views human thought and behavior.
- Understand the physiological and biochemical links of human behavior.

SYLLABUS

Introducing Psychology

(i) Concept and definition of psychology, Roots of psychology, Psychology as a scientific discipline.

(ii) Key Perspectives in Psychology- Behavioral, Cognitive, Humanistic, Psychodynamic, and

Socio-cultural.

Methods in Psychology

(i) Natural Observation, Survey and Case Study - Nature, advantages and limitations.

(ii) Experimental and Correlational methods -Nature, advantages and limitations.

Biological Bases of Behavior

(i) Structure and functions of the neurons, Communication within and between neurons,

Chemical regulation of the endocrine glands.

(ii) Structure and functions of the Central nervous system and Autonomic nervous system

States of Mind

(i) Nature of consciousness; changes in consciousness- sleep-wake schedules

(ii) Extended states of Consciousness - Hypnosis, Meditation and Hallucinations

Text Books:

1. Baron, R. A. (2002). Psychology (5th Edition), New Delhi: Pearson Education.
2. Hilgard & Atkinson- Introduction to Psychology (2003) 14th Edition, Thomson Learning Inc.
3. Mohanty, N., Varadwaj, K. & Mishra, H.C. (2014). Explorations of Human Nature and
4. Strength: Practicals in Psychology, DivyaPrakashani, Samantarapur, Bhubaneswar.

Reference Books:

1. Morgan, C.T., King, R.A., Weisz, J.R., &Schopler, J. (2008). Introduction to psychology (7th
2. edition) Bombay: Tata-McGraw Hill.
3. Feldman, R.S. (2004). Understanding Psychology (6th Edition), New Delhi, Tata-McGraw Hill.

Industry 4.0
Open Elective
Syllabus

Prerequisite:

- Students should have knowledge about Sensors
- Students should have knowledge about robotics and IoT

Course Objective

- This course provides students with an introduction to Industry 4.0, its building blocks, its applications and advantages compared to conventional production techniques.
- Learners get a deep insight into components and technologies of industry 4.0 can be used to build up the production of the future.
- It is also important that the theory is deepened by means of roadmap technologies with phase wise developments.
- To impart knowledge of smart manufacturing, IIot for industry 4.0.

Course Outcomes
Students will be able to:

- Describe Industry 4.0 and scope for Indian Industry
- Demonstrate conceptual framework and road map of Industry 4.0
- Describe IIoT, cloud computing and big data, smart factories role in Industry 4.0
- Describe Robotic technology and Augmented reality for Industry 4.0
- Demonstrate obstacle and framework conditions for Industry 4.0

SYLLABUS

Introduction to Industry 4.0: Introduction, Idea of Industry 4.0, Various Industrial Revolutions, Origin concept of Industry 4.0,Industry 4.0 Production system, How is India preparing for Industry 4.0, Comparison of Industry Factory and Today's Factory.

Trends in Industry 4.0: Introduction, Main Concepts and Components of Industry 4.0, State of Art Technologies, Proposed Framework for Industry 4.0, Trends of Industrial Big Data and Smart Business Transformation.

Roadmap for Industry 4.0: Introduction, Proposed Framework for Technology Roadmap: Strategy Phase, Development Phase, Smart Manufacturing, Types of Smart Devices, Smart Logistics, Smart Cities, Predictive Analytics.

Advances in the Era of Industry 4.0: Introduction, Recent Technological Components of Robots- Advanced Sensor Technologies, Internet of Things, Industrial Robotic Applications- Manufacturing, Maintenance and Assembly, IIoT- Industrial IoT.

The Role of Industry 4.0 and Future Aspects: Introduction, Challenges & Future of Works and Skills for Workers in the Industry 4.0 Era, Strategies for competing in an Industry 4.0 world.

Reference Books:

1. Alp Ustundag and Emre Cevikcan,"Industry 4.0: Managing the Digital Transformation".
2. Bartodziej, Christoph Jan,"The Concept Industry 4.0".
3. Klaus Schwab,"The Fourth Industrial Revolution".
4. Christian Schröde, "The Challenges of Industry 4.0 for Small and Medium-sized Enterprises".

List of Open Source Software/learning website:

1. www.nptel.ac.in/

Geographic Information System
Open Elective
Syllabus

Prerequisite:

- Students with a thorough understanding of GIS fundamentals, practical skills in data management and analysis, and the ability to apply GIS in various decision-making contexts.

Course objectives:

- Understand the Fundamentals of GIS
- Learn about GIS Data Structures and Models
- Explore Spatial Data Editing and Attribute Data Management
- Grasp Spatial Analysis Techniques

Course Outcomes:

- Demonstrate Comprehensive Knowledge of GIS
- Apply Data Structure and Model Concepts in GIS
- Perform Spatial Data Editing and Attribute Data Management:
- Conduct Advanced Spatial Analysis
- Utilize Geo-Statistical Analysis and Decision Support Systems:

SYLLABUS

Introduction to GIS

Basic concepts: Definition and history, Components of GIS, Recent trends and applications of GIS; Data structure and formats, Spatial data models – Raster and vector, Data base design- editing and topology creation in GIS, Linkage between spatial and non-spatial data, Data inputting in GIS. Rectification, Transformation Methods; Root Mean Square (RMS) Error.

Data Types and Data Models Data Types; Spatial Data; Non-Spatial Data, Data Input; Existing GIS Data, Metadata; Conversion of Existing Data, Creating New Data, Data Models; Vector Data Model; Raster Data Model; Integration and Comparison of Vector and Raster Data Mdels

Spatial Data Editing Types of Digitizing Errors, Causes for Digitizing Errors; Topological Editing and Non-topological Editing; Other Editing Operations; Editing Using Topological Rules.

Attribute Data and Data Exploration Attribute Data in GIS, Attribute Data Entry, Manipulation of Fields and Attribute Data, Data Exploration; Attribute Data Query, Raster Data Query, Map- Based Data Manipulation,

Spatial Analysis Spatial Data: Definition, Analysis, Processes & Steps, Software and Tools, Geodatabase Model, Role of Databases in GIS, Creating, Editing and Managing, Classification scheme of Vector- Based and Raster- Based GIS Operation Raster- Based Techniques: Methods of reclassification, overlay analysis, Digital Terrain Analysis and Modeling- TIN and DEM, Surface representation and analysis, Slope and Aspect, Geographic Visualization Data Classification, Map Comparison,

Geo Statistical Analysis Techniques: Introduction to Spatial Interpolation: Control Points, Global Method- Trend surface analysis, regression model, local methods- Thiessen polygons, density estimation, Inverse Distance weighted Interpolation, Kriging- Ordinary Kriging and Universal Kriging, GIS and decision support system, Introduction to AHP, basic principal of AHP. Principal and components of multiple criteria decision making

Text Books:

1. kang-tsung Chang (2007), 'Introduction to Geographic Information Systems' Tata MCGraw Hill, New Delhi.
2. C.P.Lo and Albert K.W. Yeung (2006) "Concepts and Techniques of Geographic information Systems" Prentice Hall of India, New Delhi

Reference Books:

1. Burrough, Peter A. and Rachael McDonnell, (1998), 'Principles of Geographical Information Systems' Oxford University press, New York.
2. Magwire, D.J. Goodchild, M.F. and Rhind, D.M., (2005), 'Geographical Information Systems: Principles and Applications', Longman Group, U.K.
3. Burrough, P.A., 1986, Geographical Information System for land Resources System, Oxford Univ. Press, UK.

Business Analytics
Open Elective
Syllabus

Prerequisite:

- Students should have knowledge about probability &statistics
- Students should have knowledge about basic python or R programming

Course objective:

- To learn how to develop models to predict categorical and continuous outcomes, using statistical techniques.
- To implement Data Mining techniques such as Decision Tree, classification, Linear regression, Logistic regression and Bayesian NW models.
- To know the enterprise information systems and support systems in business organizations
- To know the visualization techniques to analyze data
- To Visualize the data for Business Intelligence decisions

Course outcomes:

After completion of course students would be

- Understand the process of business enterprises and their work flow for business Analytics
- Analyze probability and Random variable experiments
- Understand data analytics and decision support systems for Business enterprises
- Solving business problems and analyze the data using Machine Learning Techniques
- Implementing Data security and Ethics in business.

SYLLABUS

Introduction to Business Analytics: Why Business Analytics, benefits of implementing Business Analytics, Business Intelligence Vs Business Analytics. Four stages of Business Analytics model, process to implement business analytics, Business Analytics Techniques.

Probability: Axioms of probability, Conditional probability, Baye's theorem, Random Variable, commonly used distributions (continuous and discrete), Cumulative Distribution Function (CDF) and Probability Density Function (PDF) their properties; Joint distributions, Function of random variables. Independence of Random Variables, Correlation of Random Variables, Correlation coefficient, Exponential Family of Distributions, Population and Random Sampling, Sample mean, variance and standard deviation, Sampling from Normal distribution, t-distribution, F-distributions and Chi-square Distribution.

Data Analytics : What is data analytics, Types of data Analytics. Importing, cleaning, and transforming business data, Algorithmic thinking, Data visualization, grouping and aggregation, reshaping Statistical modeling and time series, Data exploration, Communication of results.

Enterprise Information Systems in Business: what is information systems, components of Information System, Role of Information System in Business. Types of Information Systems, Information System resources and Infrastructure; MIS and DSS in business and OLAP operations on business data, IS infrastructure-Hardware, software, and networks

Business Data Analysis and Visualization: Tabulation, bar diagram, Multiple Bar diagram, Pie diagram, Measure of central tendency: mean, median, mode, Measure of dispersion: variance, standard deviation, Coefficient of variation. Correlation, decision tree, construction of decision tree. Regression lines. Classification, Clustering and Multiple linear predictions, t-test, F-test, ANOVA one-way classification, chi square test, Time series: forecasting Method of least squares, moving average method.

Security and Ethical challenges in Business: Ethical responsibility of business professionals, business and technology ethics, ethical guidelines, cybercrime and piracy

Text Books:

1. Douglas C. Montgomery, Larry Faris Thomas and George C. Runger (2003) `Engineering Statistics" , 3rd edition, John Wiley & Sons.
2. Ger Koole, An Introduction to Business Analytics;
3. Ramesh Behl , James A.O'Brien George M. Marakas; Management Information Systems

References:

1. Probabillityand statistics; Murray R. Spiegel, John Schiller and R.Alu Srinivasan; Mcgrawhill
2. Practical statistics for Data Scientist , Peter Bruce & Andrew Bruce, O'Reeilly

Electric and Hybrid Vehicles
Open Elective
Syllabus

Prerequisite: Students must have knowledge about understanding of electric propulsion, regenerative braking, battery technology, internal combustion engines, powertrain integration, and hybrid system control strategies.

Course objectives:

- To familiarize the students with the need and advantages of electric and hybrid electric vehicles.
- To know various architectures of hybrid electric vehicles
- To understand the power management of plug in electric vehicles.
- To study and understand different power converters used in electrical vehicles
- To familiarize with different batteries and other storage systems.

Course Outcomes:

- Summarize the concept of Electric Vehicles (EV) and Hybrid Electric Vehicles (HEV).
- Analyse the various drive train configurations of hybrid electric vehicles.
- Choose an effective motor for EV and HEV application and summarize drive train concept of plug in electric vehicles
- Analyse the power converters used in hybrid electric vehicles
- Summarize concept of energy storage systems using battery and other storage systems

SYLLABUS

Fundamentals of vehicle: components of conventional vehicle and propulsion load; Drive cycles and drive terrain; Concept of electric vehicle and hybrid electric vehicle; History of hybrid vehicles - advantages and applications of Electric and Hybrid Electric Vehicles.

Hybridization of Automobile: Architectures of HEVs - series and parallel HEVs - complex HEVs. Plug-in hybrid vehicle (PHEV) - constituents of PHEV - comparison of HEV and PHEV; Extended range hybrid electric vehicles (EREVs) - blended PHEVs - Fuel Cell vehicles and its constituents.

Special Machines for EV and HEVs: Characteristics of traction drive - requirement of electric motors for EV/HEVs. Induction Motor drives -their control and applications in EV/HEVs. Permanent magnet Synchronous motor: configuration - control and applications in EV/HEVs. Brushless DC Motors: Advantages - control of application in EV/HEVs. Switch reluctance motors: Merits limitations - control of SRM for EV/HEVs.

Power Electronics in HEVs: Boost and Buck-Boost converters - Multi Quadrant DC-DC converters - DC-AC Inverter for EV and HEV applications - Three Phase DC-AC inverters - Voltage control of DC-AC inverters using PWM - EV and PHEV battery chargers.

Energy Sources for HEVs : Energy Storage - Battery based energy storage and simplified models of battery - fuel cells – their characteristics and simplified models - super capacitor based energy storage - its analysis and simplified models - flywheels and their modeling for energy storage in EV/HEV - Hybridization of various energy storage devices.

Text Books

1. Ali Emadi - Advanced Electric Drive Vehicles - CRC Press - 2014.
2. Iqbal Hussein - Electric and Hybrid Vehicles: Design Fundamentals - CRC Press - 2003.

Reference Books:

1. MehrdadEhsani - YimiGao - Sebastian E. Gay - Ali Emadi - Modern Electric - Hybrid Electric and Fuel Cell Vehicles: Fundamentals - Theory and Design - CRC Press - 2004.
2. James Larminie - John Lowry - Electric Vehicle Technology Explained - Wiley - 2003.
3. H. Partab: Modern Electric Traction - DhanpatRai& Co - 2007.

NoSQL DATABASES
OPEN ELECTIVE
SYLLABUS

Course Objectives:

- Define NoSQL, its characteristics and history, and the primary benefits for using NoSQL data
- Define the major types of NoSQL databases including a primary use case andadvantages/disadvantages of each type
- Create wide-column, document, key-value, graph and object-oriented databases, add content, and run queries.
- Describe the NoSQL data architecture patterns
- Perform basic database administration tasks.
- Develop NoSQL desktop and cloud database solutions

Course Outcomes:

At the end of the course, student will be able to

- Enumerate different features of NOSQL Databases
- Compare different data models
- Design a Key-Value Database for a real world problem
- Design a Document Database for a real world problem
- Design a Graph Database for a real world problem

SYLLABUS:

Introduction to NoSQL. The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Standard Model, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters,The Emergence of NoSQL.

Aggregate Data Models, Aggregates, Consequences of Aggregate Orientation, Key-Value and Document Data Models, Column-Family Stores, Summarizing Aggregate-Oriented Databases.

More Details on Data Models, Relationships, Graph Databases, Schemaless Databases, Materialized Views, Modeling for Data Access, Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication, Consistency, Update Consistency, Read Consistency, Relaxing Consistency, The CAP Theorem, Relaxing Durability, Quorums

Key-Value Databases, Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preferences, Shopping Cart Data, When Not to Use, Relationships among Data, Multi operation Transactions, Query by Data, Operations by Sets

Document Databases, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analyticsor Real-Time Analytics, E-Commerce Applications, When Not to Use, Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure

Column-Family Stores, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Counters.

Graph Databases, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Connected Data, Routing, Dispatch, and Location-Based Services Recommendation Engines

Text Books:

1. Sadalage, P. & Fowler, M., NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence. (1st Ed.). Upper Saddle River, NJ: Pearson Education, In, 2012.

Reference Books:

1. Gauravvaish, Getting started with NoSQL , PACKT publishing, ISBN: 978184969488
2. Redmond, E. & Wilson, J., Seven Databases in Seven Weeks: A Guide to Modern Databases andthe NoSQL Movement (1st Ed.), 2012
3. Raleigh, NC: The Pragmatic Programmers, LLC. ISBN-13: 978- 1934356920 ISBN-10: 1934356921

DATA SCIENCE
OPEN ELECTIVE
Syllabus

Course objectives:

- Knowhow and expertise to become a data scientist.
- Essential concepts of statistics and machine learning that are vital for datascience;
- Significance of exploratory data analysis (EDA) in data science.
- Critically explore and analyze data visualizations presented on the dashboards
- Suitability and limitations of tools and techniques related to data science process

Course Outcomes:

- Describe the steps involved in Data Science process and the technologies needed for a data scientist.
- Identify suitable ML techniques for data modelling and apply them for decision support.
- handle large datasets with distributed storage and processing system
- use appropriate tools for data collection, EDA and model building for specific types of data 5. build a prototype application of Data Science as a case study.

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SYLLABUS

Introduction to Data science, benefits and uses, facets of data, data science process in brief, big data ecosystem and data science

Data Science process: Overview, defining goals and creating project charter, retrieving data, cleansing, integrating and transforming data, exploratory analysis, model building, presenting findings and building applications on top of them

Applications of machine learning in Data science, role of ML in DS, Python tools like sklearn, modelling process for feature engineering, model selection, validation and prediction, types of ML including semi-supervised learning

Handling large data: problems and general techniques for handling large data, programming tips for dealing large data, case studies on DS projects for predicting malicious URLs, for building recommender systems

NoSQL movement for handling Bigdata: Distributing data storage and processing with Hadoop framework, case study on risk assessment for loan sanctioning, ACID principle of relational databases, CAP theorem, base principle of NoSQL databases, types of NoSQL databases, case study on disease diagnosis and profiling

Tools and Applications of Data Science: Introducing Neo4j for dealing with graph databases, graph query language Cipher, Applications graph databases, Python libraries like nltk and SQLite for handling Text mining and analytics, case study on classifying Reddit posts

Data Visualization and Prototype Application Development: Data Visualization options, Cross filter, the JavaScript Map Reduce library, creating an interactive dashboard with dc.js, Dashboard developmenttools, Applying the DS process for respective engineering problem solving scenarios as a detailed case study.

Textbook:

1. Davy Cielen, Arno D.B.Meysman, and Mohamed Ali, "Introducing to Data Science using Python tools", Manning Publications Co, Dreamtech press, 2016
2. Prateek Gupta, "Data Science with Jupyter" BPB publishers, 2019 for basics

Reference Books:

1. Joel Grus, "Data Science From Scratch", OReilly, 2019
2. Doing Data Science: Straight Talk From the Frontline, 1 st Edition, Cathy O'Neil and Rachel Schutt, O'Reilly, 2013

PYTHON PROGRAMMING (Skilled course)
OPEN ELECTIVE
SYLLABUS

Course objectives:

- familiarize students with key data structures in Python including lists and dictionaries and apply them in context of searching, sorting, text and file handling
- introduce students to calculation of statistical measures using Python such as measures of central tendency, correlation
- familiarize students with important Python data related libraries such as Numpy and Pandas and use them to manipulate arrays and data frames
- introduce students to data visualization in Python through creation of line plots, histograms, scatter plots, box plots and others
- Implementation of basic machine learning tasks in Python including pre-processing data, dimensionality reduction of data using PCA, clustering, classification and cross-validation

Course Outcomes:

After completion of the course the student should be able to:

- implement searching, sorting and handle text and files using Python data structures such as lists and dictionaries
- calculate statistical measures using Python such as measures of central tendency, correlation
- use Python data related libraries such as Numpy and Pandas and create data visualizations
- Use and generate Data Visualization techniques in Python.
- implement basic machine learning tasks pre-processing data, compressing data, clustering, classification and cross-validation.

SYLLABUS

1. Python Programs on lists & Dictionaries
2. Python Programs on Searching and sorting
3. Python Programs on Text Handling
4. Python Programs on File Handling
5. Python Programs for calculating Mean, Mode, Median, Variance, Standard Deviation
6. Python Programs for Karl Pearson Coefficient of Correlation, Rank Correlation
7. Python Programs on NumPy Arrays, Linear algebra with NumPy
8. Python Programs for creation and manipulation of Data Frames using Pandas Library
9. Write a Python program for the following.
   - Simple Line Plots,
   - Adjusting the Plot: Line Colours and Styles, Axes Limits, Labelling Plots,
   - Simple Scatter Plots,
   - Histograms,
   - Customizing Plot Legends,
   - Choosing Elements for the Legend,
   - Boxplot
   - Multiple Legends,

- Customizing Colorbars,
- Multiple Subplots,
- Text and Annotation,
- Customizing Ticks

10. Python Programs for Data pre-processing: Handling missing values, handling categorical data, bringing features to same scale, selecting meaningful features
11. Python Program for Compressing data via dimensionality reduction: PCA
12. Python Programs for Data Clustering
13. Python Programs for Classification
14. Python Programs for Model Evaluation: K-fold cross validation.

Reference Books:

1. Core Python Programming, Second Edition, Wesley J. Chun, Prentice Hall
2. Chris Albon, ―Machine Learning with Python Cookbook-practical solutions from pre-processing to Deep learning‖, O'REILLY Publisher,2018
3. Mark Summerfield, Programming in Python 3--A Complete Introduction to the Python Language, Second Edition, Additson Wesley
4. Phuong Vo.T.H , Martin Czygan, Getting Started with Python Data Analysis, Packt Publishing Ltd
5. Armando Fandango, Python Data Analysis, Packt Publishing Ltd
6. Magnus Vilhelm Persson and Luiz Felipe Martins, Mastering Python Data Analysis, Packt Publishing Ltd
7. Sebastian Raschka & Vahid Mirjalili, ―Python Machine Learning‖, Packt Publisher, 2017

MOBILE COMPUTING
OPEN ELECTIVE
Syllabus

Course objectives:

- To introduce the basic concepts and principles in mobile computing. This includes major techniques involved, and networks & systems issues for the design and implementation of mobile computing systems and applications.
- To explore both theoretical and practical issues of mobile computing.
- To provide an opportunity for students to understand the key components and technologies involved and to gain hands-on experiences in building mobile applications

Course Outcomes:

On successful completion of course learner will be able:

- To identify basic concepts and principles in mobile communication & computing, cellular architecture.
- To describe the components and functioning of mobile networking.
- To classify variety of security techniques in mobile network.
- To describe and apply the concepts of mobility management

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SYLLABUS

Basics of Android: Introduction to Android Operating System, Version of Android, Installing of software, Android example, Internal Details, Software Stack, Android Core Building Blocks, Android Emulator, AndroidManifest.xml, R.java file, Hide Title Bar, Screen Orientation.

User Interface Widgets: Working with Button, Toast, Custom Toast, Button, Toggle Button, Switch Button, Image Button, Check Box, Alert Dialog, Spinner, Spinner and other widgets, Auto Complete Text View, Rating Bar, Date Picker. Time Picker, Progress Bar, Activity life cycle and example, Intents-types, Fragment lifecycle and types.

Android Menu, Layouts and Views: Option Menu, Context Menu, Popup Menu, Types of layouts-Relative, Linear, Table, Grid. Types of views- Grid, Web, Scroll, Search, Tab Host, Dynamic List, Expanded List views.

Android services and Data storage: web service, Android services, Android Service API, lifecycle and examples. Shared preferences, Soap Vs Restful web service, Internal storage, External storage, Sqlite Databases, Storing data into external oracle database.

Multimedia and Animation: Playing audio and video, creating audio player ,Alarm manager, gallery, Animation API, Drawable class, Rotate, Fade, Zoom animations, XML &JSON -XML Parsing SAX, XML Parsing DOM , XML Pull Parser , JSON Parsing.

Speech API and Telephony API, Web services: Text To Speech API, Example, managing speech and pitch, Speech to text. Telephony manager, Get calls state, call tracker, make phone call and send SMS, Email. Web Service introduction, SOAP vs RESTFUL web services, external oracle data base connections.

Content Providers and Notifications: Fundamentals of content providers, Content URI, Creation of custom content provider. Notification API, Notification Builder, Issuing notifications, Notification Compact builder, Examples

Textbook:

1. Beginning Android 4 Application Development- WEI-MENG LEE, Wiley India Pvt.ltd

Reference Books:

1. Introduction to Android Application Development: Android Essentials,4/E, Joseph Annuzzi, Jr.LaurenDarcey, Shane Conder, Pearson Education publishers
2. Professional Android 4 Application Development, Reto Meier, Wiley India Pvt.ltd
3. Android Application Development, Pradeep Kothari, Dreamtech publications
4. http://developer.android.com/guide/index.html

AI CHATBOTS
OPEN ELECTIVE
Syllabus

Course objectives:

- Learn how artificial intelligence powers chatbots, get an overview of the bot ecosystem and bot anatomy, and study different types of bots and use cases.
- Identify best practices for defining a chatbot use case, and use a rapid prototyping framework to develop a use case for a personalized chatbot.

Course Outcomes:

On successful completion of course learner will be able:

- Develop an in-depth understanding of conversation design, including onboarding, flows, utterances, entities, and personality.
- Design, build, test, and iterate a fully-functional, interactive chatbot using a commercial platform.
- Deploy the finished chatbot for public use and interaction.

SYLLABUS

Introduction: Benefits from Chatbots for a Business, A Customer-Centric Approach in Financial Services, Chatbots in the Insurance Industry, Conversational Chatbot Landscape, Identifying the Sources of Data: Chatbot Conversations, Training Chatbots for Conversations, Personal Data in Chatbots, Introduction to the General Data Protection Regulation (GDPR)

Chatbot Development Essentials: Customer Service-Centric Chatbots, Chatbot Development Approaches, Rules-Based Approach, AI-Based Approach, Conversational Flow, Key Terms in Chatbots, Utterance, Intent, Entity, Channel, Human Takeover, Use Case: 24x7 Insurance Agent

Building a Chatbot Solution: Business Considerations, Chatbots Vs Apps, Growth of Messenger Applications, Direct Contact Vs Chat, Business Benefits of Chatbots, Success Metrics, Customer Satisfaction Index, Completion Rate, Bounce Rate, Managing Risks in Chatbots Service, Generic Solution Architecture for Private Chatbots

Natural Language Processing, Understanding, and Generation: Chatbot Architecture, Popular Open Source NLP and NLU Tools, Natural Language Processing, Natural Language Understanding, Natural Language Generation, Applications.

Introduction to Microsoft Bot, RASA, and Google Dialog flow: Microsoft Bot Framework, Introduction to QnA Maker, Introduction to LUIS, Introduction to RASA, RASA Core, RASA NLU, Introduction to Dialog flow Chatbot Integration Mechanism: Integration with Third-Party APIs, Connecting to an Enterprise Data Store, Integration Module

Textbook:

1. Abhishek Singh, Karthik Ramasubramanian, Shrey Shivam, “Building an Enterprise Chatbot: Work with Protected Enterprise Data Using Open Source Frameworks”, ISBN 978-1-4842-5034-1, Apress,2019

Reference Books:

1. Janarthanam and Srini, Hands-on chatbots and conversational UI development: Build chatbots and voice user interfaces with C (1 ed.), Packt Publishing Ltd, 2017. ISBN 978-1788294669.
2. Galitsky, Boris., Developing Enterprise Chatbots (1 ed.), Springer International Publishing, 2019. ISBN 978-303004298
3. Kelly III, John E. and Steve Hamm, Smart machines: IBM's Watson and the era of cognitive computing (1 ed.), Columbia University Press, 2013. ISBN 978- 0231168564.
4. Abhishek Singh, Karthik Ramasubramanian and Shrey Shivam, Building an Enterprise Chatbot (1 ed.), Springer, 2019. ISBN 978-1484250334.

Human Resource Management
HSS Elective
Syllabus

Prerequisite: Basic knowledge of recruitment, training, performance management, compensation, and employee relations

Course Objective: The Objective of this course is to familiarize students with the different aspects of managing human resources in the organisation through the phases of acquisition, development and retention.

Course Outcomes

- To develop an understanding about the functions of HRM
- To demonstrate the basic understanding of different tools used in HR planning and Job analysis
- To relate with various stages of Recruitment and training of employees
- To develop an understanding about basics of Performance appraisal
- To evaluate the importance of welfare programs and initiatives in promoting the employees

SYLLABUS

Introduction: History & Evolution of HRM, Concept, Scope, Characteristics, Objectives, & importance of HRM, Personnel management vs. HRM

Human Resource Planning: Objectives, Need and importance, process of human resource planning, Problems of human resource planning; Job Analysis: Introduction, uses of Job analysis, Process of Job analysis, Job description and Job specification.

Recruitment: Introduction to recruitment, factors governing recruitment, process and sources of recruitment; Selection: Meaning of selection, Steps in selection process, Selection tests and interviews; Placement & Induction: Concept of placement, Concept of induction, concept of transfer, concept of promotion, Promotion policy

Training: Concept and importance of training, types of training, methods of training, designing of training program, evaluation of training effectiveness; Career planning and development: Concept, objectives and process; Job evaluation: Concept and essentials of Job evaluation, methods of Job evaluation

Performance appraisal: Concept, importance, methods- traditional and modern methods, Job evaluation vs. performance appraisal

Maintenance: Communication and counselling, Welfare, Health and Safety, Separation: Turnover, Retirement, Lay off, Retrenchment, Discharge, Dismissal and V.R.S.

Text Books:

1. Aswathappa, K., Human resources and Personnel Management, Tata McGraw Hill Pub. Co., Ltd., New Delhi.

2. Parvin Durai, Human Resource Management, Pearson India.
3. Subba Rao P., Essentials of Human Resource Management and Industrial Relations, Himalaya Publishing, Mumbai.

References:

1. Flippo, Edwin B., Personnel Management, McGraw Hill Publishing Company, Singapore.
2. Michael Armstrong, Handbook of Human Resource Management Practice (11th Edition), Kogan Page, London, 2009.
3. Gary Dessler, Human Resource Management, Pearsons Education, Delhi, 2004.
4. John Storey, Managing Human Resources: Preparing for the 21st Century, Beacon Booms, New Delhi, 2007.
5. Seema Sanghi, Human Resource Management, McMillan, Delhi, 2011.

Operations Research
HSS Elective
Syllabus

Course Objective:

- Formulate a real-world problem as a mathematical programming model
- Understand the theoretical workings of the simplex method for linear programming andperform iterations of it by hand
- Understand the relationship between a linear program and its dual, including strong duality and complementary slackness
- Solve specialized linear programming problems like the transportation and assignment problems
- Solve network models like the shortest path, minimum spanning tree, and maximum flow problems

Course Outcomes:

- Students will be able to describe characteristics and scope of OR.
- Students will be able to define and formulate mathematical problems.
- Students will be able to select optimal problems solving techniques for a given problem using LP.
- Students will be able to formulate and solve transportation, travelling sales man andtransshipment problems.
- Students will be able to formulate and solve optimization problems related to job/ workassignments.
- Students will be able to demonstrate and solve simple models of Game theory.
- Students will be able to evaluate optimum solution using dynamic programming fordifferent applications.

SYLLABUS

Overview of Operations Research: Types of OR Models, Phases of Operations Research–OR Techniques, Introduction to Linear Programming, Formulation of Linear Programming Problem, Graphical Solution; Graphical Sensitivity Analysis.

Standard Form of LPP: Basic Feasible Solutions, Unrestricted Variables, Simplex Algorithm, Artificial Variables, Big M Method, Two Phase Simplex Method, Degeneracy,
Alternative Optimal, Unbounded Solutions, Infeasible Solutions, Primal and Dual Problems and Their Relations, Dual Simplex Method

Transportation Problem: LPP, Initial Solutions, North West Corner Rule, Lowest Cost Method, Vogel's Approximation Method, Optimum Solutions of TPP, Degeneracy in Transportation, Transportation Algorithms

Assignment Problem: Assignment Problem as LPP, Hungarian Method, Travelling Salesman Problem, Solutions of TSP, Sequencing Problems, N-Jobs Two Machine Problems, N Jobs K Machines Problems,Two-Jobs M- Machine Problems, Crew Scheduling Problems

Network Representation of a Project: CPM and PERT, Critical Path Calculations, Time – Cost

Optimizations, PERT Analysis and Probability Considerations, Resource Analysis in Network Scheduling.

Replacement Problems: Individual and Group Replacement Policy, Reliability & System Failure Problems, Inventory-Factors Effecting Inventory-EOQ, Inventory Problems with and Without Shortages, Inventory Problems with Price Breakups, Multi Item Deterministic Problems. Probabilistic Inventory Problems

Game Theory: Two Person Zero Sum Games, Mixed Strategy Games and Their Algorithms.

Textbooks:

1. Operations Research, KantiSwaroop, P.K. Gupta, ManMohan, Sulthan Chand & Sons Education
2. Operations Research–An Introduction, HandyATaha–Pearson Education

References:

1. Taha.H.A, Operations Research : An Introduction, McMilan publishing Co., 1982. 7 th ed.
2. Ravindran A, Philips D.T & Solberg.J.J, Operations Research: Principles and practice, John Wiley & Sons, New York, 1987.
3. Frank S. Budnick, Dennis Mcleavey and Richard Mojena, Principles of Operations Research forManagement. All India Traveler Book seller, Delhi.
4. Gillet.B.E., Introduction to Operations Research - A Computer oriented algorithmic approach, McGraw Hill, 1987.
5. Joseph.G.Ecker& Michael Kupper Schimd, Introduction to Operations Research, John Wiley & Sons, 1988.
6. Hillier.F.S & Liberman.G.J, Operations Research, Second Edition, Holden Day Inc, 1974.
7. Kanti Swarup, Gupta.P.K. & Man Mohan, Operations Research, S.Chand& Sons

INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP
HSS ELECTIVE
SYLLABUS

Course Objectives:

- To familiarize the students with the concepts of Management.
- To relate the concepts of Management with industrial organizations.
- To explain the factors affecting productivity and how productivity can be increased inan Industrial undertaking.
- To set forth a basic framework for understanding Entrepreneurship.

Course Outcomes:

On completion of the course, the students will be able to:

- Understand the roles, skills and functions of management.
- Distinguish the different types of business organizations.
- Identify the factors involved in Production Operations Management.
- Diagnose organizational problems and take suitable decisions.
- Establish good Human Resource Management practices.
- Acquire necessary knowledge and skills required for organizing and carrying out

SYLLABUS

Basic Concepts of Management: Definition, Nature and Importance; Functions of the Management; Levels of Management; F.W Taylor's Scientific Management; Henry Fayol's Principles of Management;

Forms of Business Organizations: Introduction, Types of Business organizations: Private Sector- Individual Ownership, Partnership, Joint stock companies and Co-Operative organizations**;** Public sector- Departmental Organizations, Public Corporations and Government Companies; The Joint Sector Management.

Production and operations Management: Plant location- Factors to be considered in the selection of Plant location; Break - even analysis- Significance and managerial applications; Importance of Production Planning and Control and its Functions; Human Resource Management and Functions of Human Resource Manager (in brief); Functions of Marketing; Methods of Raising Finance.

Entrepreneurship: Definition, Characteristics and Skills, Types of Entrepreneurs, Entrepreneur vs. Professional Managers, , Growth of Entrepreneurs, Nature and Importance of Entrepreneurs, Women Entrepreneurs, Problems of Entrepreneurship.

Entrepreneurial Development and Project Management: Institutions in aid ofEntrepreneurship Development, Idea generation: Sources and Techniques; Stages in Project formulation; Steps for starting a small enterprise - Incentives for Small Scale Industries by Government.

Textbooks:

1. Sharma,S.C, and Banga, T.R., Industrial Organization & Engineering Economics,Khanna Publishers, Delhi, 2000.
2. Vasant Desai , (The Dynamics of Entrepreneurial Development and Management

(Planning for future Sustainable growth),HImalayan Publishing House, 2018.

Reference Books:

1. Aryasri , A.R., Management Science, McGraw HIll Education (India PrivateLimited , New Delhi 2014.
2. Sheela, P. , and Jagadeswara Rao**,** K., Entrepreneurship, Shree Publishing House,Guntur, Andhra Pradesh, 2017.

FINANCIAL MANAGEMENT FOR ENGINEERS
HSS ELECTIVE
SYLLABUS

Course Objectives:

- To provide awareness and understanding of the ways finance helps in reaching business objectives.
- To familiarise with the form, content and analysis of financial statements and theaccounting principles and techniques.
- To Identify signals pointing to deterioration in financial condition and analyse thereasons for variances between the actual and budgeted results
- To facilitate in the improvement of organizations‘ performance by pointing out the importance of cost control, breakeven and variance analysis.
- To equip with the ability to communicate comfortably with Financial Executives anddiscuss the financial performance of the organization effectively..

Course Outcomes:

On completion of the course, the students will be able to:

- Ability to Analyse financial statements
- Understanding costs and methods to reduce them
- Taking decisions regarding the price of the products services, or both
- Skill to practice different Budgeting Systems in organisations

SYLLABUS

UNIT-I

Accounting concepts and systems - Elements of Financial Statements - Trading, Profit & Loss Statement- Cash Flow Statements - Notes to Accounts - Profits vs. Cash Flows

UNIT-II

Analysis of Financial Statements - Financial Analysis - Financial Ratios and their Interpretations covering: Profitability Ratios; Liquidity Ratios; Return on Capital Ratios; - Management of Working Capital: Capital and Its Components - Working Capital Cycle - Working Capital Financing.

UNIT-III

Management Decision Making: Cost concepts and its application in Decision Making - Types of cost – Direct & Indirect, Fixed & Variable - Cost Sheet - Cost Volume Profit Analysis - Understanding Cost behaviour – Cost concepts and its application in Decision Making - Relevance of Activity Based Costing- Marginal Costing - Make or Buy - Shut down or continue - Sell or process further - Domestic vs. Export Sales

UNIT-IV

Budgets and Budgetary Control: Different types of Budgets (Departmental, Function based, Cash, Master) - Budgeting systems (ABC / ZBB / Rolling/ Incremental / Planning) - Variance Analysis - Capital Budgeting and Investment Appraisals - Meaning of Capital Budgeting - Relevance of Capital Budgeting - Techniques of Capital Budgeting - Payback Period - Accounting Rate of Return - Net Present Value - Internal Rate of Return - Discounted Payback Period

UNIT-V

Means of Finance: Financial Instruments - Shares, Debentures, Derivatives - Share Capital Vs. Term Loans- Leasing - Financial Markets - Capital Markets - Stock Exchanges.

Reference Books:

1. Finance for Non-Finance People by Sandeep Goal (2017), Publisher: Taylor and Francis.
2. Finance for Non-Finance Managers by B.K. Chatterjee (1988), Jaico PublishingHouse, Sold by Amazon
3. Finance for Nonfinancial Managers: Finance for Small Business, Basic Finance Concepts (Accounts and Finance) by Murugesan Ramaswamy (2021), Repro Books-On-Demand

Generative AI Models

Honors Course

SYLLABUS

Course Objectives:

This course aims at enabling students,

- Understand and apply the fundamentals of Generative AI and large language models.
- Implement GPT architecture for text generation and dialogue systems.
- Fine-tune BERT for downstream NLP tasks and explore advanced Transformer architectures.
- Evaluate real-world applications, challenges, and emerging trends in Generative AI.

Course Outcomes:

After learning the course, the students should be able to:

- Understand large language models' architecture and pre-training techniques.
- Apply the GPT model for natural language processing tasks.
- Apply the BERT model for natural language processing tasks.
- Implement Generative Adversarial Networks (GANs) for image generation tasks using TensorFlow
- Analyzing the performance and limitations of large language models.

SYLLABUS

Introduction to Large Language Models:

Overview of Generative AI and Large Language Models. Basics of attention mechanisms and Transformer architecture. Pre-training techniques and transfer learning strategies.

GPT Models and Applications:

Study of GPT architecture and variants. Applications of GPT models in text generation and dialogue systems. Case study-based implementation of GPT-based tasks. GPT-based chatbot enhances E-Shop's customer support service

BERT and Advanced Techniques:

Understanding BERT architecture and pre-training objectives. Fine-tuning BERT for downstream NLP tasks. Exploration of advanced Transformer architectures and techniques

Text Generation with Generative AI: Introduction to Text Generation, LSTM-based Text Generation, Transformer-based Text Generation, Fine-Tuning Language Models, and Text Generation Applications

Image Generation with Generative AI: Introduction to Image Generation, Implementing GANs for Image Generation Training and Fine-Tuning GANs, Generating Images with VAEs, Advanced Techniques in Image Generation, and Image and Video Generation Applications.

Applications and Future Directions:

Real-world applications of large language models. Challenges and limitations of current approaches. Emerging trends and future directions in Generative AI.

Text Books:

1. Generative AI for Everyone: Understanding the Essentials and Applications of This Breakthrough Technology". Altaf Rehmani.
2. Generative AI with Python and TensorFlow 2: Create images, text, and music with VAEs, GANs, LSTMs, Transformer models , Joseph Babcock and Raghav Bali, 2024

Reference Books:

1. Generative Adversarial Networks Cookbook: Over 100 recipes to build generative models using Python, TensorFlow, and Keras by Josh Kalin.
2. Generative AI in Software Development: Beyond the Limitations of Traditional Coding Jesse Sprinter, 2024.
3. Deep Learning by Ian Goodfellow, Yoshua Bengio, and Aaron Courville.
4. Neural Networks and Deep Learning: A Textbook by Charu C. Aggarwal.

e-sources:

1. https://elearn.nptel.ac.in/shop/iit-workshops/completed/leveraging-generative-ai-for-teaching programming-course s/?v=c86ee0d9d7ed
2. https://elearn.nptel.ac.in/shop/iit-workshops/completed/introduction-to-languagemodels/?v=c86ee0d9d7ed

HIGH PERFORMANCE COMPUTING

Honors Course

SYLLABUS

Course Objectives:

The objective of the subject is to

- Introduce the basic concepts related to HPC architecture and parallel computing
- To discuss various computational techniques for studying soft matter systems.
- To apply these concepts to examine complex biomolecular/materials systems that generally require large-scHPC platform with hybrid CPU-GPU architectures –

Course Outcomes: After completion of this course

- Design, formulate, solve and implement high performance versions of standard single threadedalgorithms.
- Demonstrate the architectural features in the GPU and MIC hardware accelerators.
- Design programs to extract maximum performance in a multicore, shared memory executionenvironment processor.
- Analyze Symmetric and Distributed architectures.
- Develop and deploy large scale parallel programs on tightly coupled parallel systems using themessage passing paradigm.

Syllabus

Graphics Processing Units-Introduction to Heterogeneous Parallel Computing, GPU architecture, Thread hierarchy, GPU Memory Hierarchy.

GPGPU Programming-Vector Addition, Matrix Multiplication algorithms. 1D, 2D, and 3D Stencil Operations, Image Processing algorithms – Image Blur, Gray scaling. Histogramming, Convolution, Scan, Reduction techniques.

Many Integrated Cores-Introduction to Many Integrated Cores. MIC, Xeon Phi architecture. Thread hierarchy. Memory Hierarchy. Memory Bandwidth and performance considerations.

Shared Memory Parallel Programming- Symmetric and Distributed architectures. OpenMP Introduction. Thread creation, Parallel regions. Worksharing, Synchronization.

Message Passing Interface-MPI Introduction, Collective communication, Data grouping for communication.

Text Books:

1. Programming Massively Parallel Processors A Hands-on Approach, 3e Wen-Mei W Hwu, David BKirk, Morgann Kaufmann,2013.
2. Using OpenMP, Scientific and Engin edition, Barbara Chapman, Gabriele Jost, Ruud van der Pas,MIT Press, 2008.

Reference Books:

1. Intel Xeon Phi Coprocessor Architecture and Tools, RezaurRahman, Apress Open, 2013.
2. Using MPI, Gropp, Lusk, Skjellum, The MIT press, 2014.
3. Recent publications in IPDPS, PACT, and similar.

SOCIAL NETWORK ANALYSIS

Honors Course
SYLLABUS

Course Objectives:

- Formalize different types of entities and relationships as nodes and edges and represent this information as relational data
- Plan and execute network analytical computations
- Use advanced network analysis software to generate visualizations and perform empiricalinvestigations of network data
- Interpret and synthesize the meaning of the results with respect to a question, goal, or task

Course Outcomes:

After completing the course student should:

- Know basic notation and terminology used in network science
- Be able to visualize, summarize and compare networks
- Illustrate basic principles behind network analysis algorithms
- Develop practical skills of network analysis in R programming language
- Be capable of analyzing real work networks

SYLLABUS

Social Network Analysis: Preliminaries and definitions, Erdos Number Project, Centrality measures, Balance and Homophily.

Random graph models: Random graphs and alternative models, Models of network growth, Navigation in social Networks, Cohesive subgroups, Multidimensional Scaling, Structural equivalence, roles and positions.

Network topology and diffusion, Contagion in Networks, Complex contagion, Percolation and information, Navigation in Networks Revisited.

Small world experiments, small world models, origins of small world, Heavy tails, Small Diameter, Clustering of connectivity, The Erdos Renyi Model, Clustering Models.

Network structure -Important vertices and page rank algorithm, towards rational dynamics in networks, basics of game theory, Coloring and consensus, biased voting, network formation games, network structure and equilibrium, behavioral experiments, Spatial and agent-based models.

Text Books:

1. S. Wasserman and K. Faust. “Social Network Analysis: Methods and Applications”, CambridgeUniversity Press.
2. D. Easley and J. Kleinberg, “Networks, Crowds and Markets: Reasoning about a highlyconnected world” , Cambridge University Press, 1st edition,2010

Reference Books:

1. Maarten van Steen. “Graph Theory and Complex Networks. An Introduction”, 2010.
2. Reza Zafarani, Mohammed Ali Abbasi, Huan Liu. “Social Media Mining: An Introduction”.Cambridge University Press 2014.
3. Maksim Tsvetovat and Alexander Kouznetsov. “Social Network Analysis for Startups”. O’ReillyMedia, 2011.

e-Resources:

1) https://www.classcentral.com/course/edx-social-network-analysis-sna-9134
2) https://www.coursera.org/learn/social-network-analysis

SPEECH PROCESSING

Honors Course

SYLLABUS

Course Objectives:

The main objective of the course is to understand the basic principles of sound and speech production and perception, speech recognition, synthesis and dialogue systems

Course Outcomes:

By the end of the course, students will be able to

- Understand the speech production and perception process.
- Analyze speech signals in time and frequency domain.
- Design and implement algorithms for processing speech signals.

SYLLABUS

Fundamentals of Digital Speech Processing: Anatomy & Physiology of Speech Organs, The process of Speech Production, Acoustic Phonetics, Articulatory Phonetics, The Acoustic Theory of Speech Production-Uniform lossless tube model, effect of losses in vocal tract, effect of radiation at lips, Digital models for speech signals.

Time Domain Models for Speech Processing: Introduction- Window considerations, Short time energy and average magnitude Short time average zero crossing rate, Speech Vs Silence discrimination using energy and zero crossing, Pitch period estimation using a parallel processing approach, The short time autocorrelation function, The short time average magnitude difference function, Pitch period estimation using the autocorrelation function.

Linear Predictive Coding (LPC) Analysis: Basic principles of Linear Predictive Analysis: The Autocorrelation Method, The Covariance Method, Solution of LPC Equations: Cholesky Decomposition Solution for Covariance Method, Durbin's Recursive Solution for the Autocorrelation Equations, Comparison between the Methods of Solution of the LPC Analysis Equations, Applications of LPC Parameters: Pitch Detection using LPC Parameters, Formant Analysis using LPC Parameters.

Homomorphic Speech Processing: Introduction, Homomorphic Systems for Convolution: Properties of the Complex Cepstrum, Computational Considerations, The Complex Cepstrum of Speech, Pitch Detection, Formant Estimation, The Homomorphic Vocoder. Speech Enhancement: Nature of interfering sounds, Speech enhancement techniques: Single Microphone Approach : spectral subtraction, Enhancement by re- synthesis, Comb filter, Wiener filter, Multi microphone Approach

Automatic Speech & Speaker Recognition: Basic pattern recognition approaches, Parametric representation of speech, Evaluating the similarity of speech patterns, Isolated digit Recognition System, Continuous digit Recognition System. Hidden Markov Model (HMM) for Speech: Hidden Markov Model (HMM) for speech recognition, Viterbi algorithm, Training and testing using HMMS. Speaker Recognition: Recognition techniques, Features that distinguish speakers, Speaker Recognition Systems: Speaker Verification System, Speaker Identification System.

Text Books:

1. L.R. Rabiner and S. W. Schafer, "Digital Processing of Speech Signals", Pearson Education.
2. Douglas O'Shaughnessy, "Speech Communications: Human & Machine", 2nd Ed., Wiley India,2000.

3. L.R Rabinar and R W Jhaung, “Digital Processing of Speech Signals”, 1978, Pearson Education.

Reference Books:

1. Thomas F. Quateri, “Discrete Time Speech Signal Processing: Principles and Practice”, 1st Edition.,PE.
2. Ben Gold & Nelson Morgan, “Speech & Audio Signal Processing”, 1st Edition, Wiley

DATA VISUALIZATION
Honors Course
SYLLABUS

Course Objectives:

- Understand and apply principles of mapping data onto visual aesthetics, including scales, coordinate systems, and color use in visualization
- Develop skills to effectively visualize distributions, associations, and time series data, using appropriate plots and visualization techniques
- Analyze and represent uncertainty in data visualizations, including trends, probabilities, and the uncertainty of point estimates and curve fits
- Apply the principle of proportional ink and avoid common pitfalls in color use to create clear, accurate, and accessible visualizations.

Course Outcomes:

Upon completion of this course, the students will be able to

- Understand basics of Data Visualization
- Implement visualization of distributions
- Write programs on visualization of time series, proportions & associations
- Apply visualization on Trends and uncertainty
- Explain principles of proportions

SYLLABUS

INTRODUCTION TO VISUALIZATION: Visualizing Data-Mapping Data onto Aesthetics, Aesthetics and Types of Data, Scales Map Data Values onto Aesthetics, Coordinate Systems and Axes- Cartesian Coordinates, Nonlinear Axes, Coordinate Systems with Curved Axes, Color Scales-Color as a Tool to Distinguish, Color to Represent Data Values, Color as a Tool to Highlight, Directory of Visualizations- Amounts, Distributions, Proportions, x–y relationships, Geospatial Data

VISUALIZING DISTRIBUTIONS: Visualizing Amounts-Bar Plots, Grouped and Stacked Bars, Dot Plots and Heatmaps, Visualizing Distributions: Histograms and Density Plots- Visualizing a Single Distribution, Visualizing Multiple Distributions at the Same Time, Visualizing Distributions: Empirical Cumulative Distribution Functions and Q-Q Plots-Empirical Cumulative Distribution Functions, Highly Skewed Distributions, Quantile Plots, Visualizing Many Distributions at Once-Visualizing Distributions Along the Vertical Axis, Visualizing Distributions Along the Horizontal Axis

VISUALIZING ASSOCIATIONS & TIME SERIES: Visualizing Proportions-A Case for Pie Charts, A Case for Side-by-Side Bars, A Case for Stacked Bars and Stacked Densities, Visualizing Proportions Separately as Parts of the Total, Visualizing Nested Proportions- Nested Proportions Gone Wrong, Mosaic Plots and Treemaps, Nested Pies, Parallel Sets. Visualizing Associations Among Two or More Quantitative Variables-Scatterplots, Correlograms, Dimension Reduction, Paired Data. Visualizing Time Series and Other Functions of an Independent Variable-Individual Time Series, Multiple Time Series and Dose– Response Curves, Time Series of Two or More Response Variables

VISUALIZING UNCERTIANITY: Visualizing Trends-Smoothing, Showing Trends with a Defined Functional Form, Detrending and Time-Series Decomposition, Visualizing Geospatial Data-Projections, Layers, Choropleth Mapping, Cartograms, Visualizing Uncertainty-Framing

Probabilities as Frequencies, Visualizing the Uncertainty of Point Estimates, Visualizing the Uncertainty of Curve Fits, Hypothetical Outcome Plots

PRINCIPLE OF PROPORTIONAL INK: The Principle of Proportional Ink-Visualizations Along Linear Axes, Visualizations Along Logarithmic Axes, Direct Area Visualizations, Handling Overlapping Points- Partial Transparency and Jittering, 2D Histograms, Contour Lines, Common Pitfalls of Color Use-Encoding Too Much or Irrelevant Information, Using Nonmonotonic Color Scales to Encode Data Values, NotDesigning for Color-Vision Deficiency

Text Books:

1. Claus Wilke, "Fundamentals of Data Visualization: A Primer on Making Informative and Compelling Figures", 1st edition, O'Reilly Media Inc, 2019.
2. Ossama Embarak, Data Analysis and Visualization Using Python: Analyze Data to Create Visualizations for BI Systems, Apress, 2018

Reference Books:

1. Tony Fischetti, Brett Lantz, R: Data Analysis and Visualization, O'Reilly, 2016

Dept. of Electronics & Communications Engineering

Andhra University College of Engineering

Visakhapatnam-530003

4 Years B.TECH

and

B.TECH+M.TECH (DOUBLE DEGREE COURSE)

Scheme of Instruction and Examination with effect from 2022-2023 admitted batch onwards

Under APSCHE Curriculum

SCHEME and Syllabus
(With effect from 2022-23 admitted Batch)
B.Tech & B.Tech+M.Tech
III Year - I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
EC3101	PC	Control Systems	4	0	30	70	100	3
EC3102	PC	Digital Communications	4	0	30	70	100	3
EC3103	PC	Internet of Things	4	0	30	70	100	3
EC3104	PE	Professional Elective-I	4	0	30	70	100	3
EC3105	OE	Open Elective-I	4	0	30	70	100	3
EC3106	PC	Digital Communication Lab	0	3	50	50	100	1.5
EC3107	PC	Internet of ThingsLab	0	3	50	50	100	1.5
EC3108	SC	Object Oriented Programming through JAVA	1	2	50	50	100	2
EC3109	INT	Internship-I			50	50	100	2
Internship-I(2months) done after 2nd Year 2nd Semester to be evaluated during 3rd Year 1st Semester								
							Total Credits	**22**

B.Tech & B.Tech+M.Tech
III Year - II Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
EC3201	PC	Antennas and Wave Propagation	4	0	30	70	100	3
EC3202	PC	Digital Signal Processing	4	0	30	70	100	3
EC3203	PC	Microwave Engineering	4	0	30	70	100	3
EC3204	PE	Professional Elective-II	4	0	30	70	100	3
EC3205	OE	Open Elective-II	4	0	30	70	100	3
EC3206	PC	Antenna Simulation Lab	0	3	50	50	100	1.5
EC3207	PC	Digital Signal Processing Lab	0	3	50	50	100	1.5
EC3208	PC	Microwave Engineering Lab	0	3	50	50	100	1.5
EC3209	SC	Soft Skills	1	2	50	50	100	2
							Total Credits	**21.5**
Internship-II								

B.Tech & B.Tech+M.Tech
IV Year - I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
EC4101	PE	Professional Elective-III	4	0	30	70	100	3
EC4102	PE	Professional Elective-IV	4	0	30	70	100	3
EC4103	PE	Professional Elective-V	4	0	30	70	100	3
EC4104	OE	Open Elective-III	4	0	30	70	100	3
EC4105	OE	Open Elective-IV	4	0	30	70	100	3
EC4106	HSSE	HSS-Elective	4	0	30	70	100	3
EC4107	SC	WEB Technologies	1	2	50	50	100	2
EC4108	INT	Internship-II			50	50	100	2
Internship-II (2months) done after 3rdYear 2nd Semester to be evaluated during 4th Year 1st Semester								
							Total Credits	**22**

B. Tech & B. Tech+M.Tech
IV Year - II Semester

Course code	Category	Course Title	Internal Marks	External Marks	Total Marks	Credits
EC4201	PROJ	Project work	100	100	200	14
					Total Credits	**14**

PROFESSIONAL ELECTIVES (PE)

1. Global Positioning System.
2. Radar Engineering.
3. Cellular Mobile Communication.
4. Electronic Measurements and Instrumentation.
5. Data Structures.
6. EMI/EMC.
7. Internet and Web Technology.
8. Speech Processing.
9. Computer Networks.
10. TV and Satellite Communication System.
11. Transducers and Signal Conditioning.
12. VLSI Design.
13. Digital Image Processing.
14. Fiber Optic Communication.
15. Advanced Microprocessors.

OPEN ELECTIVES (OE)

1. Low Power VLSI Design.
2. Wireless Sensor Networks.
3. Smart Antenna Systems.
4. Artificial Neural Networks.
5. Embedded System Design.
6. Bio-Medical Instrumentation.
7. FPGA Design.
8. DSP Processors and Architectures.
9. Information Theory and Coding.
10. Financial Management for Engineers.
11. Data Science.
12. Artificial Intelligence and Machine Learning.

HSS ELECTIVES (HSSE)

1. Industrial Management & Entrepreneurship.
2. Organizational Behavior.
3. Operations Research.

EC3101CONTROL SYSTEMS (PC)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
EC 3101	**Control Systems**	**4**			**30**	**70**	**100**	**3hrs**	**3**

Course Objectives: The main objectives of this course are given below

- To introduce the concepts of open loop and closed loop systems, mathematical models of mechanical and electrical systems, and concepts of feedback.
- To study the characteristics of the given system in terms of the transfer function and introducing various approaches to reduce the overall system for necessary analysis.
- To develop the acquaintance in analyzing the system response in time-domain and frequency domain in terms of various performance indices.
- To analyze the system in terms of absolute stability and relative stability by different approaches.

Course Outcomes: At the end of the course the student will be able to

CO 1: Develop the transfer function using block diagram algebra and signal flow graph methods.

CO 2: Construct the mathematical model of the physical feedback control systems.

CO 3: Realize the Time Domain Analysis of Control Systems and analyze the Concepts and Necessary Conditions for Stability of control systems.

CO 4: Evaluate the stability of control systems using time and frequency response methods.

CO 5: Analyze system's absolute, relative, local stability using different frequency domain methods.

Syllabus

UNIT – I: Basic Structure of a Feedback Control System Introduction to Mathematical Modeling of Physical Systems – Equations of Electrical Networks – Modeling of Mechanical Systems – Equations of Mechanical Systems, Analogous Systems.

UNIT – II: Transfer Functions of Linear Systems – Impulse Response of Linear Systems – Block Diagrams of Control Systems – Signal Flow Graphs (Simple Problems) –

Reduction Techniques for Complex Block Diagrams and Signal Flow Graphs (Simple Examples).

UNIT – III: Time Domain Analysis of Control Systems – Time Response of First and Second Order Systems with Standard Input Signals – Steady State Error Constants – Effect of Derivative and Integral Control on Transient and Steady State Performance of Feedback Control Systems.

UNIT -IV: Concept of Stability and Necessary Conditions for Stability – Routh-Hurwitz Criterion, Relative Stability Analysis, the Concept and Construction of Root Loci, Analysis of Control Systems with Root Locus (Simple Problems to understand theory).

UNIT – V: Correlation between Time and Frequency Responses – Polar Plots – Bode Plots – Log Magnitude versus Phase Plots – All Pass and Minimum Phase Systems – Nyquist Stability Criterion – Assessment of Relative Stability – Constant M and N Circles.

Text Books:

1. Automatic Control Systems, Benjamin C. Kuo, PHI Publication (5th Edition).
2. Control Systems Engineering, I. J. Nagrath and M. Gopal, Wiley Eastern Ltd.

Reference Books:

1. Modern Control Engineering, Ogata, PHI.
2. Control Systems Principles and Design, M.Gopal, McGrawHill.

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EC3102 DIGITAL COMMUNICATIONS (PC)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
EC 3102	Digital Communications	4			30	70	100	3hrs	3

Course Objectives:

- To understand different pulse digital modulation techniques and their comparison.
- To familiarize various digital modulation techniques and calculation of their error probabilities.
- To analyze error performance of a digital communication system in presence of noise and other interferences.
- To understand concept of spread spectrum communication system.

Course Outcomes:

CO 1: Differentiate the various types of pulse digital modulation techniques.

CO 2: Outline the band pass digital modulation and demodulation techniques.

CO 3: Evaluate the performance of digital communication system in the presence of noise.

CO 4: Analyze various receivers and determine the probability of error for various digital modulation techniques.

CO 5: Classify the different spread spectrum modulation techniques.

SYLLABUS

UNIT – I: Analog-to-Digital Conversion: Pulse modulation techniques, Sampling, Time Division Multiplexing, Pulse Amplitude Modulation, Pulse Width Modulation, Pulse Position Modulation, Digital Modulation Techniques: Pulse Code Modulation, Differential Pulse Code Modulation, Delta Modulation, Adaptive Delta Modulation, Continuously Variable Slope Delta Modulation, Companding, Noise in Pulse-Code and Delta-Modulation Systems.

UNIT – II: Bandpass Transmission: Binary Phase-Shift Keying, Differential Phase-Shift Keying, Differentially-Encoded PSK (DEPSK), Quadrature Phase-Shift Keying (QPSK), M-ary PSK, Quadrature Amplitude Shift Keying (QASK), Binary Frequency Shift-Keying,

Similarity of BFSK and BPSK, M-ary FSK, Minimum Shift Keying (MSK), Duo-binary Encoding.

UNIT – III: Mathematical Representation of Noise: Some Sources of Noise, Frequency-Domain Representation of Noise, The Effect of Filtering on the Probability Density of Gaussian Noise, Spectral Components of Noise Response of a Narrowband Filter to Noise, Effect of a Filter on the Power Spectral Density of Noise, Superposition of Noises, Mixing Involving Noise, Linear Filtering, Noise Bandwidth, Quadrature Components of Noise, Power Spectral Density of n(t) and n(t), Probability Density of n(t), n(t), and their Time Derivatives, Representation of Noise Using Orthonormal Coordinates, Irrelevant Noise Components.

UNIT – IV: Data Transmission: A Base-band Signal Receiver, Probability of Error, The Optimum Filter, White Noise: The Matched Filter, Probability of Error of the Matched Filter, Coherent Reception: Correlation, Phase-Shift Keying, Frequency-Shift Keying, Non-coherent Detection of FSK, Differential PSK, Four Phase PSK (QPSK), Error Probability for QPSK, Probability of Error of Minimum Shift Keying (MSK), Comparison of Modulation Systems.

UNIT – V: Spread Spectrum Modulation: Direct Sequence (DS) Spread Spectrum, Use of Spread Spectrum with Code Division, Multiple Access (CDMA), Ranging using DS Spread Spectrum, Frequency Hopping (FH) Spread Spectrum, Generation and Characteristics of PN Sequences, Acquisition (Coarse Synchronization) of a FH Signal, Tracking (Fine Synchronization) of a FH Signal, Acquisition (Coarse Synchronization) of a DS Signal, Tracking of a DS Signal.

Text Books:

1. Analog and Digital Communication Systems by Martin S. Roden, 3rd edition, Prentice Hall, 1994.
2. Principles of Communications by Taub and Schilling.

Reference Books:

1. Modern Analog and Digital Communications by B.P.Lathi, Oxford reprint, 3rd Edition, 2004.
2. Digital and Analog Communication systems by Samshanmugam, John Wiley, 2005.
3. Principles of Digital Communications- J.Das, SK.Mullick, P.K.Chatterjee.

EC3103 INTERNET OF THINGS (PC)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
EC 3103	Internet of Things	4			30	70	100	3hrs	3

Course Objectives:

- Vision and Introduction to Internet of Things (IoT).
- Understand IoT Market perspective.
- Data and Knowledge Management and use of Devices in IoT Technology.
- Understand State of the Art – IoT Architecture.
- Understand Real World IoT Design Constraints, Industrial Automation and Commercial.

Course Outcomes: At the end of the course, student will be able to

CO 1: Explain in a concise manner how the general Internet as well as Internet of Things work.

CO 2: Understand constraints and opportunities of wireless and mobile networks for Internet of Things.

CO 3: Use basic sensing and measurement and tools to determine the real-time performance of network of devices.

CO 4: Develop prototype models for various applications using IoT technology.

CO 5: To understand data acquisition and storage process in IOT applications.

SYLLABUS

UNIT – I: Internet of Things Overview: Introduction to Internet of things, IoT Conceptual Framework, IoT Architecture View, Technology Behind IoT, Sources of IoT, M2M Communication, Examples of IoT, IoT/M2M Systems layers and Desing Standardization, Communication Technologies, Data Enrichment, Data Consolidation and Device Management at Gateway.

UNIT – II: Design Principles for Web Connectivity: Introduction, Web Communication Protocols for Connected Devices, Message Communication Protocols for Connected Devices, Web Connectivity for Connected Devices Network using Gateway, SOAP, REST, HTTP RESTful and WebSocket, Internet Connectivity, Internet- Based Communication, IP Addressing in the IoT, Media Access Control, Application Layer Protocols: HTTP, HTTPS, FTP, Telnet.

UNIT – III: Data Processing and Analytics: Introduction, Data Acquiring and Storage, Organising the Data, Transactions, Business Processes, Integration and Enterprise Systems, Analytics, Knowledge Acquiring, Managing and Sorting Process, Cloud Computing Paradigm for Data Collection, Storage and Computing, Cloud Service Models, IoT Cloud -Based Services Using the Xively, Nimbits and Other Platforms.

UNIT – IV: Prototyping the Embedded Devices for IoT and M2M: Introduction, Embedded Computing Basics, Embedded Platforms for Prototyping: Arduino, Intel® Galileo, Intel® Edison, Raspberry Pi, BeagleBone, mBed boards and Computing Systems, Things Always Connected to the Internet/Cloud, Prototyping Embedded Device Software, Devices, Gateways, Internet and Web/Cloud Services Software-Development.

UNIT – V: Business Models and Processes Using IoT: Introduction, Business Models and Business Model Innovation, Value Creation Scenarios for Internet of Things, Business Model Scenarios for Internet of Things.

Text Books:

1. Internet of Things: Architecture, Design Principles and Applications, Rajkamal, McGraw Hill Higher Education.

2. Internet of Things, A.Bahgya and V.Madisetti, Univesity Press,2015.

Reference Books:

1. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley.

2. Getting Started with the Internet of Things, Cuno Pfister, Oreilly.

EC3104 Program Elective-I

(Refer Annexure-I for Syllabus details)

EC3105 Open Elective-I

(Refer Annexure-II for Syllabus details)

EC3106 DIGITAL COMMUNICATION LAB (PC)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
EC 3106	**Digital Communications Lab**			**3**	**50**	**50**	**100**	**3hrs**	**1.5**

Course Objectives:

- A/D and D/A Converters.
- Continuously Variable Slope Delta Modulation
- Phase Shift Keying (PSK) Modulator
- Frequency Shift Keying (PSK) Modulator.

Course Outcomes:

CO 1: Practically verifying A/D and D/A Converters.
CO 2: Practically Analyze Continuously Variable Slope Delta Modulation

CO 3: Practically know the concept of Phase Shift Keying (PSK) Modulator.

CO 4: Practically understand the concepts of Frequency Shift Keying (PSK) Modulator.

CO 5: Practically verify Encoding and Decoding schemes.

SYLLABUS

List of Experiments:

1. Sample the given input signal for different sampling rates and recover the signal by means of appropriate low – pass filter.
2. Study the Pulse – Width Modulation for both AC and DC Modulating Signals and obtain the corresponding waveforms.
3. Study the Pulse – Position Modulation for both AC and DC Modulating Signals and obtain the corresponding waveforms.
4. Study the functioning of a given Analog to Digital Converter.
5. Study the functioning of a given Digital to Analog Converter.

6. Encode the given 4-Bit Data Word into 16-Bit Orthogonal Encoded Word using Hadamard Code.

7. Decode the 16-Bit Orthogonal Encoded Word to 4-Bit Data Word.

8. Study the performance of the given Continuously Variable Slope Delta Modulation (CVSD).

9. Obtain the characteristics of the Phase Shift Keying (PSK) Modulator.

10. Obtain the characteristics of the Frequency Shift Keying (FSK) Modulator.

EC3107 INTERNET OF THINGS LAB (PC)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
EC 3107	**Internet of Things Lab**			**3**	**50**	**50**	**100**	**3hrs**	**1.5**

Course Objectives:

- Interface Arduino to ZigBee module.
- Interface Arduino to GSM module.
- Interface sensors to Raspberry Pi module.
- Design an IoT system.

Course Outcomes:

CO 1: Interface Arduino to ZigBee module and GSM modules.

CO 2: Interface Arduino Bluetooth modules.

CO 3: Make use of Cloud platform to upload and analyse any sensor data.

CO 4: Use of Devices, Gateways and Data Management in IoT.

CO 5: Use the knowledge and skills acquired during the course to build and test a complete working IoT system involving prototyping, programming and data analysis.

SYLLABUS

List of Experiments:

1. Introduction to Arduino platform and programming.
2. Interfacing Arduino to Zigbee module.
3. Interfacing Arduino to GSM module.
4. Interfacing Arduino to Bluetooth Module.
5. Introduction to Raspberry PI platform and python programming.
6. Interfacing sensors to Raspberry PI.
7. Communicate between Arduino and Raspberry PI using any wireless medium.
8. Setup a cloud platform to log the data.
9. Log Data using Raspberry PI and upload to the cloud platform.
10. Design an IOT based system.

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EC3108 OBJECT ORIENTED PROGRAMMING THROUGH JAVA (SC)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
EC 3108	**Object Oriented Programming Through JAVA**	**1**		**2**	**50**	**50**	**100**	**3hrs**	**2**

Course Objectives:

- To write programs using abstract classes.
- To write programs for solving real world problems using java collection frame work.
- To write multithreaded programs.
- To write GUI programs using swing controls in Java.
- To introduce java compiler and eclipse platform.
- To impart hands on experience with java programming.

Course Outcomes:

CO 1: Able to write programs for solving real world problems using java collection frame work.

CO 2: Able to write programs using abstract classes.

CO 3: Able to write multithreaded programs.

CO 4: Able to write GUI programs using swing controls in Java.

CO 5: Apply validation techniques to build a reliable solution to a given problem.

SYLLABUS

List of Programs:

1. Use Eclipse or Net bean platform and acquaint with the various menus. Create a test project, add a test class, and run it. See how you can use auto suggestions, auto fill. Try code formatter and code refactoring like renaming variables, methods, and classes. Try debug step by step with a small program of about 10 to 15 lines which contains at least one if else condition and afor loop.
2. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. Handle any possible exceptions like divided by zero.
3. a) Develop an applet in Java that displays a simple message.

b) Develop an applet in Java that receives an integer in one text field, and computes its factorialValue and returns it in another text field, when the button named “Compute” is clicked.

4. Write a Java program that creates a user interface to perform integer divisions. The user enterstwo numbers in the text fields, Num1 and Num2. The division of Num1 and Num 2 is displayedin the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, theprogram would throw a Number Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception. Display the exception in a message dialog box.
5. Write a Java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print thevalue of cube of the number.
6. Write a Java program for the following:
    i) Create a doubly linked list of elements.
    ii) Delete a given element from the above list.
    iii) Display the contents of the list after deletion.
7. Write a Java program that simulates a traffic light. The program lets the user select one of threelights: red, yellow, or green with radio buttons. On selecting a button, an appropriate messagewith “Stop” or “Ready” or “Go” should appear above the buttons in selected color. Initially, thereis no message shown.
8. Write a Java program to create an abstract class named Shape that contains two integers andan empty method named print Area (). Provide three classes named Rectangle, Triangle, and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.
9. Suppose that a table named Table.txt is stored in a text file. The first line in the file is the header,and the remaining lines correspond to rows in the table. The elements are separated by commas. Write a java program to display the table using Labels in Grid Layout.
10. Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired (Use Adapter classes).

EC3201 ANTENNAS AND WAVE PROPAGATION (PC)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
EC 3201	**Antennas and Wave Propagation**	**4**			**30**	**70**	**100**	**3hrs**	**3**

Course Objectives:

- To understand the applications of the electromagnetic waves in free space.
- To introduce the working principles of various types of antennas.
- To discuss the major applications of antennas with an emphasis on how antennas are employed to meet electronic system requirements.
- To understand the concepts of radio wave propagation in the atmosphere.

Course Outcomes:

CO 1: Understand the radiation mechanism of an antenna and identify basic antenna parameters.

CO 2: Design and analyze various types of antenna Arrays.

CO 3: Construct and Analyze HF, VHF and UHF Antennas.

CO 4: Analyze Microwave antennas and summarize the antenna measurement techniques.

CO 5: Outline the characteristics of radio wave propagation.

SYLLABUS

UNIT – I: Radiation and Antennas: Antenna definition and Functions, Network theorems, Properties of antennas, Antenna parameters, Polarization, Basic antenna elements, Radiation mechanism, Radiation fields of alternating current element, Radiated power and radiation resistance of current element, Radiation, induction and electrostatic fields, Hertzian dipole, Different current distributions in linear antennas, Radiation from half-wave dipole, Radiation from quarter wave monopole, Radiation characteristics of dipoles.

UNIT – II: Analysis of Linear Arrays: Directional characteristics of dipole antennas, Radiation pattern of alternating current element, Radiation pattern expressions of centre-fed

vertical dipoles of finite length, Radiation patterns of centre-fed vertical dipoles, Radiation patterns of centre-fed horizontal dipoles, Radiation patterns of vertical dipoles, Two-element uniform array, Uniform linear arrays, Field strength of a uniform linear array, First sidelobe ratio (SLR), Broadside and End-fire arrays, Patterns of array of non-isotropic radiators, Multiplication of patterns, Generalized expression for principle of pattern multiplication, Radiation pattern characteristics, Binomial arrays, Effect of earth on vertical patterns, Effect of earth on radiation resistance, Methods of excitation, Impedance matching techniques, Transmission loss between transmitting and receiving antennas – FRIIS formula, Antenna temperature and signal-to-noise ratio.Array Synthesis, Synthesis methods, Fourier transform method, Linear array design by Woodward-Lawson method, Dolph-chebychev method (Tschebyscheff distribution), Taylor method, Laplace transform method, Standard amplitude distributions.

UNIT – III: HF, VHF and UHF Antennas: Introduction, Isotropic radiators, Directional antennas, Omni-directional antennas, Resonant antennas, Nonresonant antennas, LF antennas, Antennas for HF, VHF and UHF, Dipole arrays, Folded dipole, V-Antennas, Inverted V-antennas, Rhombic antenna, Yagi-Uda antenna, Log-periodic antennas, Loop antenna, Helical antenna, Whip antenna, Ferrite rod antenna, Turnstile antennas, Discone antennas, Notch antenna.

UNIT – IV: Microwave Antennas and Antenna Measurements: Introduction, Rod reflector, Plane reflector, Corner reflector, Parabolic reflector, Types of parabolic reflectors, Feed systems for parabolic reflectors, Shaped beam antennas, Horn antennas, Corrugated horns, Slot antennas, Impedance of a few typical dipoles, Slots in the walls of rectangular waveguides, Babinet's principle, Lens antennas, Microstrip antennas , Measurement ranges, Indoor and outdoor ranges, Antenna impedance measurements, Measurement of radiation resistance, Gain measurements, Measurement of antenna bandwidth, Directivity measurement, Measurement of sidelobe ratio, Measurement of radiation efficiency, Measurement of antenna aperture efficiency, Measurement of polarization of antenna, Phase measurement.

UNIT – V: Wave Propagation: Propagation characteristics of EM Waves, Factors involved in the propagation of radio waves, Ground wave propagation, Ground wave field strength by Maxwell's equations, Reflection of radio waves by the surface of the earth, Roughness of earth, Reflection factors of earth, Wave tilt of the ground wave, Tropospheric wave propagation, Atmospheric effects in space wave propagation, Duct propagation, Radio horizon,

Troposcatter, Fading of EM waves in Troposphere, Line of sight (LOS), Ionospheric propagation, Characteristics of ionosphere, Refractive index of ionosphere, Phase and group velocities, Mechanism of Ionospheric propagation, reflection and refraction, Characteristic parameters of Ionospheric propagation, Sky wave field strength, Fading and diversity techniques, Faraday's rotation, Effect of earth's magnetic field.

Text Book:

1. Antennas and Wave Propagation, G.S.N. Raju, Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2007.

Reference Books:

1. EM Waves and Radiation Systems, E. C. Jordan and K. G. Balmain, PHI – N. Delhi, 1997.
2. Antennas, J.D. Kraus, McGraw Hill, NY.
3. Antenna theory, C.A. Balanis, John Wiley & Sons, NY, 1982.

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EC3202 DIGITAL SIGNAL PROCESSING (PC)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
EC 3202	Digital Signal Processing	4			30	70	100	3hrs	3

Course Objectives:

- To Analyze the Discrete Time Signals and Systems.
- To understand the various implementations of digital filter structures.
- To know the importance of FFT algorithm for computation of Discrete Fourier Transform.
- To learn the FIR and IIR Filter design procedures.
- To know the applications of DSP.

Course Outcomes:

CO 1: Apply the concepts of difference equations to Analyze the discrete time systems

CO 2: Make use of the FFT algorithm for solving the DFT of a given signal.

CO 3: Analyze the Digital IIR & FIR filter design for different specifications.

CO 4: Analyze the Digital FIR filter design for different specifications.

CO 5: Understand the signal Processing concepts in various applications.

SYLLABUS

UNIT – I: Discrete - Time Signals and Systems: Discrete - Time Signals – Sequences, Linear Shift – Invariant Systems, Stability and Causality, Linear Constants – Coefficient Difference Equations, Frequency Domain Representation of Discrete – Time Signals and Systems.

UNIT – II: Applications of Z – Transforms: System Functions H(z) of Digital Systems, Stability Analysis, Structure and Realization of Digital Filters, Finite Word Length Effects.

UNIT – III: Discrete Fourier Transform (DFT): Properties of the DFS, DFS Representation of Periodic Sequences, Properties of DFT, Convolution of Sequences. Fast – Fourier Transforms (FFT):

Radix – 2 Decimation – In – Time (DIT) and Decimation – In – Frequency (DIF), FFT Algorithms, Inverse FFT.

UNIT – IV: IIR Digital Filter Design Techniques: Design of IIR Filters from Analog Filters, Analog Filters Approximations (Butterworth and Chebyshev Approximations), Frequency Transformations, General Considerations in Digital Filter Design, Bilinear Transformation Method, Step and Impulse Invariance Technique.

UNIT – V: Design of FIR Filters: Fourier series Method, Window Function Techniques, Comparison of IIR and FIR Filters. Applications of FFT in Spectrum Analysis and Filtering, Application of DSP in Speech Processing.

Text Book:

1. Alan V. Oppenheim and Ronald W. Schafer: Digital Signal Processing, PHI.

Reference Books:

1. Sanjit K. Mitra, Digital Signal Processing "A – Computer Based Approach", Tata Mc Graw Hill.
2. Raddar and Rabiner, Application of Digital Signal Processing.
3. S. P. Eugene Xavier, Signals, Systems and Signal Processing, S. Chand and Co. Ltd.
4. Antonio, Analysis and Design of Digital Filters, Tata Mc Graw Hill.

EC3203 MICROWAVE ENGINEERING (PC)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
EC 3203	Microwave Engineering	4			30	70	100	3hrs	3

Course Objectives:

- The microwave components.
- Microwave signal generators and amplifiers.
- Various microwave circuits and microwave integrated circuits.
- Various microwave parameter measurements.

Course Outcomes:

CO 1: Analyze the microwave components.

CO 2: Illustrate microwave signal generators and amplifiers.

CO 3: Understand the operation of various microwave circuits.

CO 4: Infer various microwave integrated circuits.

CO 5: Infer various microwave parameter measurements.

SYLLABUS

UNIT – I: Microwave Components: Introduction to Microwaves and their applications, Coaxial Line Components, Wave-guide Components, Directional Couplers, Hybrid Tee Junction, Magic Tee, Attenuators, Ferrite Devices, Isolators, Circulators, Cavity Resonators, Re-entrant Cavities, Wave-meters, Microwave Filters, Detectors, Mixers.

UNIT -II: Microwave Signal Generators and Amplifiers: Vacuum Tube Triodes, Resonant Cavity Devices, Reflex Klystron, two – Cavity Klystron, Multi – Cavity Klystron, Slow – Wave Devices, TWT, Crossed Field Devices, Magnetrons, Semiconductor Devices, Microwave BJTs, FETs, Tunnel Diodes, Gunn Diode, IMPATT, TRAPATT Diodes.

UNIT – III: Microwave Circuits: Scattering Matrix and its Properties, Scattering Matrix of directional coupler, circulator, E Plane Tee, H plane Tee and Magic Tee.

UNIT – IV: Microwave Integrated Circuits: Materials, Substrate, Conductor, Dielectric and Resistive Materials, MMIC Growth, Fabrication Techniques, MOSFET Fabrication, NMOS Growth and CMOS Development, Thin Film Formation.

UNIT – V: Microwave Measurements: VSWR, Frequency, Guide Wavelength, Coupling and Directivity measurements.

Text Books:

1. Microwave Engineering, G.S.N. Raju, IK International Publishers.
2. Microwave Communications – Components and Circuits, E. Hund, McGraw Hill.
3. Microwave Devices and Circuits, S. Y. Liao, PHI.
4. Microwave Engineering, R. Chatterjee, East – West Press Pvt. Ltd.

Reference Books:

1. Foundations For Microwave Engineering, R. R. Collin, McGraw Hill.

EC3204 Program Elective-II
(Refer Annexure-I for Syllabus details)

EC3205 Open Elective-II
(Refer Annexure-II for Syllabus details)

EC3206 ANTENNA SIMULATION LABORATORY (PC)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
EC 3206	Antennas Simulation Lab			3	50	50	100	3hrs	1.5

Course Objectives:

- To understand the fundamental working principle of an antenna.
- To describe/explore the different antenna parameters like input impedance, far-field radiation patterns, reflection coefficient, etc.
- To apply the different feeding technique.
- To evaluate and perform the optimization to achieve a certain goal.
- To design the wire antennas, microstrip antennas, etc.

Course Outcomes:

CO 1: Understand different simulation software used for antenna design and analysis.
CO 2: Understand the design and analyzing basic antenna and its parameters experimentally.
CO 3: Design and understand wire antennas and microstrip antennas using HFSS.
CO 4: Understand the different feeding technique used for antenna design.
CO 5: Design wire antennas, Microstrip antennas, and Microstrip based filters using EM simulator.

SYLLABUS

List of Experiments:

1. Design of fundamental parameters of the antenna and an overview of HFSS to measure different antenna parameters.
2. Design of a half-wave dipole antenna.
3. Design of a quarter-wave monopole antenna.
4. Design and simulation of rectangular microstrip patch antenna with a particular operating frequency, dielectric constant and substrate thickness.
5. Design of microstrip patch antenna using a coaxial feeding technique.

6. Design and simulation of dual-band rectangular patch antenna using the inset feeding technique.
7. Design and simulation of rectangular microstrip patch antenna using CPW feeding with slot for bandwidth enhancement.
8. Design of aperture coupled rectangular microstrip patch antenna with two different substrates.
9. Design of proximity coupled rectangular microstrip patch antenna.
10. Design and simulation of Dielectric Resonator Antenna with a particular operating frequency, dielectric constant and substrate thickness.
11. Design and Simulation of MPA using MATLAB.
12. Design and Simulation of MPA using the CST Microwave Studio Suite 2020.

EC3207 DIGITAL SIGNAL PROCESSING LAB (PC)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
EC 3207	**Digital Signal Processing Lab**			**3**	**50**	**50**	**100**	**3hrs**	**1.5**

Course Objectives:

- To make familiar with practical implementation of the digital signal processing.
- To develop DSP algorithms for convolution, correlation and DFT.
- To design digital filters.
- To have hands on experience in MATLAB and DSP processor.

Course Outcomes:

CO 1: Generation and Implementation of discrete time signals and systems using MATLAB

CO 2: Analyze the Frequency analysis of discrete signals and systems using MATLAB.

CO 3: Design and simulate FIR and IIR filters with different techniques using MATLAB.

CO 4: Verification of Linear and Circular Convolution using DSP Processor.

CO 5: Implementation of FIR and IIR filters with different techniques using DSP Processor.

SYLLABUS

List of Experiments:

1). Sampling theorem, illustration of up sampling in time and frequency domain.

2). Sampling theorem, illustration down sampling in time and frequency domain.

3) Implement: -

a) Linear Convolution of Two Sequences.

b) Circular Convolution of Two Sequences.

c) Cross-Correlation and Auto-Correlation.

4) FFT of a given (8 point and 16 point) N-point Sequence using: -

a) DIF-FFT b) DIT-FFT.

5) System Response of Discrete Time Sequences: -

a) Impulse b) Step

6) Spectral Analysis of given Waveforms. And Plot Spectrogram (Frequency v/s Time): -

a) Sine b) Square c) Audio file.

7) Study of Architecture of DSP Chip-TMS320C6711.

8) Design following IIR Digital Filters using i) Butterworth and ii) Chebyshev designs:

(a) LPF (b) HPF (c) BPF (d) BSF

9) Design FIR Digital Filters using a) Rectangular window b) Hamming window:

(a) LPF (b) HPF (c) BPF (d) BSF.

10) Addition of White Gaussian Noise to an Audio file and recover the Signal using Butterworth filters.

11) Perform various operations on Digital Images.

(a) Cropping (b) rotation (c) histogram (d) binary image

(e) B to G conversion (f) water marking (g) Adding noise to the image.

EC3208 MICROWAVE ENGINEERING LAB (PC)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
EC 3208	Microwave Engineering Lab			3	50	50	100	3hrs	1.5

Course Objectives:

- VSWR.
- V-I Characteristics of GUNN Diode.
- Coupling Factor and Directivity of a 4-Port directional coupler.
- Microwave frequency

Course Outcomes:

CO 1: Measurement of VSWR.

CO 2: Experimentally analyze V-I Characteristics of GUNN Diode.

CO 3: Measure Coupling Factor and Directivity of a 4-Port directional coupler practically.

CO 4: Practically experimenting and understand radiation pattern of Horn Antenna.

CO 5: Practically analyze analog and digital fiber optic links.

SYLLABUS

List of Experiments:

1. Measurement of VSWR.
2. V-I Characteristics of GUNN Diode.
3. Measurement of Coupling Factor and Directivity of a 4-Port directional coupler.
4. Measurement of Microwave frequency.
5. Reflex Klystron Characteristics.
6. Radiation Pattern of Horn Antenna.
7. Fiber Optic Analog Link.
8. Fiber Optic Digital Link.
9. Other four experiments from the choice either from Microwave Engineering or from Antenna Theory.

EC3209 SOFT SKILLS (SC)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
EC 3209	Soft Skills	1		2	50	50	100	3hrs	2

Course Objectives:

- To develop skills to communicate clearly.
- To aid students in building interpersonal skills.
- To enhance team building and time management skills.
- To inculcate active listening and responding skills.

Course Outcomes:

CO 1: Make use of techniques for self-awareness and self-development.

CO 2: Apply the conceptual understanding of communication into everyday practice.

CO 3: Understand the importance of teamwork and group discussions skills.

CO 4: Develop time management and stress management.

CO 5: Preparation of resume and interviews.

SYLLABUS

Introduction to Soft Skills: Communication – Verbal and Non-Verbal Communication - Personal grooming (Etiquette, Attitude, Body Language), Posture, Gestures, Facial Expressions, Eye Contact, Space Distancing, Presentation Skills, Public Speaking, just a Minute (JAM) sessions, Adaptability.

Goal Setting and Time Management: Immediate, Short term, Long term, Smart Goals, Strategies to Achieve goals, Types of Time, Identifying Time Wasters, Time Management Skills, Stress Busters.

Leadership and Team Management: Qualities of a Good Leader, Team Dynamics, Leadership Styles, Decision Making, Problem Solving, Negotiation Skills.

Group Discussions: Purpose (Intellectual ability, Creativity, Approach to a problem, Tolerance), Group Behaviour, Analysing Performance.

Job Interviews: Identifying job openings, Covering Letter and CVs / Resumes, Interview (Opening, Body-Answer Q, Close-Ask Q), Telephone Interviews, Types of Questions.

Reference Books:

1. Krannich, Caryl, and Krannich, Ronald L. Nail the Resume! Great Tips for Creating Dynamite Resumes. United States, Impact Publications, 2005.
2. Hasson, Gill. Brilliant Communication Skills. Great Britain: Pearson Education, 2012
3. Prasad, H. M. How to Prepare for Group Discussion and Interview. New Delhi: Tata McGraw-Hill Education, 2001.
4. Pease, Allan. Body Language. Delhi: Sudha Publications, 1998.
5. Rizvi, Ashraf M. Effective Technical Communication: India, McGraw-Hill Education. 2010
6. Thorpe, Edgar &Showick Thorpe. Winning at Interviews. 2nd Edition. Delhi: Dorling Kindersley, 2006.

EC-4101 Program Elective-III

(Note: Refer Annexure-I for Syllabus details)

EC4102 Program Elective-IV

(Note: Refer Annexure-I for Syllabus details)

EC4103 Program Elective-V

(Note: Refer Annexure-I for Syllabus details)

EC4104 Open Elective-III

(Note: Refer Annexure-II for Syllabus details)

EC4105 Open Elective-IV

(Note: Refer Annexure-II for Syllabus details)

EC4106 HSS Elective

(Note: Refer Annexure-III for Syllabus details)

EC4107 WEB TECHNOLOGIES (SC)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
EC 4107	WEB Technologies	1		2	50	50	100	3hrs	2

Course Objectives:

- To develop an ability to design and implement static and dynamic website.
- Create conforming web pages.
- Understand, analyze and create XML documents and XML Schema.
- Understand, analyze and build web applications using PHP.
- Handling Cookies and Sessions using PHP, SERVLETS and JSP.

Course Outcomes:

CO 1: Design and implement dynamic websites with good aesthetic sense of designingand latest technical know-how's.

CO 2: Create web pages using HTML and Cascading Styles sheets.

CO 3: Analyze a web page and identify its elements and attributes.

CO 4: Create dynamic web pages using JavaScript.

CO 5: Build web applications using PHP.

SYLLABUS

List of Programs:

1. Design the following static web pages required for an online book storeweb site.

   i) HOME PAGE: The static home page must contain three frames.
   ii) LOGIN PAGE
   iii) CATOLOGUE PAGE: The catalogue page should contain thedetails of all the books available in the web site in a table.
   iv) REGISTRATION PAGE

2. Write a JavaScript to validate the following fields of the Registrationpage.

i) First Name (Name should contains alphabets and the lengthshould not be less than 6 characters).

ii) Password (Password should not be less than 6 characters length).

iii) E-mail id (should not contain any invalid and must follow thestandard pattern name@domain.com)

iv) Mobile Number (Phone number should contain 10 digits only).

v) Last Name and Address (should not be Empty).

3. Develop and demonstrate the usage of inline, internal and externalstyle sheet using CSS.

4. Develop and demonstrate JavaScript with POP-UP boxes andfunctions for the following problems:

   i) Input: Click on Display Date button using onclick () function.
   Output: Display date in the textbox.

   ii) Input: A number n obtained using prompt.
   Output: Factorial of n number using alert.

   iii) Input: A number n obtained using prompt.
   Output: A multiplication table of numbers from 1 to 10 of n using alert.

   iv) Input: A number n obtained using prompt and add another numberusing confirm.
   Output: Sum of the entire n numbers using alert.

5. Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next in the list. Add CSS to customize the properties of the font of the capital (color, bold and font size).

6. Write an HTML page including any required JavaScript that takes a number from text field in the range of 0 to 999 and shows it in words. It should not accept four and above digits, alphabets and special characters.

7. Develop and demonstrate PHP Script for the following problems:

   i) Write a PHP Script to find out the Sum of the Individual Digits.

   ii) Write a PHP Script to check whether the given number isPalindrome or not.

8. Implement the web applications with Database using PHP.

9. Modify the above PHP program to use an xml instead of database.

10. Write a program to design a simple calculator using (i) JavaScript (ii)PHP**.**

EC4201 PROJECT WORK

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
EC 4201	Project Work			28	100	100	200		14

Course Objectives:

- To give the real-life exposure on modelling, development and implementation of hardware and embedded systems.
- To give exposure in the relevant field of specialization.
- To focus on research problems and analysis, solutions, research methodology, publishing/patenting research work.

Course Outcomes:

CO 1: Apply critical and creative thinking in the design of engineering projects, plan and manage your time effectively as a team.

CO 2: Consider the business context and commercial positioning of designed devices or systems and apply knowledge of the real-world situations that a professional engineer can encounter.

CO 3: Use fundamental knowledge and skills in engineering and apply it effectively on a project and design and develop a functional product prototype while working in a team.

CO 4: Undertake an engineering project under mentorship and timely reflect on your own and peer's technical and non- technical learning.

CO 5: Orally present and demonstrate your product to peers, academics, generally and industry community and manage any disputes and conflicts within and outside your team.

ANNEXURE -I

PROFESSIONAL ELECTIVES (PE)

1. Global Positioning System.
2. Radar Engineering.
3. Cellular Mobile Communication.
4. Electronic Measurements and Instrumentation.
5. Data Structures.
6. EMI/EMC.
7. Internet and Web Technology.
8. Speech Processing.
9. Computer Networks.
10. TV and Satellite Communication System.
11. Transducers and Signal Conditioning.
12. VLSI Design.
13. Digital Image Processing.
14. Fiber Optic Communication.
15. Advanced Microprocessors.

GLOBAL POSITIONING SYSTEM (PE)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
	Global Positioning System	**4**			**30**	**70**	**100**	**3hrs**	**3**

Course Objectives:

- Global Position System with GPS working principle.
- Other global satellite constellations.
- GPS satellite constellation and signals.
- Block diagrams of Synthetic Aperture Radar (SAR), Phased array Radars and others.
- different coordinate systems

Course Outcomes:

CO 1: Understand the basic concepts of Global Position System with GPS working principle.

CO 2: Understand the basic concepts of other global satellite constellations.

CO 3: Analyze various GPS Errors.

CO 4: Analyze GPS satellite constellation and signals.

CO 5: Examine using different coordinate systems.

SYLLABUS

UNIT – I: Introduction to GPS: Global Position System, the History of GPS, the Evolution of GPS, Development of NAVSTAR GPS, Block I, Block II satellites, Block IIA, Block IIR and Block II R-M satellites.

UNIT – II: GPS Working: Principal Trilateration, Determination of where the satellites are, Determination of how far the satellites are, Determining the receiver position in 2D or X-Y Plane, Determining the receiver position in 3D or X-Y-Z Plane, basic equations for finding user position, user position determination with least squares estimator.

UNIT – III: Other Global Satellite Constellation: GLONASS, GALILEO, Comparison of 3GNSS (GPS, GALILEO, GLONASS) in terms of constellation and services provided.

UNIT – IV: GPS Satellite constellation and Signal Structure: GPS system segments, Space segment, Control segment, User segment, GPS Signals, Pseudorandom noise (PRN) code, C/A code, P code Navigation data, Signal structure of GPS.

UNIT – V: Coordinate Systems: Geoid, Ellipsoid, Coordinate Systems, Geodetic and Geo centric coordinate systems, ECEF coordinates, world geodetic 1984 system, Conversion between Cartesian and geodetic coordinate frame.

Text Books:

1. G S RAO, Global Navigation Satellite Systems, McGraw-Hill Publications, New Delhi, 2010.
2. Pratap Mishra, Global positioning system: signals, measurements, and performance, Ganga-Jamuna Press, 2006.

Reference Books:

1. Scott Gleason and Demoz Gebre-Egziabher, GNSS Applications and Methods, Artech House, 685 Canton Street, Norwood, MA 02062, 2009.
2. James Ba – Yen Tsui, 'Fundamentals of GPS receivers – A software approach', John Wiley & Sons (2001).
3. B.Hoffmann- Wellenhof, GPS theory and practice, 5th Edition, Springer 2001.

RADAR ENGINEERING (PE)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
	Radar Engineering	**4**			**30**	**70**	**100**	**3hrs**	**3**

Course Objectives:

- To study the principles of operation of various blocks of Radar systems and Radar Range equation in detail.
- To study the functions of various blocks of CW Radar, FM-CW Radar, MTI and Pulse Doppler Radars, Tracking radar and their limitations and applications.
- To study the functions of various blocks of Radar receivers and detection of Radar signals in noise in detail.
- To study the principles and working of phased array antennas and their application to radar systems.

Course Outcomes:

CO 1: Understand the basic concepts of Radar, equation and factors influencing radar range equation.

CO 2: Knowledge of different types of radars and understand the detection criteria for different parameters.

CO 3: Distinguish the fixed and moving targets using different types of radar systems. Analyze Tracking Radar.

CO 4: Examine block diagrams of Synthetic Aperture Radar (SAR), Phased array Radars and others.

CO 5: Knowledge about different radar transmitters and receivers and identify the different types of display devices & duplexers used in radar receivers.

SYLLABUS

UNIT – I: Introduction to RADAR: Radar Equation, Radar Block Diagram and Operation, Prediction of Range, Minimum Detectable Signal, Receiver Noise, Probability Density Functions, S/N, Integration of Radar Pulses, Radar Cross-section, Transmitter Power, PRF and Range Ambiguities, Radar Antenna Parameters, System Losses and Propagation Effects.

UNIT - II: MTI and Pulse Doppler RADAR: Introduction, Delay line Cancellers, Moving target Detector, Limitation to MTI performance, MTI from moving platform, Pulse Doppler Radar.

UNIT – III: Tracking RADARS: Sequential Lobing, Conical Scan, Monopulse tracking Radar, Low angle tracking, Pulse compression, Block Diagrams of Synthetic Aperture Radar (SAR), Phased array Radars, MST Radar, ECM, ECCM.

UNIT – IV: Detection of Signals in Noise: Matched Filter Receiver, Detection Criteria, Constant False Alarm Rate Receivers. Information From RADAR Signals: Basic Radar Measurements, Pulse Compression, Target Recognition.

UNIT – V: RADAR Transmitters and Receivers: Magnetron, Solid State RF Power Source, Other Aspects of Radar Transmitters, Radar Receiver, Superheterodyne Receiver, Duplexers and Receivers Protectors, Radar Displays.

Text Book:

1. Radar Engineering and Fundamentals of Navigational Aids, G S N Raju, IK International Publishers, 2008.

Reference Book:

1. Introduction to Radar Systems, Skolnik, McGraw Hill, 2007.

CELLULAR AND MOBILE COMMUNICATION (PE)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
	Cellular and Mobile Communication	**4**			**30**	**70**	**100**	**3hrs**	**3**

Course Objectives:

- To know the evolution of Mobile communication and cell concept to improve capacity of the system.
- Understand the basic cellular concepts like frequency reuse, cell splitting, cell sectoring etc., and various cellular systems.
- Understand the frequency management, channel assignment, various propagation effects in cellular environment and the concepts of handoff and types of handoffs.
- Understand the architectures of GSM and 3G cellular systems.

Course Outcomes:

CO 1: Explain the fundamentals of cellular radio system design and its basic elements.

CO 2: Analyze the concepts of different co-channel, non-co-channel interference and cellular coverage on signal & traffic of a designed system.

CO 3: Identify the various types of multiplexing and modulation techniques suitable for mobile communications.

CO 4: Analyze mobile radio propagation models.

CO 5: Summarize the different types of second-generation system architectures such as GSM, TDMA and CDMA for mobile communication systems.

SYLLABUS

UNIT – I: Introduction: Evolution of Mobile Communications, Mobile Radio Systems around the world, First, Second, Third Generation Wireless Networks, Wireless Local Loop (WLL), Wireless LANs, Bluetooth, Personal Area Networks (PANs), Examples of Wireless Communication Systems, A Simplified Reference Model, Applications.

UNIT – II: Wireless Transmission Techniques: Frequencies for radio transmission, Signals, Antennas, Signal Propagation, Multiplexing, Modulation Techniques: ASK, PSK, FSK,

Advanced ASK, Advanced PSK, Multicarrier, Spead Spectrum: Direct sequence and Frequency hopping, Medium Access control- SDMA, FDMA, TDMA, CDMA, Comparison of S/F/T/CDMA.

UNIT – III: The Cellular Concept: Introduction, Frequency reuse, Handoff strategies, Interference and System Capacity: Co- Channel Interference, Channel Planning, Adjacent Channel Interference, Power control for reducing interference, Trunking and Grade of Service, Cell Splitting, Sectoring, Repeaters for Range extension, A microcell zone concept.

UNIT – IV: Mobile Radio Propagation: Introduction, Free space propagation model, The three basic propagation models-Reflection, Diffraction and Scattering, Two-ray model, Outdoor propagation models, Indoor propagation models, Signal Penetration into building, Small scale multipath Propagation, Parameters of Mobile multipath channels, Types of small scale fading.

UNIT -V: Telecommunication Systems: GSM: Mobile Services, System Architecture, Radio interface, Protocols, Localization and Calling, Handover, Security, New data services, UMTS and IMT-2000: Releases and Standardization, System Architecture, Radio interface, UTRAN, Handover.

Text Books:

1. Mobile Cellular Communication by Gottapu Sasibhushana Rao, PEARSON International, 2012.

Reference Books:

1. Mobile Communications-Jochen Schiller, Pearson education, 2nd Edn, 2004.
2. Wireless Communications: Principles and Practice-Theodore. S. Rapport, Pearson education, 2nd Edn, 2002.
3. Mobile Cellular Telecommunications-W.C.Y. Lee, Tata McGraw Hill, 2nd Edn, 2006.
4. Wireless and Mobile Communications-Lee, McGraw Hill, 3rd Edition, 2006.
5. Wireless Communications and Networks-William Stallings, Pearson Education, 2004.

ELECTRONIC MEASUREMENTS & INSTRUMENTATION (PE)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
	Electronic Measurement and Instrumentation	**4**			**30**	**70**	**100**	**3hrs**	**3**

Course Objectives:

- To introduce the fundamentals of Electronics Instruments and Measurement
- To provide an in-depth understanding of Measurement errors.
- To address the underlying concepts and methods behind Electronics measurements.
- To understand operation of different instruments.
- To know the principles of various types of transducers and sensors.

Course Outcomes:

CO 1: Understand the different characteristics of electronic measuring instruments.

CO 2: Make use of Signal generators to analyze a signal.

CO 3: Understand the design and functioning of Oscilloscopes.

CO 4: Utilize AC bridges for measurement of inductance and distinguish active transducers from passive transducers.

CO 5: Develop the ability to use instruments for measurement of physical parameters.

SYLLABUS

UNIT – I: Basic Measurement Concepts: Measurement systems – Static and dynamic characteristics – error analysis – moving coil meters – DC ammeters, DC voltmeters, Series type ohmmeter, Shunt type ohmmeter, multimeter - moving iron meters – Bridge measurements – Wheatstone, Kelvin, Guarded Wheatstone, Maxwell, Hay, Schering, Anderson and Wein bridge.

UNIT – II: Basic Electronic Measurements: AC voltmeters using rectifiers, True RMS responding voltmeter, Electronic multimeter – Comparison of analog and digital techniques – digital voltmeter - Ramp, Stair case ramp, Integrating, Continuous balance, Successive approximation.

UNIT -III: Digital Instruments: Frequency counters – measurement of frequency and time interval – extension of frequency range – measurement errors - Cathode ray oscilloscopes –

block schematic – applications – special oscilloscopes – Storage and sampling oscilloscopes – wave analyzer - distortion analyzer - spectrum analyzer – Q meters.

UNIT -IV: Transducers: Introduction, Classification of transducers, Analog transducers, Resistive transducers, Potentiometers, Strain gauges, Types of strain gauges, Resistance strain gauges, Semiconductor strain gauges, Resistance thermometers, Thermometers, Application of Thermistors, Thermo-couple construction, Measurement of thermocouple output, Compensating circuits, Advantages and disadvantages of thermocouples.

UNIT – V: Displacement Transducers: Variable inductance type transducer, Variation of self-inductance, Variation of mutual inductance, Linear variable differential transformer, Rotary variable differential transformer, Capacitive transducers, Piezo-electric transducers, Digital transducers, Shaft Encoder.

Text Books:

1. Albert D. Helfrick and William D. Cooper – Modern Electronic Instrumentation and Measurement Techniques, Prentice Hall of India, 2003.
2. A K Sawahney, Electrical and Electronics Measurement and Instrumentation, Dhanpat Rai,2000

Reference Books:

1. H S Kalsi, Electronic instrumentation, TMH, 1995.
2. Ernest O. Doebelin, Measurement Systems- Application and Design-Tata McGraw-Hill-2004.
3. Oliver B.M. & Cage – Electronic Measurements & Instrumentation -Tata McGraw Hill
4. K Padma Raju,Y J Reddy, Instrumentation and Control Systems, McGraw Hill Education,2016.

DATA STRUCTURES (PE)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
	Data Structures	**4**			**30**	**70**	**100**	**3hrs**	**3**

Course objectives:

- Assess how the choice of data structures and algorithm design methods impacts the performance of programs.
- Choose the appropriate data structure and algorithm design method for a specified application.
- Solve problems using data structures such as linear lists, stacks, queues, binary trees, heaps binary search trees, and graphs and writing programs for these solutions.

Course outcomes:

CO 1: Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithm.

CO 2: Demonstrate different methods for traversing trees.

CO 3: Compare alternative implementations of data structures with respect to performance.

CO 4: Discuss the computational efficiency of the principal algorithms for sorting and searching.

CO 5: Understand the concepts of Topological Ordering of nodes, Graph Traversal.

Syllabus

UNIT – I: Introduction to Data Structures: Review of C Programming, Recursive Definition and Processes, Recursion in C, Simulation of Recursion, Efficiency of Recursion, Abstract Data Types, Meaning and Definition of Data Structures, Arrays.

UNIT – II: Stacks: Stack as an Abstract Data Type, Primitive Operations, Implementing Stack Operations using Arrays, Infix, Postfix and Prefix: Definitions, Evaluation and Conversions. Queues: Queue as an Abstract Data Type, Sequential Representation, Types of Queues, Operations, Implementation using Arrays. Linked List: Operations, Implementation of Stacks, Queues and priority Queues using Linked Lists+, Circular Lists: Insertion, Deletion and Concatenation Operations, Stacks and Queues as Circular Lists, Doubly Linked Lists.

UNIT – III: Trees: Binary Trees - Definitions and Operations, Binary Tree Representation: Node Representation, Implicit array Representation, Binary Tree Traversal, Threaded Binary Trees and their Traversal, Trees and their Applications; Tree Searching: Insertion and Deletion of a node from a Binary Search Tree, Efficiency of Binary Search Tree operations.

UNIT - IV: Searching: Basic Searching Techniques: Dictionary as an Abstract Data Type, Algorithmic Notation, Sequential Searching and its Efficiency, Binary Search, Interpolation Search. Sorting: General Background: Efficiency, Asymptotic Notations, Efficiency of Sorting, Bubble Sort and Quick Sort and their Efficiency, Selection Sorting, Binary Tree Sort, Heap Sort, Insertion Sorts, Shell Sort, Address calculation Sort, Merge and Radix Sorts.

UNIT – V: Graphs and Their Application: Definition of Graphs, Representation of Graphs, Transitive closure, Linked Representation of Graphs, Topological Ordering of nodes, Graph Traversal and Spanning Forests, Undirected Graphs and their Traversals, Applications of Graphs, Minimal Spanning Trees.

Textbooks:

1. Data Structures Using C and C++ Yddish Langsam, Moshe J. Augenstein and Aaron M. Tanenbaum, Prentice Hall of India (2nd Edition)

2. Data Structures, Algorithms and Applications with C++, Sahani Mc-Graw Hill

EMI/EMC (PE)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
	EMI/EMC	**4**			**30**	**70**	**100**	**3hrs**	**3**

Course Objectives:

- To familiarize with the fundamentals that are essential for electronics industry in the field of EMI / EMC
- To understand EMI sources and its measurements
- To understand the various techniques for electromagnetic compatibility.
- Acquire broad knowledge of various EM radiation measurement techniques.
- Model a given electromagnetic environment/system so as to comply with the standards.

Course Outcomes:

CO 1: Understand the EMI sources, EMC regulations and methods of eliminating interferences.

CO 2: Identifying of EMI hotspot and various techniques like Grounding, Shielding, Cabling.

CO 3: Analyze the effect of EM noise in system environment and its sources.

CO 4: Summarize the EMC design constraints and make appropriate trade-offs that meets all requirements.

CO 5: Differentiate various EMI measurement techniques.

SYLLABUS

UNIT – I: Introduction to EMI/EMC: EMI Sources, EMI Coupling, Noise Path, Models of Noise Coupling, EMC Regulations, Designing for EMC, Compliance Tests, Elimination of EMI, EMI Testing, Compliance Test and Engineering Tests.

UNIT – II: Grounding Techniques: Grounding Techniques, Shielding Techniques, Cabling Techniques.

UNIT – III: Conducted EMI/EMC: Origin of Conducted EMI, Common and Normal mode Noise, Noise from Power Electronic Systems, Spectra of Pulse Noise Sources, Modeling of EMI Noise Sources, Transient Disturbance Simulation Signals, EMI Filters for Mains Noise.

UNIT -IV: Choice of Passive Components: EMC Design Components

UNIT -V: EMI Measurement Technology: EMI Measuring Instruments, Pitfalls of EMI Measurements, Test Instrumentation Accessories and their Characteristics, Measurement of Pulsed EMF, EMI Patterns from Different List Objects, EMI Immunity Test System, Software in EMI/EMC Measurements, Recent Trends in Susceptibility Measurement, Cost Effective EMI/EMC Measurements, Setup and its Maintenance.

Text Books:

1. IMPACT Learning Material Series Modules 1 – 9, IIT New Delhi, Published by RSTE.
2. Electromagnetic Compatibility, R. C. Paul.

INTERNET & WEB TECHNOLOGY (PE)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
	Internet & WEB Technology	**4**			**30**	**70**	**100**	**3hrs**	**3**

Course Objectives:

- To understand best technologies for solving web client/server problems.
- To analyze and design real time web applications.
- To use Java script for dynamic effects and to validate form input entry.
- To Analyze to Use appropriate client-side or Server-side applications.

Course Outcomes:

CO 1: Understand the concepts of HTML, Java scripts and Cascading Style Sheets

CO 2: Generate XML documents and Schemas and summarize Java Beans.

CO 3: Develop and deploy real time web applications in web servers and Servlets.

CO 4: Build JSP tools that assist in automating data transfer over the Internet.

CO 5: Accessing a Database from Servlets & JSP Page.

SYLLABUS

UNIT – I: HTML Common tags- List, Tables, images, forms, Frames; Cascading Style sheets; Java Script: - Introduction to Java Scripts, Objects in Java Script**,** Dynamic HTML with Java Script. XML, Document type definition, XML Schemas, Document Object model, Presenting XML, Using XML Processors: DOM and SAX.

UNIT – II: Java Beans: Introduction to Java Beans, Advantages of Java Beans, BDK, Introspection, Using Bound properties, Bean Info Interface, Constrained properties Persistence, Customizes, Java Beans API, Introduction to EJB's

UNIT -III: Web Servers and Servlets: Tomcat web server, Introduction to Servlets: Lifecycle of a Server let, The Servlet API, The javax.servelet Package, Reading Servlet parameters, and Reading Initialization parameters. The javax.servelet HTTP package, Handling Http Request & Responses, Using Cookies-Session Tracking, Security Issues

UNIT – IV: JSP Application Development: Generating Dynamic Content, Using Scripting Elements Implicit JSP Objects, Conditional Processing – Displaying Values Using an Expression to Set an Attribute, Declaring Variables and Methods Error Handling and Debugging Sharing Data between JSP pages, Requests, and Users Passing Control and Date between Pages – Sharing Session and Application Data – Memory Usage Considerations

UNIT – V: Database Access: Database Programming using JDBC, Studying Javax.sql. *Package, accessing a Database from Servlets & JSP Page, Application – Specific Database Actions, Deploying JAVA Beans in a JSP Page, Introduction to struts framework.

Text Books:

1. Internet and World Wide Web – How to program by Dietel and Nieto
PHI/Pearson Education Asia.
2. Advanced Java™ 2 Platform How to Program, Deitel/Deitel/Santry 3. Java Server Pages – Hans Bergsten, SPD O'Reilly

Reference Books:

1. HTML Black Book: The Programmer's Complete HTML Reference Book-by Steven Holzner
2. Core Servelets and Java Server Pages Volume2: Core Technologies by Marty Hall and Larry Brown, Pearson Education.

SPEECH PROCESSING (PE)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
	Speech Processing	**4**			**30**	**70**	**100**	**3hrs**	**3**

Course Objectives:

- To understand the basic principles of sound and speech production and perception.
- To understand basic principles of speech recognition, synthesis and dialogue systems
- To obtain an introductory overview in the field.

Course Outcomes:

CO 1: Model an electrical equivalent of Speech Production system.

CO 2: Convey details of a range of commonly used speech feature extraction techniques.

CO 3: Provide a basic understanding of multidimensional techniques for speech representation and classification methods.

CO 4: Familiarize you with the practical aspects of speech processing, including robustness, and applications of speech processing, including speech enhancement, speaker recognition and speech recognition.

CO 5: Design a Homomorphic Vocoder for coding and decoding of speech

SYLLABUS

UNIT – I: Fundamentals of Digital Speech Processing: Anatomy & Physiology of Speech Organs, The process of Speech Production, Acoustic Phonetics, Articulatory Phonetics, The Acoustic Theory of Speech Production- Uniform lossless tube model, effect of losses in vocal tract, effect of radiation at lips, Digital models for speech signals.

UNIT – II: Time Domain Models for Speech Processing: Introduction- Window considerations, Short time energy and average magnitude Short time average zero crossing rate, Speech Vs Silence discrimination using energy and zero crossing, Pitch period estimation using a parallel processing approach, The short time autocorrelation function, The short time

average magnitude difference function, Pitch period estimation using the autocorrelation function.

UNIT – III: Linear Predictive Coding (LPC) Analysis: Basic principles of Linear Predictive Analysis: The Autocorrelation Method, The Covariance Method, Solution of LPC Equations: Cholesky Decomposition Solution for Covariance Method, Durbin's Recursive Solution for the Autocorrelation Equations, Comparison between the Methods of Solution of the LPC Analysis Equations, Applications of LPC Parameters: Pitch Detection using LPC Parameters, Formant Analysis using LPC Parameters.

UNIT -IV: Homomorphic Speech Processing: Introduction, Homomorphic Systems for Convolution: Properties of the Complex Cepstrum, Computational Considerations, The Complex Cepstrum of Speech, Pitch Detection, Formant Estimation, The Homomorphic Vocoder. Speech Enhancement: Nature of interfering sounds, Speech enhancement techniques: Single Microphone Approach: spectral subtraction, Enhancement by re-synthesis, Comb filter, Wiener filter, Multi microphone Approach.

UNIT - V: Automatic Speech & Speaker Recognition: Basic pattern recognition approaches, Parametric representation of speech, Evaluating the similarity of speech patterns, Isolated digit Recognition System, Continuous digit Recognition System. Hidden Markov Model (HMM) for Speech: Hidden Markov Model (HMM) for speech recognition, Viterbi algorithm, Training and testing using HMMS. Speaker Recognition: Recognition techniques, Features that distinguish speakers, Speaker Recognition Systems: Speaker Verification System, Speaker Identification System.

Text Books:

1. L.R. Rabiner and S. W. Schafer, "Digital Processing of Speech Signals", Pearson Education.
2. Douglas O'Shaughnessy, "Speech Communications: Human & Machine", 2nd Ed., Wiley India, 2000.
3. L.R Rabinar and R W Jhaung, "Digital Processing of Speech Signals", 1978, Pearson Education.

Reference Books:

1. Thomas F. Quateri, “Discrete Time Speech Signal Processing: Principles and Practice”, 1st Edition., PE.
2. Ben Gold & Nelson Morgan, “Speech & Audio Signal Processing”, 1st Edition, Wiley.

COMPUTER NETWORKS (PE)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
	Computer Networks	**4**			**30**	**70**	**100**	**3hrs**	**3**

Course Objectives:

- To describe how computer networks are organized with the concept of layered approach.
- To implement a simple LAN with hubs, bridges and switches.
- To analyze the contents in a given Data Link layer packet, based on the layer concept.
- To design logical sub-address blocks with a given address block.
- To describe how routing protocols work.

Course Outcomes:

CO 1: Understand the concepts of Network Topologies, structures, layers, physical layer Guided Transmission media and Multiplexing concepts.

CO 2: Understand how the Media Access control problem solved in a network using multiple access protocols.

CO 3: Detect and analyze the Datalink layer Framing, Error control Techniques and protocols in a network.

CO 4: Make use of the Network Layer routing algorithms, congestion control algorithms to perform better network communication.

CO 5: Analyze the internet Transport layer protocols and application layer services.

SYLLABUS

UNIT – I: Introduction: Uses of Computer Networks, Network Structure, Architectures, Services, Standardization, Functions of Various Network Layers, Network examples. Physical layer -Theoretical Basis for Data Communication, Transmission Media, Analog and Digital Transmission, Transmission and Switching ISDN.

UNIT – II: Medium Access Sub-layer: LAN, MAN, Protocol, ALOHA, IEEE Standard for 802 for LANs, Fiber Optic Networks, Satellite Networks.

UNIT – III: Data Link layer: Design Issues, Error Detection and Correction, Protocols and their Performance, Specifications and Examples.

UNIT -IV: Network layers: Design Considerations, Difference between Gateway, Ethernet Switch, Router, Hub, Repeater, Functions of Router, Congestion Control Internetworking and Examples, Details of IP addressing schemes, TCP/IP Protocol details.

UNIT – V: The Transport Layer: The Transport Service, Elements of Transport Protocols, The Internet Transport Protocols; UDP, The Internet Transport Protocols; TCP. The Application Layer -The Domain Name System, Electronic Mail, The World Wide Web.

Text Books:

1. Data Communications and Networking by Behrouz A. Forouzan, 2nd Edition, Tata McGraw Hill.

Reference Books:

1. Computer Networks, A. S. Tannenbaum, PHI – New Delhi.
2. Computer Networking Terminology Products and Standards, R. P. Suri and J. K. Jain, Tata McGraw Hill.

TV AND SATELLITE COMMUNICATION (PE)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
	TV and Satellite Communication	**4**			**30**	**70**	**100**	**3hrs**	**3**

Course Objectives:

- basic television system.
- With examples of Signal Transmission and Channel Bandwidth
- Television Receiver and Colour Television
- various concepts of satellite communication.

Course Outcomes:

CO 1: Analyze the concepts of basic television system.

CO 2: Illustrate examples of Signal Transmission and Channel Bandwidth.

CO 3: Understand the different television camera principles and receiver circuits.

CO 4: Infer Television Receiver and Colour Television.

CO 5: Infer various concepts of satellite communication.

SYLLABUS

UNIT – I: Basic Television System: Sound and Picture Transmission, the Scanning Process, Interlaced Scanning, Number of Scanning Lines, Vertical and Horizontal Resolution, Bandwidth of the Baseband Picture Signal. Composite - Video Signal, Video signal levels, Need for Synchronization, Details of Horizontal and Vertical Sync Pulses, Equalizing Pulses.

UNIT – II: Signal Transmission and Channel Bandwidth: AM and FM Channel Bandwidth, VSB Transmission, Complete Channel Bandwidth, Reception of Vestigial Sideband Transmission, Television Standards, Block Schematic study of a typical TV Transmitter.

UNIT -III: The TV Picture Tube: Monochrome Picture Tube, Picture Tube Characteristics and Picture Tube Control Circuits, Gamma Correction. Television Cameras: Principle of working and constructional details of Image Orthicon, Vidicon, Plumbicon and Silicon diode array Vidicon and Solid-state Image Scanners. Television Receiver: Block Schematic and Functional Requirements, VSB Correction. Vertical and Horizontal Deflection Circuits, E.H.T. Generation, Study of Video IF Amplifier Video Detector, Sound Channel Separation, Sync Separation Circuits.

UNIT – IV: Colour Television: Principles of Additive and Subtractive Colour Mixing, Chromaticity Diagram, Compatibility and Reverse Compatibility of Colour and Monochrome TV Requirements, Colour Signal Transmission, Bandwidth for Colour Signal Transmission, Sub-carrier Modulation of Chroma Signals, NTSC Encoding (Y, I, Q signals), PAL Encoding (Y, U, V signals), NTSC and PAL Decoders, Types of Colour TV Picture Tubes (Delta-gun, PIL and Trinitron Picture Tubes), Convergence Techniques.

UNIT – V: Satellite Communication: Orbital Aspects, Tracking and Control of Communication Satellites, Launch Vehicles, Propagation Characteristics: Attenuation and Noise, Frequency Bands, Satellite Transponders, Earth Station: Configuration, High Power Amplifiers, Antennas, LNA, Link Design, Multiple Access: FDMA, TDMA, CDMA, SPADE, INTELSATs, INSAT.

Text Books:

1. Global Navigation Satellite Systems with Essentials of Satellite Communications authored by G S Rao, Mc-Graw Hill Publication, New Delhi 2010
2. Monochrome and Colour Television, R. R. Gulati, Wiley Eastern.

Reference Books:

1. Television Engineering, A. M. Dhake, Tata - McGraw Hill.
2. Satellite Communication, D. C. Agarwal, Khanna Publishers.
3. Satellite Communication, T. Pratt and S. W. Bostian, John Wiley and Sons.

TRANSDUCERS AND SIGNAL CONDITIONERS (PE)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
	Transducers and Signal Conditioning	**4**			**30**	**70**	**100**	**3hrs**	**3**

Course Objectives:

- To understand the necessity and advantages of transducer.
- To learn the operation and applications of various transducer.
- To design and construct different transducers.
- To measure several parameters using transducers.

Course Outcomes:

- Understand study about the concepts of measurement, error and uncertainty, transducer classification, terminology, static and dynamic characteristics of transducers.
- Gain knowledge on working principle construction, operation, characteristics and features of different transducers.
- Understand the concepts of signal conversion and signal conditioning methods for different transducers.
- Understand the selection criteria of transducer for particular application and use the same for developing the applications.
- Design and understand the signal conditioning circuits.

SYLLABUS

UNIT – I: Introduction: Measurement systems, Basic electronic measuring system, Transduction principles, Classification of transducers, General transducers characteristics, Criteria for transducer selection.

UNIT – II: Resistive Transducers: Principles of operation, construction, theory, advantages and disadvantages, applications of Potentiometers, strain gauges, (metallic and semi-conductor type), Resistance Thermometer, Thermistors. Inductive Transducers: Types of Inductive transducer, Principles of operation, construction, Advantages & disadvantages and applications. Various variable Inductive Transducers, LVDT (Linear variable differential

transformer). Capacitive Transducers: Types of capacitive transducer, Principles of operation, construction, theory, advantages and disadvantages and applications, of capacitive transducers based upon familiar equation of capacitance.

UNIT – III: Active Transducers: Principle of operation, construction, theory, advantages and disadvantages and applications of following transducers: Thermocouple, Piezo-electric transducer, Magneto-strictive transducer, Hall effect transducer, Photo-voltaic transducer and electrochemical transducer.

UNIT - IV: Other Transducers: Optical transducers: photo-emissive, photo-conductive and Photovoltaic cells, Digital Transducers: Optical encoder, Shaft encoder. Feedback fundamentals, introduction to Inverse transducer. Elastic Transducers: Spring bellows, diaphragm, bourdon tube – their special features and application.

UNIT – V: Signal Conditioning: Concept of signal conditioning, Applications of AC/DC Bridges, Application of Op-amp circuits used in instrumentation, Instrumentation amplifiers, Interference, grounding, and shielding.

Text Books:

1. Murty DVS, “Transducers & Instrumentation”, Prentice Hall of India
2. Sawhney AK, “Electrical and Electronics Measurements and Instrumentation,” Dhanpat Rai and Sons
3. Kalsi HS, “Electronic Instrumentation,” Tata McGraw Hill

4. Patranabis D, “Sensors and Transducers,” Prentice Hall of India 5. Doebelin EO, “Measurement Systems: Application and Design,” Tata McGraw Hill

Reference Books:

1. H.K.P. Neubert Instrument Transducers Oxford University Press: (Second edition).

VLSI DESIGN (PE)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
	VLSI Design	**4**			**30**	**70**	**100**	**3hrs**	**3**

Course Objectives:

- VLSI technology
- circuit design processes with stick diagrams and layout diagrams.
- VLSI circuit
- scaling of MOS circuits with sub system design and layout

Course Outcomes:

CO 1: Describe the basic concepts of VLSI technology.

CO 2: Demonstrate circuit design processes with stick diagrams and layout diagrams.

CO 3: Understand the aspects of design tools, testability and practical design for guidelines.

CO 4: Demonstrate basic circuit concepts.

CO 5: Summarize scaling of MOS circuits with sub system design and layout.

SYLLABUS

UNIT - I: Review of microelectronics and an introduction to MOS technology: Introduction to IC technology, MOS and related VLSI technology, NMOS, CMOS, BiCMOS Technologies, Thermal aspects of processing, Production of E beam marks.

UNIT – II: MOS and BiCMOS circuit design processes: MOS layers, Stick diagrams, Design rules, and layout, 2 & 1.2 micro meter CMOS rules, Layout diagrams, Symbolic diagram. Basic Circuit concepts - Sheet resistance, Area capacitances of layers, Delay unit, Wiring Capacitances, Choice of layers. Scaling of MOS Circuits -Scaling models, Scaling function for device parameters, Limitations of scaling.

UNIT – III: Sub system design and Layout: Architectural issues, Switch logic, Examples of Structural design (Combinational logic). Sub system design process Design of ALU subsystem,

some commonly used storage elements, Aspects of design tools, Design for testability, Practical design for test guidelines, Built in self-test, CMOS project-an incrementor / decrementer, a comparator for two n-bit numbers. Ultra-fast systems, Technology development, MOSFET based design.

UNIT – IV: Introduction to Embedded Systems: Embedded Systems, Processor Embedded into a System, Embedded Hardware Units and Devices in a System, Embedded Software in a System, Examples of Embedded Systems, Embedded Systems on Chip, Complex Systems Design and Processors, Design Process in Embedded System, Formalization of System Design, Design Process and Design Examples, Classification of Embedded Systems, Skills required for an Embedded System Designer.

UNIT – V: Embedded Software Development Process and Tools: Introduction to Embedded Software Development Process and Tools, Host and Target Machines, Linking and Locating Software, Getting Embedded Software into the Target System, Issues in Hardware-Software Design and Co-design

Text books:

1. Basic VLSI Design by Douglas A, Pucknell, Kamran Eshraghian, Prentice-Hall, l996, 3rd Edition.
2. Embedded Systems Architecture, Programming and Design, second edition by Raj Kamal, Tata McGraw Hill Publication (Chapter 1, Chapter 13)

Reference Books:

1. Mead, C.A and Conway, LA, “Introduction to VLSI Systems”, Addison-Wesley, Reading, Massachusetts, l980.

DIGITAL IMAGE PROCESSING (PE)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
	Digital Image Processing	**4**			**30**	**70**	**100**	**3hrs**	**3**

Course Objectives:

- To familiarize with basic concepts of digital image processing and different image transforms
- To learn various image processing techniques like image enhancement, restoration, segmentation and compression
- To understand color fundamentals and different color models.
- To understand wavelets and morphological image processing.

Course Outcomes:

CO 1: Illustrate the fundamental concepts of Digital Image Processing and different image transforms.

CO 2: Analyze the effect of spatial and frequency domain filtering of images.

CO 3: Evaluate the methodologies for image restoration and reconstruction.

CO 4: Compare the different color image processing techniques.

CO 5: Categorize different image segmentation techniques and morphological image operations.

SYLLABUS

UNIT – I: Introduction: Origins of digital image processing, uses digital image processing, fundamental steps in digital image processing, components of an image processing system, digital image fundamentals, Elements of visual perception, light and electromagnetic spectrum, imaging sensing and acquisition, image sampling and quantization. Some basic relationships between pixels, and introduction to the mathematical tools used in digital image processing.

UNIT – II: Image Transforms: Need for image transforms, Spatial Frequencies in image processing, introduction to Fourier transform, discrete Fourier transform, fast Fourier transform and its algorithm, properties of Fourier transform. Discrete sine transforms. Walsh Transform. Hadamard transform, Haar Transform. Slant transforms, SVD and KL Transforms or Hotelling Transform

UNIT -III: Intensity Transformations and Spatial Filtering: Background, some basic intensity transformation functions, histogram processing, fundamentals of spatial filtering, smoothing spatial filters, sharpening spatial filters, combining spatial enhancement methods, using fuzzy techniques for intensity transformations and spatial filtering. Filtering in the frequency domain, Preliminary concepts, Sampling and the Fourier transform of sampled functions, the discrete Fourier transform (DFT) of one variable, Extension to functions of two variables, some properties of the 2-D Discrete Fourier transform. The Basic of filtering in the frequency domain, image smoothing using frequency domain filters, Selective filtering, Implementation.

UNIT – IV: Image restoration and Reconstruction: A model of the image degradation /Restoration process, Noise models, restoration in the presence of noise only-Spatial Filtering, Periodic Noise Reduction by frequency domain filtering, Linear, Position –Invariant Degradations, Estimation the degradation function, Inverse filtering, Minimum mean square error (Wiener) filtering, constrained least squares filtering, geometric mean filtering, image reconstruction from projections. Image compression: Fundamentals, various compression methods-coding techniques, digital image water marking. Image segmentation: Fundamentals, point, line, edge detection thresholding, region –based segmentation, segmentation using Morphological watersheds, the use of motion in segmentation. Color image processing, Color fundamentals, color models, pseudo color image processing, basic of full color image processing, color transformations, smoothing and sharpening. Image segmentation based on color, noise in color images, color image compression.

UNIT – V: Wavelets and Multi-resolution Processing: image pyramids, sub band coding & Haar transforms multi resolution expressions, wavelet transforms in one dimension. The fast wavelets transform, wavelet transforms in two dimensions, wavelet packets. Morphological image processing: preliminaries Erosion and dilation, opening and closing, the Hit-or-miss transformation, some Basic Morphological algorithms, grey –scale morphology

Text Books:

1. R. C. Gonzalez and R. E. Woods, Digital Image Processing, 3rd edition, Prentice Hall, 2008.
2. R. C. Gonzalez, R. E. Woods and Steven L. Eddins, Digital Image Processing Using MATLAB, 2rd edition, Prentice Hall, 2009.
3. Anil K.Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India, 9th Edition, Indian Reprint, 2002.
4. Jayaraman, S. Esakkirajan, and T. Veerakumar, Digital Image Processing, Tata McGraw-Hill Education.

FIBER-OPTIC COMMUNICATIONS (PE)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
	Fiber Optic Communication	**4**			**30**	**70**	**100**	**3hrs**	**3**

Course Objectives:

- To realize the significance of optical fibre communications.
- To understand the construction and characteristics of optical fibre cable.
- To develop the knowledge of optical signal sources and power launching.
- To identify and understand the operation of various optical detectors.
- To understand the design of optical systems and WDM.

Course Outcomes:

CO 1: Understand and analyze the constructional parameters of optical fibres.

CO 2: Estimate the losses due to attenuation, absorption, scattering and bending.

CO 3: Compare various optical detectors and choose suitable one for different applications.

CO 4: Understand different optical sources and detectors.

CO 5: Be able to design an optical system.

SYLLABUS

UNIT – I: Overview of Optical Fiber Communication: - Historical development, The general system, Advantages of Optical Fiber Communications, Optical Fiber Wave Guides- Introduction, Ray Theory Transmission, Total Internal Reflection, Acceptance Angle, Numerical Aperture, Skew Rays, Cylindrical Fibers- Modes, V number, Mode Coupling, Step Index Fibers, Graded Index Fibers. Single Mode Fibers- Cut Off Wavelength, Mode Field Diameter, Effective Refractive Index, Fiber Materials Glass, Halide, Active Glass, Chalgenide Glass, Plastic Optical Fibers.

UNIT – II: Signal Distortion in Optical Fibers: Attenuation, Absorption, Scattering and Bending Losses, Core and Cladding Losses, Information Capacity Determination, Group Delay, Types of Dispersion - Material Dispersion, Wave-Guide Dispersion, Polarization Mode

Dispersion, Intermodal Dispersion, Pulse Broadening, Optical Fiber Connectors- Connector Types, Single Mode Fiber Connectors, Connector Return Loss.

UNIT – III: Fiber Splicing: Splicing Techniques, Splicing Single Mode Fibers, Fiber Alignment and Joint Loss- Multimode Fiber Joints, Single Mode Fiber Joints. Optical Sources- LEDs, Structures, Materials, Quantum Efficiency, Power, Modulation, Power Bandwidth Product, Injection Laser Diodes- Modes, Threshold Conditions, External Quantum Efficiency, Laser Diode Rate Equations, Resonant Frequencies, Reliability of LED & ILD.

Source to Fiber Power Launching: - Output Patterns, Power Coupling, Power Launching, Equilibrium Numerical Aperture, Laser Diode to Fiber Coupling

UNIT -IV: Optical Detectors: Physical Principles of PIN and APD, Detector Response Time, Temperature Effect on Avalanche Gain, Comparison of Photo Detectors, Optical Receiver Operation- Fundamental Receiver Operation, Digital Signal Transmission, Error Sources, Receiver Configuration, Digital Receiver Performance, Probability of Error, Quantum Limit, Analog Receivers.

UNIT – V: Optical System Design: Considerations, Component Choice, Multiplexing, Point-to- Point Links, System Considerations, Link Power Budget with Examples, Overall Fiber Dispersion in Multi-Mode and Single Mode Fibers, Rise Time Budget with Examples. Transmission Distance, Line Coding in Optical Links, WDM, Necessity, Principles, Types of WDM, Measurement of Attenuation and Dispersion, Eye Pattern.

Text Books:

1. Optical Fiber Communications – Gerd Keiser, MC GRAW HILL EDUCATION, 4th Edition, 2008.

2. Optical Fiber Communications – John M. Senior, Pearson Education, 3rd Edition, 2009.

Reference Books:

1. Fiber Optic Communications – D.K. Mynbaev , S.C. Gupta and Lowell L. Scheiner, Pearson Education, 2005.

2. Text Book on Optical Fibre Communication and its Applications – S.C.Gupta, PHI, 2005.
3. Fiber Optic Communication Systems – Govind P. Agarwal, John Wiley, 3rd Ediition, 2004.
4. Introduction to Fiber Optics by Donald J.Sterling Jr. – Cengage learning, 2004.

ADVANCED MICROPROCESSORS (PE)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
	Advanced Microprocessor	**4**			**30**	**70**	**100**	**3hrs**	**3**

Course Objectives:

- To describe the function of the microprocessor and detail its basic operation.
- To understand the concepts of advanced architecture in the microprocessors.
- To describe the function and purpose of each program-visible registers in microprocessor.
- To interface memory devices with 80186,80286,80386 and 80486.

Course Outcomes:

CO 1: Understand the functionality of 80186,80286,80386 and 80486 architecture to design advanced microprocessors systems

CO 2: Analyze the Performance of RISC and CISC architectures.

CO 3: Interface the advanced processors with Memory.

CO 4: Understand timing and instruction cycle timings.

CO 5: Summarize the interfacing rules of different peripherals with advanced microprocessor.

SYLLABUS

UNIT – I: 80386 Architecture: Instruction set - Addressing modes - Real mode - Protected mode - 80386 Architecture - Address segmentation - Paging - Segment registers. Basic 486 Architecture - 486 memory system and memory management - Features of Pentium memory and I/O systems - Pentium memory management - Introduction to Pentium Pro features.

UNIT -II: High Performance CISC Architecture – Pentium: CPU Architecture- Bus Operations – Pipelining – Brach predication – floating point unit- Operating Modes –Paging – Multitasking – Exception and Interrupts – Instruction set – addressing modes – Programming

the Pentium processor.

UNIT – III: High Performancerisc RISC Architecture – ARM Arcon RISC Machine – Architectural Inheritance – Core & Architectures - Registers – Pipeline - Interrupts – ARM organization - ARM processor family – Co-processors - ARM instruction set- Thumb Instruction set.

UNIT – IV: Instruction cycle timings: The ARM Programmer's model – ARM Development tools – ARM Assembly Language Programming – Optimizing ARM Assembly Code – Optimized Primitives.

UNIT-V: Memory Interface: Memory Devices, Address Decoding, 8086, 80186,80286,80386SX Memory Interface, 80286DX and 80486 Memory Interface, Pentium through core2 Memory Interface

Reference Books:

1. The Intel Microprocessors 8086 / 8088, 80186, 80188, 80286, 80386, 80486, Pentium and Pentium – Pro Processor Architecture, Programming and Interface by Barray B. Berry, 4th Edition, PHI.
2. Microprocessors Principles and Applications by Gilmore, 2nd Edition, TMH.
3. Microprocessors and Interfacing Programming and Applications by Douglas V. Hall, Mc Graw Hill.
4. Microprocessors / Microcomputers Architecture, Software and Systems by A.J. Khambata, John Wiely & Sons.
5. Advanced Microprocessors by Daniel Tabak, Mc Graw Hill, 1995.

ANNEXURE -II

OPEN ELECTIVES (OE)

1. Low Power VLSI Design
2. Wireless Sensor Networks
3. Smart Antenna Systems
4. Artificial Neural Networks
5. Embedded System Design
6. Bio-Medical Instrumentation
7. FPGA Design
8. DSP Processors and Architectures
9. Information Theory and Coding
10. Financial Management for Engineers
11. Data Science
12. Artificial Intelligence and Machine Learning

LOW POWER VLSI DESIGN (OE)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
	Low Power VLSI Design	**4**			**30**	**70**	**100**	**3hrs**	**3**

Course Objectives:

- This course addresses a profound analysis on the development of the CMOS & Bi-CMOS digital circuits for a low voltage low power environment
- To study the concepts of device behavior and modeling
- To study the concepts of low voltage, low power logic circuits

Course Outcomes:

CO 1: Capability to recognize advanced issues in VLSI systems, specific to the deep-submicron silicon technologies.

CO 2: Students able to understand deep submicron CMOS technology and digital CMOS design styles.

CO 3: To design chips used for battery-powered systems and high-performance circuits

CO 4: Explain the equations, approximations and techniques available for deriving a device model with specified properties

CO 5: Explore and improvise on the latest techniques used for designing power-efficient logic gates, latches, and flip-flops.

SYLLABUS

UNIT – I: Low Power Design, An Over View: Introduction to low- voltage low power design, limitations, Silicon-on-Insulator.

UNIT – II: MOS/ Bi CMOS PROCESSES: Bi CMOS processes, Integration and Isolation considerations, Integrated Analog/Digital CMOS Process. Deep submicron processes, SOI CMOS, lateral BJT on SOI, future trends and directions of CMOS/ Bi CMOS processes.

UNIT – III: Device Behavior and Modeling: Advanced MOSFET models, limitations of MOSFET models, bipolar models. Analytical and Experimental characterization of sub-half

micron MOS devices, MOSFET in a Hybrid mode environment.

UNIT – IV: CMOS and Bi-CMOS Logic Gates: Conventional CMOS and Bi CMOS logic gates. Performance evaluation.

UNIT – V: Low- Voltage Low Power Logic Circuits: Comparison of advanced BiCMOS Digital circuits. ESD-free Bi CMOS, Digital circuit operation and comparative Evaluation. Low Power Latches and Flip Flops, Evolution of Latches and Flip flops-quality measures for latches and Flip flops, Design perspective.

Text Books:

1. CMOS/Bi CMOS ULSI low voltage, low power by Yeo Rofail / Gohl (3 Authors)-Pearson Education Asia 1st Indian reprint,2002

Reference Books:

1. Digital Integrated circuits, J.Rabaey PH. N.J 1996
2. CMOS Digital ICs sung-moKang and yusufleblebici 3rd edition TMH2003 (chapter 11)
3. VLSI DSP systems, Parhi, John Wiley & sons, 2003 (chapter 17)
4. IEEE Trans Electron Devices, IEEE J.Solid State Circuits, and other National and International Conferences and Symposia.

WIRELESS SENSORS & NETWORKS (OE)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
	Wireless Sensors & Networks	**4**			**30**	**70**	**100**	**3hrs**	**3**

Course Objectives:

- To understand the WSN node Architecture and Network Architecture.
- To identify the Wireless Sensor Network Platforms.
- To design and develop wireless sensor node.
- To learn the concepts of layered protocols for WSN.

Course Outcomes:

CO 1: Understand the fundamental Concepts, applications and architectures of wireless sensor networks

CO 2: Categorize the various network topologies.

CO 3: Realize the MAC Protocols for Wireless Sensor Networks.

CO 4: Describe routing protocols for ad hoc wireless networks with respect to TCP design issues.

CO 5: Outline the transport layer and security protocols for WSN and differentiate various sensor network platforms and tools.

SYLLABUS

UNIT – I: Overview of Wireless Sensor Networks: Key definitions of sensor networks, Advantages of sensor Networks, Unique constraints a challenge, Driving Applications, Enabling Technologies for Wireless Sensor Networks. Architectures - Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems and Execution Environments, Network Architecture -Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.

UNIT – II: Networking Technologies: Physical Layer and Transceiver Design Considerations, Personal area networks (PANs), hidden node and exposed node problem,

Topologies of PANs, MANETs, WANETs.MAC Protocols for Wireless Sensor Networks - Issues in Designing a MAC protocol for Ad Hoc Wireless Networks, Design goals of a MAC Protocol for Ad-Hoc Wireless Networks, Classifications of MAC Protocols, Contention - Based Protocols, Contention – Based Protocols with reservation Mechanisms, Contention – Based MAC Protocols with Scheduling Mechanisms, MAC Protocols that use Directional Antennas, Other MAC Protocols.

UNIT – III: Routing Protocols: Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classification of Routing Protocols, Table –Driven Routing Protocols, On – Demand Routing Protocols, Hybrid Routing Protocols, Routing Protocols with Efficient Flooding Mechanisms, Hierarchical Routing Protocols, Power – Aware Routing Protocols, Proactive Routing.

UNIT – IV: Transport Layer and Security Protocols: Introduction, Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks, Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer Solutions, TCP Over Ad Hoc Wireless Networks, Other Transport Layer Protocol for Ad Hoc Wireless Networks.

UNIT – V: Security in WSNs: Security in Ad Hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad Hoc Wireless Networks. Sensor Network Platforms and Tools - Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node level Simulators, State-centric programming. Applications of WSN -Ultra-wide band radio communication, Wireless fidelity systems. Future directions, home automation, smart metering Applications.

Text Books:

1. Ad Hoc Wireless Networks: Architectures and Protocols - C. Siva Ram Murthy and B.S.Manoj, 2004, PHI
2. Wireless Ad- hoc and Sensor Networks: Protocols, Performance and Control – Jagannathan Sarangapani, CRC Press
3. Holger Karl & Andreas Willig, “Protocols and Architectures for Wireless Sensor Networks", John Wiley, 2005.

Reference Books:

a. Kazem Sohraby, Daniel Minoli, &Taieb Znati, “Wireless Sensor Networks- Technology, Protocols, and Applications”, John Wiley, 2007.
2. Feng Zhao & Leonidas J. Guibas, “Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.
3. Ad- Hoc Mobile Wireless Networks: Protocols & Systems, C.K. Toh ,1 ed. Pearson Education.
4. Wireless Sensor Networks - C. S. Raghavendra, Krishna M. Sivalingam, 2004, Springer.
5. Wireless Sensor Networks – S Anandamurugan, Lakshmi Publications.

SMART ANTENNAS SYSTEMS (OE)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
	Smart Antenna Systems	**4**			**30**	**70**	**100**	**3hrs**	**3**

Course Objectives:

- To know the basic concepts on antenna.
- To know the performance of an antenna array.
- Learning self-adaptive procedure to extract the desired signal.
- Design of smart antenna system.

Course Outcomes:

CO 1: Understand antenna theory and application of signal processing in smart antennas.

CO 2: Analyze DOA estimation methods.

CO 3: Learn techniques of developing MIMO antennas.

CO 4: Understand different beam forming techniques.

CO 5: Analyze space time processing techniques.

Syllabus

UNIT – I: Smart Antennas: Introduction, Need for Smart Antennas, Overview, Smart Antenna Configurations, Switched-Beam Antennas, Adaptive Antenna Approach, Space Division Multiple Access (SDMA), Architecture of a Smart Antenna System, Receiver, Transmitter, Benefits and Drawbacks, Basic Principles, Mutual Coupling Effects.

UNIT – II: DOA Estimation Fundamentals: Introduction, Array Response Vector, Received Signal Model, Subspace-Based Data Model, Signal Autocovariance, Conventional DOA Estimation Methods, Conventional Beamforming Method, Capon's Minimum Variance Method, Subspace Approach to DOA Estimation, MUSIC Algorithm, ESPRIT Algorithm, Uniqueness of DOA Estimates.

UNIT – III: Beam Forming Fundamentals: Classical Beam former, Statistically Optimum Beamforming Weight Vectors, Maximum SNR Beam former, Multiple Sidelobe Canceller and Maximum, SINR Beam former, Minimum Mean Square Error (MMSE), Direct Matrix

Inversion (DMI), Linearly Constrained Minimum Variance (LCMV), Adaptive Algorithms for Beamforming

UNIT – IV: Integration and Simulation of Smart Antennas: Overview, Antenna Design, Mutual Coupling, Adaptive Signal Processing Algorithms, DOA, Adaptive Beam forming, Beam forming and Diversity Combining for Rayleigh-Fading, Channel, Trellis-Coded Modulation (TCM) for Adaptive Arrays, Smart Antenna Systems for Mobile Adhoc Networks (MANETs), Protocol, Simulations, Discussion.

UNIT – V: Space–Time Processing: Introduction, Discrete Space–Time Channel and Signal Models, Space– Time Beamforming, Inter symbol and Co-Channel Suppression, Space–Time Processing for DSCDMA, Capacity, and Data Rates in MIMO Systems, Discussion.

Text Books:

1. Constantine A. Balanis & Panayiotis I. Ioannides, "Introduction to Smart Antennas", Morgan & Claypool Publishers' series-2007
2. Joseph C. Liberti Jr., Theodore S Rappaport, "Smart Antennas for Wireless CommunicationsIS-95 and Third Generation CDMA Applications", PTR – PH publishers, 1st Edition, 1989.

Reference Books:

1. T.S Rappaport, "Smart Antennas Adaptive Arrays Algorithms and Wireless Position Location", IEEE press 1998, PTR – PH publishers 1999.
2. Lal Chand Godara, "Smart Antennas", CRC Press, LLC-20.

ARTIFICIAL NEURAL NETWORKS (OE)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
	Artificial Neural Networks	**4**			**30**	**70**	**100**	**3hrs**	**3**

Course Objectives:

- To provide an insight into the basic concepts.
- To understand the artificial intelligence as representation and search and its applications representation and inference.
- Situations and machine learning.
- Convolution Neural networks and Recursive Neural networks.
- Different neural and synaptic dynamics.

Course Outcomes:

CO 1: Understand the concepts Neural Networks based on learning methods.

CO 2: Apply knowledge on Rosenblatt's perceptron.

CO 3: Understand radical basis function networks and Hopfield networks.

CO 4: Analyze CNN and recursive neural networks.

CO 5: Evaluate the concepts of Reinforcement learning.

SYLLABUS

UNIT – I: Introduction to Neural Networks: Architecture based classification of Neural Networks. Classification of Neural Networks based on learning methods. Activation functions and Loss functions. Factors to be considered for choice of type of Neural Network. Introduction to hardware requirements for implementation of Neural Networks.

UNIT – II: Rosenblatt's perceptron model: Rosenblatt's perceptron convergence theorem. Back Propagation Method. Back propagation learning algorithm for multilayer feed forward Neural Network. Factors affecting back propagation-based training of a Neural Network.

UNIT – III: Radial basis function networks: Generalized regularization theory. Neural Network models with Hebbian learning. Introduction to Hopfield networks. Recurrent Neural Network models. Universal approximation theorem. Backpropagation through time. Real time recurrent learning. Long short-term memory.

UNIT -IV: Convolutional Neural Networks: Variants of the basic convolution function. Convolution algorithms. Recursive Neural Networks. Greedy layer-wise pretraining. Transfer learning. Structured probabilistic models for deep learning. Convolutional Boltzmann machines.

UNIT -V: Model based calculation of reward in Reinforcement learning: Markov decision process. Bellman's optimality criteria. Policy iteration. Value iteration. Q-learning. Model free Reinforcement learning. Deep reinforcement learning. Generative adversarial networks.

Text Books:

1. S. O. Haykin. Neural Networks & Learning Machines. 3rd Ed. Pearson. 2019

Reference Books:

1. S. J. Russell and P. Norvig. Artificial Intelligence: A Modern Approach. 3rd Ed. Pearson. 2016.

2. Charu C. Aggarwal. Neural Networks and Deep Learning: A Textbook. Springer. 2018.

3. I. Goodfellow, Y. Bengio, A. Courville, F. Bach. Deep Learning (Adaptive Computation and Machine Learning series). MIT Press. 2016

4. S. O. Haykin. Neural Networks: A comprehensive foundation. 2nd Ed. Pearson. 1997

EMBEDDED SYSTEM DESIGN (OE)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
	Embedded System Design	**4**			**30**	**70**	**100**	**3hrs**	**3**

Course Objectives:

- To introduce the Building Blocks of Embedded System and Educate in Various Embedded Development Strategies.
- To Introduce Bus Communication in processors, Input/output interfacing and to impart knowledge in various processor scheduling algorithms.
- To introduce Basics of Real time operating system and example tutorials to discuss on real time operating system tool
- To provide clear understanding about the role of firmware, operating systems in correlation with hardware systems.

Course Outcomes:

CO 1: Acquire a basic knowledge about fundamentals of microcontroller and knowledge about programming and system control to perform a specific task.

CO 2: Acquire knowledge about devices and buses used in embedded networking, and develop programming skills in embedded systems for various applications.

CO 3: Understand the concepts of memory interface, onboard external communication interfaces and design Procedure for Embedded Firmware.

CO 4: Expected to visualize the role of Real time Operating Systems in Embedded Systems.

CO 5: Expected to evaluate the Correlation between task synchronization and latency issue.

SYLLABUS

UNIT – I: Introduction to Embedded Systems: Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems. Typical Embedded System - Core of the Embedded System: General

Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS).

UNIT -II: Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

UNIT – III: Embedded Firmware: Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

UNIT -IV: RTOS Based Embedded System Design: Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multi-processing and Multitasking, Task Scheduling.

UNIT – V: Task Communication: Shared Memory, Message Passing, Remote Procedure Calland Sockets, Task Synchronization: Task Communication / Synchronization Issues, Task Synchronization Techniques, Device Drivers, How to Choose an RTOS.

Text Books:

1. Introduction to Embedded Systems-Shibu K.V, McGrawHill.

Reference Books:

1. Embedded Systems-RajKamal, MCGRAWHILLEDUCATION.
2. Embedded System Design-Frank Vahid, Tony Givargis, John Wiley.
3. Embedded Systems–Lyla, Pearson, 2013
4. An Embedded Software Primer- David E.Simon, Pearson Education.

BIO MEDICAL INSTRUMENTATION (OE)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
	Bio Medical Instrumentation	**4**			**30**	**70**	**100**	**3hrs**	**3**

Course Objectives:

- To know the sources of Bio-electric potentials and Electrodes.
- To analyze the cardiovascular &Respiratory systems and its related measurements.
- To understand the various techniques for electromagnetic compatibility.
- To acquire knowledge of electronics in clinical laboratory and therapeutic area.

Course Outcomes:

CO 1: Understand the origin of bio-potentials and role of its electrodes.

CO 2: Elucidate the cardiovascular system and its measurements.

CO 3: Develop a thorough understanding on principles of Patient Care Monitory and Measurements in Respiratory System.

CO 4: Outline the concepts of Bio telemetry and Instrumentation for the clinical laboratory.

CO 5: Summarize the application of Electronics in diagnostics and therapeutic area.

SYLLABUS

UNIT – I: Sources of Bioelectric potentials: Sources of Bioelectric potentials and Electrodes Resisting and Action Potentials, Propagation of Action Potentials, The Bioelectric Potentials Electrode theory, Bio Potential Electrodes, Biochemical Transducers.

UNIT – II: The Cardiovascular System: The Cardiovascular System and Cardiovascular Measurements, The Heart and Cardiovascular System, The Heart, Blood Pressure, Characteristics of Blood Flow, Heart Sounds Electrocardiography, Measurement of Blood Pressure, Measurement of Blood Flow and Cardiac output, Plethysmography, Measurement of Heart Sounds,

UNIT – III: Patient Care and Monitoring: Patient Care & Monitory and Measurements in Respiratory System The elements of Intensive Care Monitory, Diagnosis, Calibration and repairability of Patient Monitoring equipment, other instrumentation for monitoring patients, pace makers,

defibrillators The Physiology of respiratory system, tests and instrumentation for mechanics of breathing, respiratory theory equipment.

UNIT – IV: Biotelemetry: Bio telemetry and Instrumentation for the clinical laboratory Introduction to biotelemetry, physiological parameters adaptable to biotelemetry, the components of biotelemetry system, implantable units, applications of telemetry in patient care the blood, tests on blood cells, chemical test, automation of chemical tests

UNIT – V: X-Ray and Radioisotope Instrumentation: X – ray and radioisotope instrumentation and electrical safety of medical equipment. Generation of Ionizing radiation, instrumentation for diagnostic X – rays, special techniques, instrumentation for the medical use of radioisotopes, radiation therapy. Physiological effects of electrical current, shock Hazards from electrical equipment, Methods of accident prevention

Text Book:

1. Biomedical Instrumentation and Measurements – C. Cromwell, F.J. Weibell, E.A. Pfeiffer Pearson education.

FPGA DESIGN (OE)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
	FPGA Design	**4**			**30**	**70**	**100**	**3hrs**	**3**

Course Objectives:

- To prepare the student to be an entry-level industrial standard FPGA designer.
- To give the student an understanding of issues and tools related to FPGA design and implementation.
- To give the student an understanding of basics of System on Chip and Platform based design.
- To learn and use design flow for using FPGA and using FPGA programming to design practical circuits.

Course Outcomes:

CO 1: Be able to completely understand FPGA design flow and the building blocks of commercially available FPGA/CPLDs.

CO 2: Be able to create circuits that realize specified digital functions and to identify logic and technology-specific parameters to control the functionality, timing, power, and parasitic effects.

CO 3: Develop VHDL/Verilog models and synthesize targeting for Vertex, Spartan FPGAs.

CO 4: Develop parameterized library cells and implement system designs using parameterized cells.

CO 5 Understand the concepts of routing in FPGA and analyze different routing strategies and designing of a system having a set of objective criteria & design constraints.

SYLLABUS

UNIT – I: Introduction to FPGAs: Evolution of programmable devices, FPGA Design flow, Applications of FPGA.

UNIT – II: Design Examples Using PLDs: Design of Universal block, Memory, Floating point multiplier, Barrel shifter.

UNIT – III: FPGAs/CPLDs: Programming Technologies, commercially available FPGAs, Xilinx's Vertex and Spartan, Actel's FPGA, Altera's FPGA/CPLD.

UNIT -IV: Building blocks of FPGAs/CPLDs: Configurable Logic block functionality, Routing structures, Input/output Block, Impact of logic block functionality on FPGA performance, Model for measuring delay.

UNIT - V: Routing Architectures: Routing terminology, general strategy for routing in FPGAs, routing for row – based FPGAs, introduction to segmented channel routing, routing for symmetrical FPGAs, example of routing in a symmetrical FPGA, general approach to routing in symmetrical FPGAs, independence from FPGA routing architectures, FPGA routing structures. FPGA architectural assumptions, the logic block, the connection block, connection block topology, the switch block, switch block topology, architectural assumptions for the FPGA

Text Books:

1. John V. Old Field, Richrad C. Dorf, Field Programmable Gate Arrays, Wiley, 2008.

2. Data sheets of Artix-7, Kintex-7, Virtex-7.

3. Stephen D. Brown, Robert J. Francis, Jonathan Rose, Zvonko G. Vranesic, Field Programmable Gate Arrays, 2nd Edition, Springer, 1992.

DSP PROCESSORS & ARCHITECTURES (OE)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
	DSP Processor & Architecture	**4**			**30**	**70**	**100**	**3hrs**	**3**

Course Objectives:

- To learn the architecture, addressing modes of DSP processors.
- To interface the serial converters to a DSP device
- To give an exposure to the various fixed point & a floating point DSP architectures and to develop applications using these processors.
- To know different basic DSP algorithms.

Course Outcomes:

CO 1: Understand the concepts of DSP and numeric representations.

CO 2: Able to illustrate the architectural features of DSP devices.

CO 3: Knowledge about various addressing modes of DSP TMS320C54XX and determine various addressing modes and instructions of DSP processor.

CO 4: Understand the concepts of basic DSP algorithms and develops the skills for DSP programming.

CO 5: Analyzes the interfacing of serial and parallel communication devices to a DSP device.

SYLLABUS

UNIT – I: Introduction to Digital Signal Processing: Introduction, A Digital signal-processing system, the sampling process, Discrete time sequences Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation, Analysis and Design tool for DSP Systems MATLAB, DSP using MATLAB. Computational Accuracy in DSP Implementations -Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

UNIT – II: Architectures for Programmable DSP Devices and Execution: Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed Issues, Features for External interfacing, Hardware looping, Interrupts, Stacks, Relative Branch support, Pipelining and Performance, Pipeline Depth, Interlocking, Branching effects, Interrupt effects, Pipeline Programming models

UNIT – III: Programmable Digital Signal Processors: Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline Operation of TMS320C54XX Processors.

UNIT – IV: Implementations of Basic DSP Algorithms and FFT Algorithms: The Q-notation, FIR Filters, IIR Filters, Interpolation Filters, Decimation Filters, PID Controller, Adaptive Filters, 2-D Signal Processing, An FFT Algorithm for DFT Computation, A Butterfly Computation, Overflow and scaling, Bit-Reversed index generation, An 8-Point FFT implementation on the TMS320C54XX, Computation of the signal spectrum.

UNIT -V: Interfacing Memory And I/O Peripherals to Programmable DSP Devices: Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA). A Multichannel buffered serial port (McBSP), McBSP Programming, a CODEC interface circuit, CODEC programming, A CODEC-DSP interface example.

Text Books:

1. Digital Signal Processing – Avtar Singh and S. Srinivasan, Thomson Publications, 2004.
2. DSP Processor Fundamentals, Architectures & Features – Lapsley et al. S. Chand & Co, 2000.

Reference Books:

1. Digital Signal Processors, Architecture, Programming and Applications – B. Venkata Ramani and M.Bhaskar, TMH, 2004.
2. Digital Signal Processing – Jonatham Stein, John Wiley, 2005.

INFORMATION THEORY AND CODING (OE)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
	Information Theory and Coding	**4**			**30**	**70**	**100**	**3hrs**	**3**

Course Objectives:

- To provide an insight into the concept of information in the context of communication theory and its significance in the design of communication receivers.
- To explore in detail, the calculations of channel capacity to support error-free transmission and also, the most commonly used source coding and channel coding algorithms.
- Introduction to error-correcting codes. Types of error correcting codes and its applications
- To encourage and train to design coding schemes for data compression and error correction.

Course Outcomes:

CO 1: Overview of Probability Theory, significance of "Information" with respect to Information Theory. Derive equations for entropy, mutual information and channel capacity for all kinds of channels.

CO 2: Implement the various types of source coding algorithms and analyse their performance.

CO 3: Explain various methods of generating and detecting different types of error correcting codes.

CO 4: Understand the fundamentals of Field Theory and polynomial arithmetic, and design linear block codes and cyclic codes (encoding and decoding).

CO 5: Implement and decode a sequence at the receiver using Trellis decoder and Viterbi decoder.

SYLLABUS

UNIT – I: Information Theory: Information measure, Entropy and Information rate, Coding for a discrete memory less source, Predictive coding for sources with memory, Information transmission on discrete channels, Mutual information.

UNIT – II: Information Channels: Discrete channel capacity, coding for the binary symmetric channel, Continuous channels and system comparisons, continuous information, continuous channel capacity, Ideal communication system, system comparisons.

UNIT – III: Error Controlling Coding: Introduction, Examples of Error control coding, methods of Controlling Errors, Types of Errors, types of Codes, Linear Block Codes: matrix description of Linear Block Codes, Error detection & Correction capabilities of Linear Block Codes, Single error correction Hamming code, Table lookup Decoding using Standard Array.

UNIT – IV: Binary Cyclic Codes: Algebraic Structure of Cyclic Codes, Encoding using an (n-k) Bit Shift register, Syndrome Calculation, Error Detection and Correction

UNIT – V: Convolution Coding: Practical Convolution Encoder, Time Domain Approach, Transform Domain Approach, The Code Tree, Code Trellis, State Diagram, Decoding Methods of Convolution Codes, Sequential Decoding, Burst Error Detection and Correction Codes, Concatenated Block Codes, Turbo Codes.

Text Books:

1) Communication Systems,3/e, by A.B. Carlson, Mc. Graw Hill Publishers (for topic1)
2) Digital Communications by Simon Haykin, John Wiley & Sons (for topic 2).
3) Principles of Digital Communication, J. Das, S.K.Mullick, P. K. Chatterjee, Wiley, 1986- Technology &Engineering.
4) Information Theory and Coding, HariBhat, Ganesh Rao, Cengage, 2017.

Reference Books:

1) Principles of Digital Communications, Signal representation, Detection, Estimation &Information Coding by J Das, S.K. Mullick, P.K.Chatterjee, New Age Int. Ltd.
2) Principles of Communication Systems, Taub &Schilling, 2/e, TMH Publisher.

FINANCIAL MANAGEMENT FOR ENGINEERS (OE)

Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
	Financial Management for Engineers	**4**			**30**	**70**	**100**	**3hrs**	**3**

Objectives of this Course:

- To provide awareness and understanding of the ways finance helps in reaching business objectives.
- To familiarize with the form, content and analysis of financial statements and the accounting principles and techniques.
- To Identify signals pointing to deterioration in financial condition and analyze the reasons for variances between the actual and budgeted results
- To facilitate in the improvement of organizations' performance by pointing out the importance of cost control, breakeven and variance analysis.
- To equip with the ability to communicate comfortably with Financial Executives and discuss the financial performance of the organization effectively.

Outcomes of the Course:

CO 1: Ability to analyze financial statements.

CO 2: Understanding costs and methods to reduce them.

CO 3: Taking decisions regarding the price of the products services, or both.

CO 4: Understanding of capital budgeting and various capital budgeting techniques.

CO 5: Skill to practice different Budgeting Systems in organizations.

SYLLABUS

UNIT-I: Accounting concepts and systems - Elements of Financial Statements - trading, profit & loss Statement- Cash Flow Statements - Notes to Accounts - Profits vs. Cash Flows.

UNIT-II: Analysis of Financial Statements - Financial Analysis-Financial Ratios and their Interpretations covering: Profitability Ratios; Liquidity Ratios; Return on Capital Ratios; - Management of Working Capital: Capital and Its Components - Working Capital Cycle - Working Capital Financing.

UNIT-III: Management Decision Making: Cost concepts and its application in Decision Making - Types of cost – Direct& Indirect, Fixed& Variable - Cost Sheet - Cost Volume Profit Analysis - Understanding Cost behavior – Cost concepts and its application in Decision

Making - Relevance of Activity Based Costing - Marginal Costing - Make or Buy - Shut down or continue - Sell or process further - Domestic vs. Export Sales.

UNIT-IV: Budgets and Budgetary Control: Different types of Budgets (Departmental, Function based, Cash, Master) - Budgeting systems (ABC / ZBB / Rolling/ Incremental / Planning) - Variance Analysis - Capital Budgeting and Investment Appraisals - Meaning of Capital Budgeting - Relevance of Capital Budgeting - Techniques of Capital Budgeting - Payback Period - Accounting Rate of Return - Net Present Value - Internal Rate of Return - Discounted Payback Period.

UNIT-V: Means of Finance: Financial Instruments - Shares, Debentures, Derivatives - Share Capital Vs. Term Loans - Leasing - Financial Markets - Capital Markets - Stock Exchanges**.**

Suggested Books:

1. Finance for Non-Finance People by Sandeep Goal (2017), Publisher: Taylor and Francis.
2. Finance for Non-Finance Managers by B.K. Chatterjee (1988), Jaico Publishing House, Sold by Amazon.
3. Finance for Nonfinancial Managers: Finance for Small Business, Basic Finance Concepts (Accounts and Finance) by Murugesan Ramaswamy (2021), Repro Books-On-Demand.

DATA SCIENCE (OE)

Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
	Data Science	**4**			**30**	**70**	**100**	**3hrs**	**3**

COURSE OBJECTIVES: From the course the student will learn

- Knowledge and expertise to become a data scientist.
- Essential concepts of statistics and machine learning that are vital for data science;
- Significance of exploratory data analysis (EDA) in data science.
- Critically evaluate data visualizations presented on the dashboards.
- Suitability and limitations of tools and techniques related to data science process.

COURSE OUTCOMES: At the end of the course, student will be able to

CO 1: Analyze the fundamental concepts of data science, distinguish between various data science methods, algorithms and models used in business applications.

CO 2: Describe the steps involved in Data Science process and the technologies needed for a data scientist.

CO 3: Identify suitable ML techniques for data modeling and apply them for decision support and handle large datasets with distributed storage and processing system.

CO 4: Gives the concepts of appropriate tools for data collection, EDA and model building for specific types of data, Integrate functions, modules and packages to develop algorithms using built-in libraries and frameworks.

CO 5: Design and create eco-friendly applications using object-oriented programming concepts, and allows building a prototype application of Data Science as a case study.

SYLLABUS

UNIT I: Introduction to Data science, benefits and uses, facets of data, data science process in brief, big data ecosystem and data science. Data Science process: Overview, defining goals and creating project charter, retrieving data, cleansing, integrating and transforming data, exploratory analysis, model building, presenting findings and building applications on top of them.

Unit II: Applications of machine learning in Data science, role of ML in DS, Python tools like sklearn, modelling process for feature engineering, model selection, validation and prediction, types of ML, semi-supervised learning.Handling large data: problems and general techniques for handling large data, programming tips for dealing large data, case studies on DS projects for predicting malicious URLs, for building recommender systems.

UNIT III: NoSQL movement for handling Bigdata: Distributing data storage and processing with Hadoop framework, case study on risk assessment for loan sanctioning, ACID principle of relational databases, CAP theorem, base principle of NoSQL databases, types of NoSQL databases, case study on disease diagnosis and profiling.

UNIT IV: Tools and Applications of Data Science: Introducing Neo4j for dealing with graph databases, graph query language Cypher, Applications graph databases, Python libraries like nltk and SQLite for handling Text mining and analytics, case study on classifying Reddit posts.

UNIT V: Data Visualization and Prototype Application Development: Data Visualization options, crossfilter, the JavaScript Map Reduce library, creating an interactive dashboard with dc.js, Dashboard development tools, applying the DS process for respective engineering problem solving scenarios as a detailed case study.

Textbook:

1) Davy Cielen, Arno D.B.Meysman, and Mohamed Ali, "Introducing to Data Science using Python tools", Manning Publications Co, Dreamtech press, 2016.

2) Prateek Gupta, "Data Science with Jupyter" BPB publishers, 2019 for basics.

Reference Books:

1) Joel Grus, "Data Science from Scratch", OReilly, 2019.

2)Doing Data Science: Straight Talk from The Frontline, 1 st Edition, Cathy O'Neil and Rachel Schutt, O'Reilly, 2013.

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING (OE)

Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
	Artificial Intelligence and Machine Learning	**4**			**30**	**70**	**100**	**3hrs**	**3**

COURSE OBJECTIVES: From the course the student will learn

- Know user interfaces to improve human and AI interaction and decision making.
- Allows the students to develop AI skills.
- Introduce the concepts of expert systems and machine learning.
- To be able to apply machine learning algorithms to solve problems of moderate complexity.

COURSE OUTCOMES: At the end of the course, student will be able to

CO 1: Understanding Artificial Intelligence and different branches of Artificial Intelligence and demonstrate awareness of informed search and exploration methods.

CO 2: Explain the concepts of Knowledge representation and basic Predicate Representations, Scripts and Schematic Network.

CO 3: Design and development of expert systems and its applications and apply structured thinking to unstructured problems

CO 4: Learn algorithmic topics of machine learning and mathematically deep enough to introduce the required theory

CO 5: Learning different clustering systems and understanding the concepts of different supervised learning methods and Artificial Neural Networks.

SYLLABUS

UNIT – I: Introduction to Artificial Intelligence: Definitions of Artificial Intelligence, Artificial Intelligence Problems, Topics of Artificial Intelligence, Timelines of Artificial Intelligence, Production Systems, State Space Representation, Branches of Artificial Intelligence, Applications of Artificial Intelligence. Heuristic Search Techniques-generate-and-test, Hill climbing, Search techniques, Problem Reduction, Constraints Satisfaction, Means-ends Analysis.

UNIT – II: Knowledge Representation Structures: First- order Logic- Basic Predicate Representations, Conversion of WFF to Clause Form, Resolution, resolution Examples, issues with Resolution, Frames, Conceptual Dependency, Scripts, and Semantic Network.

UNIT -III: Reasoning: Types of Reasoning, Non- monotonic Inference Methods, Non-monotonic Reasoning, Truth Maintenance Systems, Reasoning with Fuzzy Logic, Rule- based Reasoning, Diagnosis Reasoning. Expert Systems-Characteristics of Expert System, Components of an Expert System, Expert System Development, Knowledge Engineering, Applications of Expert System, Case studies.

UNIT -IV: Learning: Types of Learning, Machine Learning, Intelligent Agents**.** Clustering-k-Means clustering, Fuzzy Clustering, Hierarchical Clustering, Cluster Similarity, Case Studies.

UNIT -V: Supervised Learning: Support Vector Machines, case-based Reasoning, Decision Trees- C4.5 Algorithm, ID3 Algorithm, Random Forest, ensemble Classifiers, and nearest neighborhood. Artificial Neural Nets – ANN Basics, ANN- Learning Process, Types of Networks, perceptron, RBF Networks, ANN Summary, Case Studies.

Text Book:

1. Artificial Intelligence and Machine Learning, by Vinod Chandra S.S and Anand Hareendran S, PHI publishers.

Reference books:

1. Artificial Intelligence by Elaine Rich, Kevin Knight, McGraw-Hill publishers.
2. Machine Learning: The Art and Science of Algorithms that Make Sense of Data by Peter Flach, Cambridge University Press.

ANNEXURE – III

HSS ELECTIVES

1. Industrial Management & Entrepreneurship.
2. Organizational Behavior.
3. Operations Research.

INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP (HSSE)

Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
	Industrial Management and Entrepreneurship	**4**			**30**	**70**	**100**	**3hrs**	**3**

Course Objectives :

- To familiarize the students with the concepts of Management.
- To relate the concepts of Management with industrial organizations.
- To explain the factors affecting productivity and how productivity can be increased in an Industrial undertaking.
- To set forth a basic framework for understanding Entrepreneurship.

Course Outcomes:

CO 1: Understand the roles, skills and functions of management and distinguish the different types of business organizations.

CO 2: Identify the factors involved in Production Operations Management.

CO 3: Diagnose organizational problems and take suitable decisions.

CO 4: Establish good Human Resource Management practices.

CO 5: Acquire necessary knowledge and skills required for organizing and carrying out entrepreneurial activities.

SYLLABUS

UNIT – I: Basic Concepts of Management: Management: Definition, Nature and Importance; Functions of the Management; Levels of Management; F.W Taylor's Scientific Management; Henry Fayol's Principles of Management.

UNIT – II: Forms of Business Organizations: Introduction, Types of Business organizations: Private Sector- Individual Ownership, Partnership, Joint stock companies and Co-Operative organizations; Public sector- Departmental Organizations, Public Corporations and Government Companies; The Joint sector Management.

UNIT -III: Production and operations Management: Plant location- Factors to be considered in the selection of Plant location; Break - even analysis- Significance and

managerial applications; Importance of Production Planning and Control and its Functions; Human Resource Management and Functions of Human Resource Manager (in brief); Functions of Marketing; Methods of Raising Finance.

UNIT – IV: Entrepreneurship: Definition, Characteristics and Skills, Types of Entrepreneurs, Entrepreneur vs. Professional Managers, Growth of Entrepreneurs, Nature and Importance of Entrepreneurs, Women Entrepreneurs, Problems of Entrepreneurship.

UNIT – V: Entrepreneurial Development and Project Management: Institutions in aid of Entrepreneurship Development, Idea generation: Sources and Techniques, Stages in Project formulation; Steps for starting a small enterprise - Incentives for Small Scale Industries by Government.

Text Books:

1. Sharma, S.C, and Banga, T.R., Industrial Organization & Engineering Economics, Khanna Publishers, Delhi, 2000.
2. Vasant Desai, The Dynamics of Entrepreneurial Development and Management (Planning for future Sustainable growth), Himalayan Publishing House, 2018.

Reference Books:

1. Aryasri, A.R., Management Science, McGraw Hill Education (India Private Limited New Delhi 2014.
2. Sheela, P. and Jagadeswara Rao, K., Entrepreneurship, Shree Publishing House, Guntur, Andhra Pradesh, 2017.

ORGANIZATIONAL BEHAVIOUR (HSSE)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
	Organizational Behaviour	**4**			**30**	**70**	**100**	**3hrs**	**3**

Course Objectives :

- To understand the basic concepts of organizational behaviour, its foundations and importance.
- To enable students to have a basic perspective of Motivation and Motivation theories.
- To acquaint the students about group behavior in organizations, including communication, leadership conflicts and organizational change and how these are linked to, and impact organizational performance.

Course Outcomes :

CO 1: Identifying fundamental aspects of organizational dynamics.

CO 2: Evaluate main theories of motivation and formulating suitable motivational strategies.

CO 3: Analyze the behavior of individuals and groups in organizations.

CO 4: Understanding of Leadership theories and Leadership behavior.

CO 5: Apply relevant theories, concepts to address important Organizational Behavior questions.

SYLLABUS

UNIT – I : Organizational Beaviour : Concept of Organisation- Concept of Organisational Behaviour - Nature of Organisational Beaviour - Role of Organisational Beaviour - Disciplines contributing to Organisational Beaviour.

UNIT – II : Motivation : Definition - Nature of Motivation - Role of Motivation - Theories of Motivation :Maslow's Need Hierarchy Theory, Herzberg's Motivation Hygiene Theory and Mc Gregor's Theory X and Theory Y.

UNIT - III: Group Dynamics: Meaning - Concept of Group - Types of groups -Formal and Informal groups - Group development - Group cohesiveness and factors affecting group cohesiveness. Leadership -Concept of Leadership - Difference between Leadership and Management - Importance of Leadership - Leadership styles: Autocratic leadership, Participative leadership and Free Rein leadership.

UNIT – IV : Communication : Manning - Communication Process - Forms of communication : Oral, Written and Non- Verbal communication - Direction of communication : Downward, Upward and Horizontal communication.

UNIT – V : Organisational conflicts : Concept of conflict - Reasons for conflict - Types of Conflict: Intrapersonal conflict, Interpersonal conflict, Intragroup conflict, Intergroup conflict, Inter organisational conflict - Conflict management. Organisational Change -Nature - Factors in Organisational change -Planned change : Process of planned change - Resistance to change: Factors in resistance to change - Overcoming resistance to change.

Text Books.

1. L.M.Prasad: Organisational Beaviour, Sultan Chand & Sons, New Delhi -110002.
2. K. Aswathappa: Organisational Behaviour, Himalaya Publishing House, New Delhi

Reference Books.

1. Stephen Robbins: Organizational Behaviour, Pearsons Education, New Delhi.

OPERATIONS RESEARCH (HSSE)

(Effective from Admitted Batch of 2022-23)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	C
					Ses.	Ext.			
	Operations Research	**4**			**30**	**70**	**100**	**3hrs**	**3**

Course Objectives:

- Formulate a real-world problem as a mathematical programming model.
- Provide knowledge of optimization techniques and approaches.
- Understand and study inventory problems.
- Know the network models.
- Put on knowledge in solving replacement problems and different queueing models.

Course Outcomes:

CO 1: Learned to translate a real-world problem into a mathematical formulation.

CO 2: Convert the problem into a mathematical model.

CO 3: Formulate and Solve Transportation, Assignment and sequencing problems.

CO 4: Able to solve maximum flow and shortest path problems.

CO 5: Capable to solve replacement problems and analyze inventory models.

SYLLABUS

UNIT - I: Introduction to Optimization: Engineering Applications of Optimization, Statement of Problem, Classification of Optimization Problem Techniques.

UNIT – II: Linear Programming: Introduction, Requirements for a LP Problem, Examples on The Application of LP, Graphical Solution of 2-Variable LP Problems, Some Exceptional Cases, General Mathematical Formulation For LPP, Canonical and Standard Forms of LP Problem, Simplex Method, Examples on The Application of Simplex Techniques. Artificial Variable Techniques - Big-M Method and Two-Phase Techniques.

UNIT – III: Transportation Problem: Matrix Terminology, Definition and Mathematical Representation of Transportation Model, Formulation and Solution of Transportation Models (Basic Feasible Solution by North-West Corner Method, Inspection Method. Vogell's Approximation Method). Assignment Problem - Matrix Terminology, Definition of

Assignment Model, Comparison with Transportation Model, Mathematical Representation of Assignment Model, Formulation and Solution of Assignment Models.

UNIT – IV: Pert Network Introduction, Phases of Project Scheduling, Network Logic, Numbering the Events (Fulkerson's Rule), Measure of Activity. Pert Network Computations-Forward Pass and Backward Pass Computations, Slack Critical Path, and Probability of Meeting the Scheduled Dates.

UNIT – V: Inventory Models: Introduction, Necessity for Maintaining Inventory, Classification of Inventory Models, Inventory Models with Deterministic Demand, Demand Rate Uniform Production Rate Infinite, Demand Rate Non-Uniform Production Rate Finite, Demand Rate Uniform-Production Rate Finite. Game Theory: Useful Terminology, Rules for Game Theory, Saddle Point, Pure Strategy, Reduce Game by Dominance, Mixed Strategies, 2x2 Games Without Saddle Point.

Text Books:

1. "Operations Research-An Introduction' By H.Taha, Prentice Hall Of India Pvt. Ltd.

2. "Engineering Optimization-Theory & Practice" By S.S. Rao, New Age International (P) Ltd.

Reference Books:

1."Operations Research – An Introduction" By P.K.Gupta& D.S.Hira, S. Chand & Co. Ltd

EE3101 PULSE & DIGITAL CIRCUITS

Course Objectives

The objectives of the Pulse & Digital Circuits course are to

- To understand the concept of wave shaping circuits, Switching Characteristics of diode and transistor.
- To study the design and analysis of various Multivibrators.
- To understand the functioning of different types of time-base Generators.
- To learn the working of logic families & Sampling Gates.

Course Outcomes

At the end of this course, students will demonstrate the ability to

- Understand working of logic families and logic gates.
- Design and implement Combinational and Sequential logic circuits.
- Understand the process of Analog to Digital conversion and Digital to Analog conversion.
- Be able to use PLDs to implement the given logical problem.

Syllabus

Linear Wave Shaping

High pass and Low pass RC circuits, Response of High pass and Low pass RC circuits to sinusoidal, step, pulse, square, exponential and Ramp inputs, High pass RC circuit as a differentiator, Low pass RC circuit as an integrator. Attenuators and its application as CRO probe, RL and RLC Circuits and their response for step input, Ringing Circuit.

Nonlinear Wave Shaping

Diode clippers, Transistor Clippers, Clipping at two independent levels, Comparator, Applications of voltage Comparators, Diode Comparator, Clamping Operation, Clamping Circuits using Diode with Different Inputs, Clamping Circuit Theorem, Practical Clamping circuits, Effect of diode Characteristics on Clamping Voltage.

Bistable Multivibrators

Transistor as a switch, Switching times of a transistor, Design and Analysis of Fixed-bias and self-bias transistor binary, Commutating capacitors, Triggering schemes of Binary, Transistor Schmitt trigger and its applications.

Monostable And Astable Multivibrators

Design and analysis of Collector coupled Monostable Multivibrator, Expression for the gate width and its waveforms. Design and analysis of Collector coupled Astable Multivibrator, expression for the Time period and its waveforms, The Astable Multivibrator as a voltage to frequency convertor.

Time Base Generators

General features of a time-base signal, Methods of Generating time base waveform, Exponential voltage sweep circuit, Basic principles of Miller and Bootstrap time base generators, transistor Miller sweep generator, transistor Bootstrap sweep generator, Current Sweep circuit, Linearity correction through adjustment of driving Waveform.

Logic Gates

Realization of gates using diodes and Transistors, RTL, DTL.

Text Books

1. Pulse Digital and Switching Waveforms, J. Millman and H. Taub, McGraw-Hill, 2nd Edition
2. 1991.
3. 2.Pulse and Digital CircuitsVenkata Rao K., Rama Sudha K., Manmadha Rao G., Pearson Education India, 2nd Edition, 2010.

Reference Books

1. Pulse and Digital Circuits, A. Anand Kumar, PHI, second edition, 2005.
2. Pulse switching and digital circuits – David A. Bell, PHI , 5th Edition, oxford university press.

EE3102 POWER ELECTRONICS

Course Objectives

- To study the characteristics of various power semiconductor devices and analyze the operation of silicon-controlled rectifier.
- To study the static and dynamic characteristics of SCR and analyze the series and parallel operation of SCR.
- To understand the operation of single phase and three phase full-wave converters and to understand basic performance parameters.
- To study the operation of dual converter and ac voltage controllers.
- To analyze the operation of single phase Cyclo-converters and high frequency dc-dc converters.
- To understand the working of inverters and application of PWM techniques for voltage control.

Course Outcomes

At the end of this course students will demonstrate the ability to

- Understand the differences between signal level and power level devices.
- Analyze controlled rectifier circuits.
- Analyze the operation of DC-DC choppers.
- Analyze the operation of voltage source inverters, Choppers & Cyclo-converters.

Syllabus

Thyristors

Introduction, Principle of Operation, Two Transistor Model, Gate Characteristics, Turn On Methods, Turn Off Methods, Thyristor Ratings, Measurement of Thyristor Parameters, Protection Circuits.

Gate Triggering Circuits

Firing of Thyristors, Pulse Transformers, Opto Isolators, Gate Triggering Circuits, Resistance Firing, Resistance-Capacitance Firing, UJT, Programmable UJT (PUT), UJT as an SCR Trigger, Synchronized UJT Triggering.

Series And Parallel Operation of Thyristors

Equalizing Networks, Triggering, String Efficiency, De-rating.

Phase Controlled Rectifiers

Single Phase-Half wave Rectifier with R& RL Circuits, Single Phase Full wave & Bridge Controlled Rectifiers, Three-Phase Half Wave and Fully Controlled Rectifiers, Three-Phase Fully Controlled Bridge Rectifier.

Inverters

Classification, Series and Parallel Inverters, Self-Commutated Inverters, The Mc Murray Inverter, The Mc Murray Bedford Inverter, Harmonic Reduction, Current Source Inverters, Voltage Source Inverters.

Choppers

Principle of Operation, Step-up, Step-down Choppers, Jones Chopper, Morgan Chopper.

Cyclo-converters

Principle of Operation, Single Phase to Single Phase Cyclo-converters, Cyclo-converter Circuits for Three-Phase Output, Control Circuits

Modern Power Semiconductor Devices

Basic Structure and Characteristics of Diode, Transistor, MOSFET, IGBT, GTO, DIAC, TRIAC

Text Books

1. Power Electronics by M. D. Singh, K. B. Khanchandani, Tata McGraw Hill Education (India) Private Limited.

Reference Books

1. Power Electronic Circuits Devices and Applications by M. H. Rashid, Pearson India
2. Power Electronics by Dr. P S Bhimbra, KhannaPublishers.

EE3103 POWER SYSTEMS - I

Course Objectives

- To study the principle of operation of different components of a thermal power stations. To study the principle of operation of different components of a Nuclear power stations.
- To study the concepts of DC/AC distribution systems and voltage drop calculations.
- To study the constructional and operation of different components of an Air and Gas Insulated
- substations. To study the constructional details of different types of cables.
- To study different types of load curves and tariffs applicable to consumers.

Course Outcomes

Upon successful completion of the course, the students will be able to

- Identify different components of a thermal power station.
- Describe the operation of various components of a nuclear power station.
- Distinguish between the operation of hydro and gas power plants.
- Analyze the significance of various factors for economic analysis of power generation.
- Select the suitable tariff method for various consumers.

Syllabus

Introduction
Basic Structure of power system, Power Generation, Comparison of different Sources of Energy.

Hydro Electric Plants
Choice of Site, Hydrology, Classification of Plants, General Arrangement, Functions of Different Components of a Hydro Plant, Advantages & Disadvantages

Thermal Power Stations (TPS)
Line Diagram and location of thermal power plant, TPS components, Boilers – Fire tube and Water tube, Super heaters, Economizers, Condensers, Draught, Cooling Water Systems.

Nuclear Power Plants
Schematic Arrangement, Components of Nuclear Reactor, Classification and working of Nuclear reactors, Different Power Reactors.

Diesel Power Plant
Understand the Working Principle, Site Selection, Plant Layout, Components, Merits and Demerits.

Gas Turbine Plants
Layout, Components of a Gas Turbine Plant, Open Cycle and Closed Cycle Plants.

Magneto Hydro Dynamic (MHD) Power Generation

Basic Concepts, Principle, Classification, Coal Burning MHD Steam Power Plant, Gas Cooled Nuclear MHD Power, Liquid Metal MHD Generator.

Operational Aspects of Generating Stations

Load Curves and Associated Definitions – Connected load, Maximum demand, Demand factor, Load factor, Diversity factor, Capacity factor, Utilization factor, Capacity, utilization and plant use factors-Numerical Problems, Selection of Units, and Load Duration Curves.

Economic Considerations

Capital and Running Costs of Generating Stations, Different Tariffs - Simple Rate Tariff, Flat Rate Tariff, Block-Rate Tariff, Two-part Tariff, Three-part tariff and power factor tariff, Comparison of Costs.

Text Books

1. A Text Book on Power System Engineering by Soni, Gupta, Bhatnagar & Chakrabarti, Dhanpat Rai & Co.

Reference Books

1. Generation & Utilization by C. L. Wadhwa
2. Electrical Power by S. L. Uppal, Khanna Publishers

EE3106 PULSE AND DIGITAL CIRCUITS LABORATORY

Course Objectives

To familiarize student with

1. Generation and processing of sinusoidal and non-sinusoidal signals.
2. Fundamentals of basic logic gates and its applications.
3. Analysis and design of various multivibrator circuits.
4. Design and analysis of UJT relaxation oscillator and boot-strap sweep circuits

Course Outcomes

After the completion of the lab, the student

1. Will be able to Generate and process sinusoidal and non-sinusoidal signals.
2. Will be able to understand fundamentals of basic logic gates and design applications.
3. Will be able to design and analyze various multivibrator circuits.
4. Will be able to design and analyze UJT relaxation oscillator and boot-strap sweep circuits

List of Experiments

1. Linear wave shaping (RC Integrator & RC differentiator).
2. Non-Linear wave shaping – Clippers.
3. Non-Linear wave shaping – Clampers.
4. Astable Multivibrator.
5. Monostable Multivibrator.
6. Bistable Multivibrator.
7. Schmitt Trigger.
8. UJT Relaxation Oscillator.
9. Bootstrap sweep circuit.
10. Constant Current Sweep Generator using BJT.

EE3107 POWER ELECTRONICS LABORATORY

Course Objectives

- To study the characteristics of various power semiconductor, derive and analyze the operation of diode bridge rectifier.
- To Design firing circuits for SCR., Analyze the operation of AC voltage controller and half-wave phase-controlled rectifiers.
- To understand the operation of single phase full-wave converters and analyze harmonics in the input current.

Course Outcomes

Student should be able to

- Explain the characteristics of various power semiconductor derive and analyze the operation of diode bridge rectifier.
- Design firing circuits for SCR. Analyze the operation of AC voltage controller and half-wave phase-controlled rectifiers.
- Explain the operation of single phase full-wave converters and analyze harmonics in the input current.

List of Experiments

1. To study V-I characteristics of SCR and measure latching and holding currents.
2. To study firing circuits of SCR.
3. To study single-phase half wave controlled rectified with (i) resistive load (ii) inductive load with and without freewheeling diode.
4. To study single phase (i) fully controlled (ii) half-controlled bridge rectifiers with resistive and inductive loads.
5. To study Thyristor forced commutation circuit.
6. To study single-phase ac voltage regulator with resistive and inductive loads.
7. To study Mc-Murray Bedford full bridge inverter.
8. To study MOSFET/IGBT based single-phase series inverter.
9. To study MOSFET/IGBT based single-phase parallel inverter.
10. To study operation of DC Jones chopper circuit
11. To study single phase Cyclo-converter

EE3108 PLCs

Course Objectives

- To Identify the components and performance characteristics of the SIMATIC S7-1200 PLC
- To learn to Install a PLC system, including the HMI and communication cabling
- To Use the various address types to edit, reload, structure and run a program
- To Document, test, and basically troubleshoot the control system and its program
- To Interface an HMI with the PLC control system

Course Outcomes

On completion of this course the participant will be able to:

- Identify the components and performance characteristics of the SIMATIC S7-1200 PLC
- Install a PLC system, including the HMI and communication cabling
- Use the various address types to edit, reload, structure and run a program
- Document, test, and basically troubleshoot the control system and its program
- Understand and create binary operations, timers, counters etc.
- Interface an HMI with the PLC control system

List of Experiments

1. Overview and significant performance characteristics of the SIMATIC S7-1200 system family
2. The components of the TIA Portal: SIMATIC STEP 7 Basic and WinCC Basic
3. Program execution in automation systems
4. Binary and digital operations in Ladder language
5. Setup and assembly of the SIMATIC S7-1200 automation system
6. Addressing and wiring the signal modules
7. Hardware and software commissioning of the SIMATIC S7-1200 with the TIA Portal
8. SIMATIC S7-1200 hardware configuration and parameterization
9. Introduction to the Touch panel (HMI)
10. Saving and documentation of the implemented program changes with the TIA Portal
11. Deeper understanding of contents through practical exercises on TIA system model

Experiments can be drafted basing on the theory course#

EE3201 POWER SYSTEM ANALYSIS & STABILITY

Course Objectives

To development the impedance diagram (p.u) and formation of Y-bus

- To study the different load flow methods.
- To study the concept of the Z-bus building algorithm.
- To study short circuit calculation for symmetrical faults.
- To study the effect of unsymmetrical faults and their effects.
- To study the rotor angle stability of power systems.

Course Outcomes

Upon successful completion of the course, the students will be able to

- Describe the per unit system of power system.
- Apply the concepts of addition or removal of element in the power system for determining the impedance matrix.
- Formulate and solve the power flow problem of power system.
- Develop and solve the positive, negative, and zero sequence networks for systems consisting of machines, transmission lines and transformers.
- Determine the fault voltages and currents for various faults.
- Analyze the stability of power system under various disturbances.

Syllabus

Per Unit Representation & Topology

Per Unit Quantities–Single line diagram– Impedance diagram of a power system – Graph theory definition – Formation of element node incidence and bus incidence matrices – Primitive network representation – Formation of Y– bus matrix by singular transformation and direct inspection methods.

Power Flow Studies

Necessity of power flow studies – Derivation of static power flow equations – Power flow solution using Gauss-Seidel Method – Newton Raphson Method (Rectangular and polar coordinates form) – Decoupled and Fast Decoupled methods.

Symmetrical Fault Analysis

Formation of Z_{Bus}: Partial network– Algorithm for the Modification of Z_{bus} Matrix for addition element for the following cases: Addition of element from a new bus to reference– Addition of element from a new bus to an old bus– Addition of element between an old bus to reference and Addition of element between two old busses (Derivations and Numerical Problems) – Modification of Z_{Bus} for the changes in network (Problems). 3–Phase short circuit currents and reactances of synchronous machine–Short circuit MVA calculations.

Symmetrical Components

Synthesis of unsymmetrical phasor from their symmetrical components– Symmetrical components of unsymmetrical phasor–Phase–shift of symmetrical components in Y–Δ–Power in terms of symmetrical components – Sequence networks – Positive, negative and zero sequence networks

Unsymmetrical Faults

Various types of faults LG– LL– LLG and LLL on unloaded alternator– unsymmetrical faults on power system.

Power System Stability Analysis

Elementary concepts of Steady state– Dynamic and Transient Stabilities– Description of Steady State Stability Power Limit–Transfer Reactance Synchronizing Power Coefficient –Power Angle Curve and Determination of Steady State Stability –Derivation of Swing Equation–Determination of Transient Stability by Equal Area Criterion–Application of Equal Area Criterion–Methods to improve steady state and transient stability.

Text Books

1. Power System Analysis by Grainger and Stevenson, Tata McGraw Hill.
2. Modern Power system Analysis – by I. J. Nagrath& D. P. Kothari: Tata McGraw–Hill Publishing Company, 2nd edition.

Reference Books

1. Power System Analysis by Hadi Saadat – TMH Edition.

EE3202 POWER SYSTEMS – II

Course Objectives

- To compute inductance/capacitance of transmission lines and to understand the concepts of GMD/GMR
- To study the performance and modeling of short, medium and long transmission lines and to obtain the equivalent circuits of various types of transmission lines
- To discuss sag and tension computation of transmission lines and to study about various effects on conductors
- To study the performance of overhead insulators and to gain knowledge on design of insulators for overhead lines
- To understand the construction and grading of cables in power transmission
- To study the corona effect and losses due to corona and how to overcome corona effect

Course Outcomes

At the end of this course, students will demonstrate the ability to

- Estimate the inductance and capacitance for different conductor configurations.
- Analyze the performance of short, medium & long transmission lines.
- Evaluate the sag and tension of transmission line for various configurations under the effect of wind and ice.
- Select a suitable insulator for a particular operating voltage, configuration and best method to improve string efficiency.
- Analyze the effect of various factors on corona.

Syllabus

Power Supply Systems

Comparison between Various Systems and Copper Efficiencies, Effect of System Voltage on Transmission Efficiency, Choice of Transmission Voltage, Conductor Size and Kelvin's Law.

Transmission Line Constants

Transmission line components, Types of conductors, Inductance and Capacitance of Single Phase and Three Phase Lines, Concept of GMDR Mutual GMD Double Circuit Line, Inductance of Composite Conductors, Transposition, Skin Effect and Proximity Effect.

Transmission Line Modeling

Generalized Network Constants, Modeling of Short Transmission line, Modeling of Medium transmission line: Nominal-T and Nominal-π methods and Long Transmission Lines, Rigorous Line Modeling.

Mechanical Design of Transmission Lines

Sag and Tension Calculations with equal and unequal heights of towers, effect of Wind and Ice on weight of conductor. Line Supports, Conductor Materials, Overhead Lines Vs Underground Cables.

Over Head Line Insulators

Types of Insulators, String efficiency and Methods for improvement–Numerical Problems, Voltage distribution, Calculation of string efficiency, Capacitance grading and Static Shielding.

Under-Ground Cables

Types of Cables, Insulation in Cables, Armouring& Covering of Cable, Insulation Resistance OFR Cables, Stress in Insulation, Sheathing in Cable, Use of Inter Sheaths, Capacitance Grading, Capacitance in 3-Core Cables.

Corona: Phenomenon of Corona, Critical Voltages, Power Loss due to Corona, Factors Affecting Corona Loss, Radio Interference.

Text Books

1. A Text Book on Power Systems Engineering by Sony, Gupta, Bhatnagar and Chakrabarti, Dhanapatrai& Co.
2. Electrical Power Systems by C. L. Wadhwa.

Reference Books

1. Electrical Power by S. L. Uppal.
2. A Course in Power Systems by J. B. Gupta.
3. Electrical Power Transmission and Distribution by S. Siva Nagaraju and S. Satyanarayana.

EE3203 CONTROL SYSTEMS

Course Objectives

- To learn the mathematical modeling of physical systems and to use block diagram algebra and signal flow graph to determine overall transfer function.
- To analyze the time response of first and second order systems and improvement of performance by proportional plus derivative and proportional plus integral controllers.
- To investigate the stability of closed loop systems using Routh's stability criterion and the analysis by root locus method.
- To present the Frequency Response approaches for the analysis of linear time invariant (LTI) systems using Bode plots, polar plots and Nyquist stability criterion.
- To discuss basic aspects of Design and compensation of linear control systems using Bode plots.
- Ability to formulate state models and analyze the systems.
- To learn the concepts of Controllability and Observability.

Course Outcomes

At the end of this course, students will demonstrate the ability to

- Understand the modeling of linear-time-invariant systems using transfer function and state-space representations.
- Develop mathematical models for physical systems.
- Employ the time domain analysis to quantify the performance of linear control systems and specify suitable controllers.
- Understand the concept of stability and its assessment for linear-time invariant systems.
- Quantify time and frequency domain specifications to determine stability margins.
- Apply state variable theory to determine the dynamic behavior of linear control systems.

Syllabus

Basic Structure of a Feedback Control System

Introduction to Mathematical Modeling of Physical Systems – Equations of Electrical Networks – Modeling of Mechanical Systems – Equations of Mechanical Systems, Analogous Systems.

Transfer Functions of Linear Systems

Impulse Response of Linear Systems – Block Diagrams of Control Systems – Signal Flow Graphs (Simple Problems) – Reduction Techniques for Complex Block Diagrams and Signal Flow Graphs (Simple Examples). Feedback Characteristics of Control Systems.

Time Domain Analysis of Control Systems

Time Response of First and Second Order Systems with Standard Input Signals – Steady State Error Constants – Effect of Derivative and Integral Control on Transient and Steady State Performance of Feedback Control Systems.

Stability

Concept of Stability and Necessary Conditions for Stability – Routh-Hurwitz Criterion, Relative Stability Analysis, the Concept and Construction of Root Loci, Analysis of Control Systems with Root Locus (Simple Problems to understand theory).

Frequency Domain Analysis of Control Systems

Correlation between Time and Frequency Responses – Polar Plots – Bode Plots – Log Magnitude versus Phase Plots – All Pass and Minimum Phase Systems – Nyquist Stability Criterion – Assessment of Relative Stability – Constant M and N Circles-The Nichols Chart.

Text Books

1. Automatic Control Systems, Benjamin C. Kuo, PHI Publication (5^{th} Edition).

Reference Books

1. Modern Control Engineering, Ogata, PHI.
2. Control Systems Engineering, I. J. Nagrath and M. Gopal, Wiley Eastern Ltd.
3. Control Systems Principles and Design M. Gopal, McGrawHill.

EE3206 MICROPROCESSOR AND MICROCONTROLLERS LABORATORY

Course Objectives

- To study programming based on 8085 and 8086 microprocessor and 8051 microcontrollers.
- To study 8085 and 8086 microprocessor-based ALP using arithmetic, logical and shift operations.

Course Outcomes

- Ability to handle arithmetic operations using assembly language programming
- Demonstrate ability to handle logical operations using assembly language programming
- Demonstrate ability to handle string instructions using assembly language programming
- Demonstrate ability to handle sorting operations and using assembly language programming

List Of Experiments

1. Arithmetic operations (addition, subtraction, multiplication and division) in 8086
2. Addition of two BCD numbers in 8086
3. Ascending order descending order of an array of numbers in 8086
4. Finding largest smallest number in an array of number in 8086
5. Generation of Fibonacci series in 8086
6. Hexa decimal to decimal conversion in 8086
7. ASCII to decimal conversion in 8086
8. Program for sorting an array for 8086
9. Program for searching for a number of character in an array for 8086
10. Program for String Manipulations for 8086
11. Seven-segment display interfacing to 8086
12. Stepper Motor Interfacing to 8086
13. Arithmetic operations (addition, subtraction, multiplication and division) in 8051 Micro Controller

EE3207 CONTROL SYSTEMS LABORATORY

Course Objectives

- To impart hands on experience to understand the performance of basic control system components such as magnetic amplifiers, D.C. servo motors, A.C. Servo motors, stepper motor and potentiometer.
- To understand time and frequency responses of control system with and without controllers and compensators.
- To understand the time and frequency response plots.
- To know the stability of the systems upto 5th order using various plots

Course Outcomes

- Able to analyze the performance and working Magnetic amplifier, D.C and A.C. servo motors and synchronous motors.
- Able to Design P,PI,PD and PID controllers
- Able to Design lag, lead and lag–lead compensators
- Able to control the temperature using PID controller
- Able to determine the transfer function of D.C motor
- Able to control the position of D.C servo motor performance
- Able to assess system stability using different plots with the help of simulation

List of Experiments

1. Time response of Second order system
2. Characteristics of Synchros
3. Programmable logic controller – characteristics of stepper motor
4. Effect of feedback on DC servo motor
5. Effect of P, PD, PI, PID Controller on a second order systems
6. Lag and lead compensation – Magnitude and phase plot
7. DC position control system 8. Transfer function of DC motor
8. Temperature controller using PID
9. Characteristics of magnetic amplifiers
10. Characteristics of AC servo motor
11. Characteristics of DC servo motor
12. Potentiometer as an error detector
13. To design Bode plots for the transfer functions of systems up to 5th order.
14. To design Root locus for the transfer functions of systems up to 5th order.
15. To design Polar and Nyquist plots for the transfer functions of systems up to 5th order.

EE3208 POWER SYSTEM LABORATORY

Course Objectives

- To compute inductance/capacitance of transmission lines and to understand the concepts of GMD/GMR.
- To study the short and medium length transmission lines, their models and performance.
- To study the effect of travelling waves on transmission lines.
- To study the factors affecting the performance of transmission lines and power factor improvement methods.

Course Outcomes

- Able to understand parameters of various types of transmission lines during different operating conditions.
- Able to understand the performance of short and medium transmission lines.
- Student will be able to understand travelling waves on transmission lines.
- Will be able to understand various factors related to charged transmission lines.

List of Experiments

1. Computation of Transmission Line Parameters.
2. Formation of Bus Admittance and Impedance Matrices and Solution of Networks.
3. Power Flow Analysis Using Gauss-Seidel Method.
4. Power Flow Analysis Using Newton-Raphson Method.
5. Symmetric and unsymmetrical fault analysis.
6. Transient and Small Signal Stability Analysis: Single-Machine Infinite Bus System.
7. Economic Dispatch in Power Systems.
8. Load – Frequency Dynamics of Single- Area and Two-Area Power Systems.
9. State estimation: Weighted least square estimation.
10. Electromagnetic Transients in Power Systems: Transmission Line Energization.

EE3209 Soft Skills

Course Objectives

1. To develop skills to communicate clearly.
2. To aid students in building interpersonal skills.
3. To enhance team building and time management skills.
4. To inculcate active listening and responding skills.

Course Outcomes

1. Make use of techniques for self-awareness and self-development.
2. Apply the conceptual understanding of communication into everyday practice.
3. Understand the importance of teamwork and group discussions skills.
4. Develop time management and stress management.

Syllabus

Introduction to Soft Skills

Communication – Verbal and Non-Verbal Communication - Personal grooming (Etiquette, Attitude, Body Language), Posture, Gestures, Facial Expressions, Eye Contact, Space Distancing, Presentation Skills, Public Speaking, just a Minute (JAM) sessions, Adaptability.

Goal Setting and Time Management

Immediate, Short term, long term, Smart Goals, Strategies to Achieve goals, Types of Time, Identifying Time Wasters, Time Management Skills, Stress Busters.

Leadership and Team Management

Qualities of a Good Leader, Team Dynamics, Leadership Styles, Decision Making, Problem Solving, Negotiation Skills.

Group Discussions

Purpose (Intellectual ability, Creativity, Approach to a problem, Tolerance), Group Behaviour, Analysing Performance.

Job Interviews

Identifying job openings, Covering Letter and CVs / Resumes, Interview (Opening, Body-Answer Q, Close-Ask Q), Telephone Interviews, Types of Questions.

Reference Books

1. Krannich, Caryl, and Krannich, Ronald L. Nail the Resume! Great Tips for Creating Dynamite Resumes. United States, Impact Publications, 2005.
2. Hasson, Gill. Brilliant Communication Skills. Great Britain: Pearson Education, 2012
3. Prasad, H. M. How to Prepare for Group Discussion and Interview. New Delhi: Tata McGraw-Hill Education, 2001.
4. Pease, Allan. Body Language. Delhi: Sudha Publications, 1998.
5. Rizvi, Ashraf M. Effective Technical Communication: India, McGraw-Hill Education. 2010
6. Thorpe, Edgar &Showick Thorpe. Winning at Interviews. 2nd Edition. Delhi: Dorling Kindersley, 2006.



SCHEME & SYLLABUS For All Semesters

(With effect from 2022-23 Admitted Batch)

B.Tech

(Information Technology)

Department of Information Technology & Computer Applications

Andhra University College of Engineering (A)

Andhra University



(With effect from 2022-23 AB)

B.Tech

INFORMATION TECHNOLOGY

(Common with B.Tech(CSE), B.Tech + M.Tech(CSE), B.Tech(AI), B.Tech(AI&ML), B.Tech(AI&DS), B.Tech(E&CE))

I Year - I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
IT1101	BS	Engineering Mathematics–I	4	0	30	70	100	3
IT1102	BS	Green Chemistry	4	0	30	70	100	3
IT1103	HSS	English	4	0	30	70	100	3
IT1104	ES	Computer Programming Using C	4	0	30	70	100	3
IT1105	ES	IT Essentials	4	0	30	70	100	3
IT1106	HSS	Communication skills Lab	0	3	50	50	100	1.5
IT1107	ES	Computer Engineering Workshop Lab	0	3	50	50	100	1.5
IT1108	ES	Computer Programming using C lab	0	3	50	50	100	1.5
Total Credits								**19.5**



(With effect from 2022-23 AB)

B.Tech

INFORMATION TECHNOLOGY

(Common with B.Tech(CSE), B.Tech + M.Tech(CSE), B.Tech(AI), B.Tech(AI&ML), B.Tech(AI&DS), B.Tech(E&CE))

I Year - II Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
IT1201	BS	Engineering Mathematics–II	4	0	30	70	100	3
IT1202	BS	Engineering Physics	4	0	30	70	100	3
IT1203	ES	Elements of Electronics Engineering	4	0	30	70	100	3
IT1204	ES	Data Structures Using C	4	0	30	70	100	3
IT1205	ES	Digital Logic Design	4	0	30	70	100	3
IT1206	ES	Linux Administration Lab	0	3	50	50	100	1.5
IT1207	BS	Engineering Physics Lab	0	3	50	50	100	1.5
IT1208	ES	Data Structures Lab	0	3	50	50	100	1.5
Total Credits								**19.5**



(With effect from 2022-23 AB)

B.Tech

INFORMATION TECHNOLOGY

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II Year - I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
IT2101	ES	Discrete Mathematical Structures	4	0	30	70	100	3
IT2102	PC	Computer Organization and Architecture	4	0	30	70	100	3
IT2103	BS	Probability Statistics and Queuing Theory	4	0	30	70	100	3
IT2104	PC	Operating Systems	4	0	30	70	100	3
IT2105	PC	Object Oriented Programming Through Java	4	0	30	70	100	3
IT2106	PC	Computer Organization & Architecture Lab	0	3	30	70	100	1.5
IT2107	PC	Object Oriented Programming Through Java Lab	0	3	50	50	100	1.5
IT2108	PC	Operating Systems Lab	0	3	50	50	100	1.5
IT2109	SC	Intellectual Property Rights (Internal)	1	2	100	0	100	2
IT2110	MC	Environmental Science	0	0	-	100	100	0
Total credits								**21.5**



(With effect from 2022-23 AB)

B.Tech

INFORMATION TECHNOLOGY

(Common with B.Tech(CSE), B.Tech + M.Tech(CSE), B.Tech(AI), B.Tech(AI&ML), B.Tech(AI&DS), B.Tech(E&CE))

II Year - II Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
IT2201	ES	Microprocessors	4	0	30	70	100	3
IT2202	PC	Design and Analysis of Algorithms	4	0	30	70	100	3
IT2203	PC	Database Management Systems	4	0	30	70	100	3
IT2204	PC	Formal Languages & Automata Theory	4	0	30	70	100	3
IT2205	HSS	Managerial Economics	4	0	30	70	100	3
IT2206	PC	Algorithms Lab through C++.	0	3	50	50	100	1.5
IT2207	PC	Database Management Systems Lab	0	3	50	50	100	1.5
IT2208	SC	Web Technologies	1	2	50	50	100	2
IT2209	MC	Professional Ethics & Universal Human Values	0	0	0	100	100	0
IT2210	MC	NCC/NSS	0	2	-	-	-	0
Total credits								**20**
Internship-I								

Guidelines for Obtaining MINOR in Information Technology:

Students belonging to other departments have to complete the following courses to obtain MINOR degree in Information Technology:

1. A student belonging to other department have to study CPNM and Python Programming as Compulsory courses and any **TWO** of the following open electives as follows:
   OE I: Block Chain Technology

   OE II: Recommender Systems

   OE III: Information Retrieval

   OE IV: Business Analytics

   OE V: Bio Informatics

   OR

   One or two MOOCS courses from NPTEL related to Information Technology without repetition from subjects within the curriculum can be used in Lieu of any of the above Open electives.

2. The duration of NPTEL courses should **NOT** be less than 12 weeks.
3. The MOOCS course(s) chosen by students of other departments for obtaining a MINOR in IT should be taken prior permission/ approval from the Chairperson – BoS of the department of **IT&CA/CS&SE, AUCE(A)**.

Guidelines for Obtaining HONORS in Information Technology:

1. The student shall earn additional 15 credits beyond 160 credits from the same branch/ department/ discipline registered for major degree.
   (i) The students having 7.0 CGPA without any backlog subjects will be permitted to register for HONORS.
   (ii) If a student is detained due to lack of attendance either in Major or in Honors, registration shall be cancelled.
   (iii) Honors is to be completed simultaneously with B. Tech program.

2. To obtain Honors in Information Technology the following subjects are to be taken for obtaining Honors:

   (i) Social Media Analytics
   (ii) Malware Analysis
   (iii) Reinforcement Learning
   (iv) Software Metrics
   (v) MOOCs for 3 credits of 12 weeks duration related to any one of the above courses.
   (vi) MOOCs may be treated as optional to obtain Honors degree in IT. If a student completes MOOCs with good grade, then it may be considered as betterment for any of the above five Courses (1 to 5)

The above five courses and MOOCs may be completed or pursued during 3rd and 4th years of his/her study of B. Tech program



(With effect from 2022-23 AB)

B.Tech

INFORMATION TECHNOLOGY

III Year - I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
IT3101	PC	Data Communications & Computer Networks	4	0	30	70	100	3
IT3102	PC	Artificial Intelligence	4	0	30	70	100	3
IT3103	PC	Object Oriented Software Engineering	4	0	30	70	100	3
IT3104	PE	Professional Elective - I	4	0	30	70	100	3
IT3105	OE	Open Elective - I	4	0	30	70	100	3
IT3106	PC	Data Communications & Computer Networks Lab	0	3	50	50	100	1.5
IT3107	PC	Object Oriented Software Engineering Lab	0	3	50	50	100	1.5
IT3108	SC	Soft Skills	1	2	50	50	100	2
IT3109	INT	Internship - I	0	0	50	50	100	2
Summer Internship 2 Months (Mandatory) after 2nd year (to be evaluated during III Year I Semester)								
Total Credits								**22**



(With effect from 2022-23 AB)

B.Tech

INFORMATION TECHNOLOGY

III Year – II Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
IT3201	PC	Internet of Things	4	0	30	70	100	3
IT3202	PC	Data warehouse & Data Mining	4	0	30	70	100	3
IT3203	PC	Cryptography & Network Security	4	0	30	70	100	3
IT3204	PE	Professional Elective - II	4	0	30	70	100	3
IT3205	OE	Open Elective - II	4	0	30	70	100	3
IT3206	PC	Internet of Things Lab	0	3	50	50	100	1.5
IT3207	PC	Data warehouse & Data Mining Lab	0	3	50	50	100	1.5
IT3208	PC	Cryptography & Network Security Lab	0	3	50	50	100	1.5
IT3209	SC	Python Programming	1	2	50	50	100	2
Industrial / Research Internship 2 months								
Total Credits								**21.5**



(With effect from 2022-23 AB)

B.Tech

INFORMATION TECHNOLOGY

IV Year – I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
IT4101	PE	Professional Elective– III	4	0	30	70	100	3
IT4102	PE	Professional Elective - IV	4	0	30	70	100	3
IT4103	PE	Professional Elective - V	4	0	30	70	100	3
IT4104	OE	Open Elective– III	4	0	30	70	100	3
IT4105	OE	Open Elective - IV	4	0	30	70	100	3
IT4106	HSSE	HSS Elective	4	0	30	70	100	3
IT4107	SC	Android App Programming	1	2	50	50	100	2
IT4108	INT	Internship -II	0	0	50	50	100	2
Industrial / Research Internship 2 months(Mandatory) after 3rd year (to be evaluated during IV Year I Semester)								
Total Credits								**22**

(With effect from 2022-23 AB)

B.Tech

INFORMATION TECHNOLOGY

IV Year – II Semester

Course code	Category	Course Title	Internal Marks	External Marks	Total Marks	Credits
IT4201	PROJ	Project work	100	100	200	14
					Total Credits	**14**



(With effect from 2022-23 AB)

B.Tech

INFORMATION TECHNOLOGY

PROFESSIONAL ELECTIVES (IT)

1. PRINCIPLES OF PROGRAMMING LANGUAGES
2. COMPILER DESIGN
3. SOFTWARE PROJECT MANAGEMENT
4. DISTRIBUTED SYSTEMS
5. GRID COMPUTING
6. SENSOR NETWORKS
7. CLOUD COMPUTING
8. DIGITAL IMAGE PROCESSING
9. MACHINE LEARNING
10. BIG DATA ANALYTICS
11. NATURAL LANGUAGE PROCESSING
12. SOFT COMPUTING
13. DEEP LEARNING
14. E-COMMERCE
15. EMBEDDED SYSTEMS



(With effect from 2022-23 AB)

B.Tech

INFORMATION TECHNOLOGY

OPEN ELECTIVES

1. CYBER SECURITY & DIGITAL FORENSICS
2. BLOCKCHAIN TECHNOLOGY
3. MOBILE COMPUTING
4. MOBILE ADHOC NETWORKS
5. RECOMMENDER SYSTEMS
6. NOSQL DATABASES
7. DATA SCIENCE
8. INFORMATION RETRIEVAL
9. DATABASE AND WEB APPLICATION SECURITY
10. BUSINESS ANALYTICS
11. HUMAN COMPUTER INTERACTION
12. BIO-INFORMATICS
13. INDUSTRY 4.0

OPEN ELECTIVES for other departments - (MINOR)

1. BLOCK CHAIN TECHNOLOGY
2. RECOMMENDER SYSTEMS
3. INFORMATION RETRIEVAL
4. BUSINESS ANALYTICS
5. BIO INFORMATICS



(With effect from 2022-23 AB)

B.Tech

INFORMATION TECHNOLOGY

HSS ELECTIVES

1. OPERATIONS RESEARCH
2. ORGANIZATIONAL BEHAVIOUR
3. INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP
4. FINANCIAL MANAGEMENT FOR ENGINEERS



(With effect from 2022-23 AB)

B.Tech

INFORMATION TECHNOLOGY

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IT1103	HSS	English	4	0	30	70	100	3
IT1104	ES	Computer Programming Using C	4	0	30	70	100	3
IT1105	ES	IT Essentials	4	0	30	70	100	3
IT1106	HSS	Communication skills Lab	0	3	50	50	100	1.5
IT1107	ES	Computer Engineering Workshop Lab	0	3	50	50	100	1.5
IT1108	ES	Computer Programming using C lab	0	3	50	50	100	1.5
Total Credits								**19.5**

IT1101 ENGINEERING MATHEMATICS-I

Course Objectives

- To transmit the knowledge of Partial differentiation.
- To know of getting maxima and minima of function of two variables and finding errors and approximations.
- To evaluate double and triple integrals, volumes of solids and area of curved surfaces.
- To expand a periodical function as Fourier series and half-range Fourier series

Course Outcomes

- Find the partial derivatives of functions of two or more variables.
- Evaluate maxima and minima, errors and approximations.
- Evaluate double and triple integrals, volumes of solids and area of curved surfaces.
- To expand a periodical function as Fourier series and half-range Fourier series.
- Have a fundamental understanding of Fourier series and be able to give Fourier expansions of a given function.

SYLLABUS

Partial Differentiation: Introduction - Functions of two or more variables - Partial derivatives - Homogeneous functions – Euler's theorem - Total derivative - Change of variables – Jacobins. Mean value Theorems (without proofs)

Applications of Partial Differentiation: Geometrical interpretation -Tangent plane and Normal to a surface -Taylor's theorem for functions of two variables - Errors and approximations -Total differential. Maxima and Minima of functions of two variables - Lagrange's method of undetermined multipliers - Differentiation under the integral Sign - Leibnitz's rule.

Multiple Integrals: Introduction - Double Integrals - Change of Order of Integration - Double Integrals in Polar Coordinates - Triple Integrals - Change of Variables.

Multiple Integrals-Applications: Area enclosed by plane curves - Volumes of solids - Area of a curved surface - Calculation of Mass - Centre of gravity - Moment of inertia - product of inertia – principal axes- Beta Function - Gamma Function - Relation between Beta and Gamma Functions. Error Function or Probability Integral.

Fourier Series: Introduction - Euler's Formulae - Conditions for a Fourier Expansion - Functions having points of discontinuity - Change of Interval - Odd and Even Functions - Expansions of Odd or Even Periodic Functions, Half-Range Series - Parseval's Formula. Practical Harmonic analysis

Text Book

1. Scope and Treatment as in “Higher Engineering Mathematics”, by Dr. B.S. Grewal, 43rd Edition, Khanna publishers.

Reference Books

1. Graduate Engineering Mathematics by V B Kumar Vatti., I.K.International publishing house Pvt. Ltd.
2. Advanced Engineering Mathematics by Erwin Kreyszig.
3. A text book of Engineering Mathematics, by N.P. Bali and Dr. Manish Goyal, Lakshmi Publications.
4. Advanced Engineering Mathematics by H.K. Dass. S. Chand Company
5. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Graw Hill Company. 6.
6. Higher Engineering Mathematics by Dr.M.K.Venkataraman.

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IT1102 GREEN CHEMISTRY

Course Objectives:

- To apply the basic knowledge of Chemistry to the Engineering Discipline.
- To develop knowledge about water and its treatment for industrial and potable purposes.
- To develop understanding in the areas of Batteries, Fuels Mechanism of Corrosion of Metals and Corrosion Control Methods, Green Chemistry and Technology and Processes involving Green Chemistry and apply the knowledge for solving existing challenges faced in various engineering and societal areas.

Course Outcomes:

- The students are able to apply the basic concepts and principles studied in Chemistry to the field of Engineering.
- The students are able to apply chemistry to different branches of engineering
- The students are able to acquire the knowledge in the areas of Water Chemistry, Mechanism of Corrosion of Metals and Corrosion Control Methods, Batteries, Fuel Cells, Green Chemistry and Technology and Processes involving Green Chemistry and suggest innovative solutions for existing challenges in these areas.

Unit 1: Water Technology

Sources of Water – Impurities and their influence of living systems – WHO Limits – Hardness and its Determination – Boiler Troubles and their removal – Water Softening Methods – Lime-Soda, Zeolite and Ion Exchange - Municipal Water Treatment-Break Point Chlorination – Desalination of Sea Water – Reverse Osmosis Method, Electro-dialysis.

Unit 2: Batteries

Primary batteries: The chemistry - Types: Zinc-carbon (Leclanche type), zinc alkaline (Duracell), zinc/air batteries; Lithium primary cells – liquid cathode, solid cathode and lithium-ferrous sulphide cells. Secondary batteries: Lead acid and VRLA (valve regulated (sealed) lead acid), nickel-cadmium, nickel-zinc, nickel-metal hydride batteries, lithium ion batteries, ultrathin lithium polymer cells. Advanced Batteries for electric vehicles, requirements of the battery – sodium-beta and redox batteries.

Unit 3: Fuel Cells

Fuel Cells: Description, working principle, anodic, cathodic and cell reactions, fabrication of electrodes and other components, applications, advantages, disadvantages and environmental aspects of the following types of fuel cells: Proton Exchange Membrane Fuel Cells, alkaline fuel cells, phosphoric acid, solid oxide, molten carbonate, direct methanol fuel cells- Membranes and Fuels

Unit 4: Corrosion

Corrosion: Origin and Theory – Types of Corrosion: Chemical and Electrochemical; Pitting, Inter granular, Waterline, Stress – Galvanic Series – Factors Effecting Corrosion. Corrosion Controlling Methods, Protective Coatings, Metallic Coatings, Electroplating and Electroless Plating.

Unit 5: Green Chemistry and Technology

Introduction and significance of green chemistry, Goals of green chemistry, 12 principles of green chemistry, toxicity of chemicals, material safety data sheet (MSDS), concept of zero pollution technologies, atom economy, functional toxicity vs non-functional toxicity, functional group approaches to green chemistry, Elimination of toxic functional group, optimization of frameworks for the design of greener synthetic pathways, Applications of green chemistry - Green solvents, green fuels and propellants, biocatalysis.

Text Books:

1. Engineering Chemistry – PC Jain and M. Jain – Dhanpath Rai and Sons, New Delhi.
2. A Text book of Engineering Chemistry – S. S. Dara – S. Chand & Co. New Delhi.
3. Hand Book of Green Chemistry and Technology; by James Clarke and Duncan Macquarrie; Blakwell Publishing.

IT1103 ENGLISH

Course Objectives:

- To make students understand the explicit and implicit meanings of a text/topic;
- To give exposure to new words and phrases, and aid to use them in different contexts;
- To apply relevant writing formats to draft essays, letters, emails and presentations; and
- To adapt oneself to a given situation and develop a functional approach to finding solutions: adaptability and problem solving.

Course Outcomes:

- Students will be able to analyse a given text and discover the various aspects related to language and literature;
- Learn the various language structures, parts of speech and figures of speech;
- Develop one's reading and writing abilities for enhanced communication; and
- Learn to apply the topics in real-life situations for creative and critical use.

SYLLABUS

On the conduct of life: William Hazlitt

Life skills: Values and Ethics

If: Rudyard Kipling

The Brook: Alfred Tennyson

Life skills: Self-Improvement

How I Became a Public Speaker: George Bernard Shaw

The Death Trap: Saki

Life skills: Time Management

On saving Time: Seneca

ChinduYellama

Life skills: Innovation

Muhammad Yunus

Politics and the English Language: George Orwell

Life skills: Motivation

Dancer with a White Parasol: Ranjana Dave

Grammar: Prepositions – Articles – Noun-Pronoun Agreement, Subject-Verb Agreement – Misplaced Modifiers–Clichés, Redundancies.

Vocabulary: Introduction to Word Formation – Root Words from other Languages –Prefixes and Suffixes–Synonyms, Antonyms– Common Abbreviations

Writing: Clauses and Sentences – Punctuation – Principals of Good Writing – Essay Writing – Writing a Summary

Writing: Essay Writing

Life skills: Innovation

Muhammad Yunus

Textbook:

1. Language and Life: A Skills Approach Board of Editors, Orient Blackswan Publishers, India.2018.

References:

1. Practical English Usage, Michael Swan. OUP. 1995.
2. Remedial English Grammar, F.T. Wood. Macmillan.2007
3. On Writing Well, William Zinsser. Harper Resource Book. 2001
4. Study Writing, Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
5. Communication Skills, Sanjay Kumar and PushpLata. Oxford University Press. 2011.
6. Exercises in Spoken English, Parts. I-III. CIEFL, Hyderabad. Oxford University Press.

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IT1104 COMPUTER PROGRAMMING USING C

Course Objectives:

- The course is designed to provide complete knowledge of C language.
- To provide students with understanding of code organization and functional hierarchical decomposition with using complex data types.
- To provide knowledge to the students to develop logics which will help them to create programs, applications in C.
- This course aims to identify tasks in which the numerical techniques learned are applicable and apply them to write programs, and hence use computers effectively to solve the task.
- This course provides the fundamental knowledge which is useful in understanding the other programming languages.

Course Outcomes:

- Identify basic elements of C programming structures like data types, expressions, control statements, various simple functions and apply them in problem solving.
- Apply various operations on derived data types like arrays and strings in problem solving.
- Design and implement of modular Programming and memory management using Functions, pointers.
- Apply Structure, Unions and File handling techniques to Design and Solve different engineering programs with minimal complexity.
- Apply Numerical methods to Solve the complex Engineering problems.

SYLLABUS

Introduction to C: Basic structure of C program, Constants, Variables and data types, Operators and Expressions, Arithmetic Precedence and associativity, Type Conversions. Managing Input and Output Operations Formatted Input, Formatted Output.

Decision Making, Branching, Looping: Decision making with if statement, Simple if statement, The if…else statement, Nesting of if…else statement, the else.. if ladder, switch statement, the (?:) operator, the GOTO statement., The while statement, the do statement, The for statement, Jumps in Loops.

Arrays & Strings: One, Two-dimensional Arrays, Character Arrays. Declaration and initialization of Strings, reading and writing of strings, String handling functions, Table of strings.

Functions: Definition of Functions, Return Values and their Types, Function Calls, Function Declaration, Category of Functions: No Arguments and no Return Values, Arguments but no Return Values, Arguments with Return Values, No Argument but Returns a Value, Functions that Return

Multiple Values. Nesting of functions, recursion, passing arrays to functions, passing strings to functions, the scope, visibility and lifetime of variables.

Pointers: Accessing the address of a variable, declaring pointer variables, initializing of pointer variables, accessing variables using pointers, chain of pointers, pointer expressions, pointers and arrays, pointers and character strings, array of pointes, pointers as function arguments, functions returning pointers, pointers to functions, pointers to structures-Program Applications.

Structure and Unions: Defining a structure, declaring structure variables, accessing structure members, structure initialization, copying and comparing structure variables, arrays of structures, arrays within structures, structures within structures, structures and functions and unions, size of structures and bit-fields- Program applications.

File handling: Defining and opening a file, closing a file, Input/ Output operations on files, Error handling during I/O operations, random access to files and Command Line Arguments- Program Applications.

Text Books:

1. Programming in ANSI C, E Balagurusamy, 6th Edition. McGraw Hill Education (India) Private Limited.

Reference Books:

1. Let Us C ,Yashwant Kanetkar, BPB Publications, 5th Edition.
2. Computer Science, A structured programming approach using C", B.A.Forouzan and R.F.Gilberg, " 3rd Edition, Thomson, 2007.
3. The C –Programming Language' B.W. Kernighan, Dennis M. Ritchie, PHI.
4. Scientific Programming: C-Language, Algorithms and Models in Science, Luciano M. Barone (Author), EnzoMarinari (Author), Giovanni Organtini, World Scientific.

IT1105 # IT ESSENTIALS

Course Objectives:

- Select the appropriate computer components to build, repair, or upgrade personal computers.
- Explain how to correctly use tools and safely work in a lab.
- Install components to build, repair, or upgrade personal computers.
- Configure computers to communicate on a network
- Configure devices to connect to the Internet and Cloud services
- Explain how to use, configure, and manage laptops and mobile devices

Course Outcomes:

- Understands the roles and responsibilities of the IT professional
- Able to Troubleshoot advanced hardware and software problems
- Provides an experience-oriented course that employs industry-relevant instructional approaches to prepare students for entry-level jobs in the industry.

Syllabus

Introduction to the Personal Computer Describe a Computer System, Identify the Names, Purposes, and Characteristics of Cases and Power Supplies, Identify the Names, Purposes, and Characteristics of Internal Components, Identify the Names, Purposes, and Characteristics of Ports and Cables, Identify the Names, Purposes, and Characteristics of Input Devices, Identify the Names, Purposes, and Characteristics of Output Devices, Explain System Resources and Their Purposes.

Safe Lab Procedures and Tool Use Explain the Purpose of Safe Working Conditions and Procedures, Identify Tools and Software Used with Personal Computer Components and Their Purposes, Implement Proper Tool Use.

Computer Assembly Attach the Components to the Motherboard and Install the Motherboard, Install Internal Drives, Install Drives in External Bays, Install Adapter Cards, Connect the Power Cables Reattach the Side Panels to the Case, Boot the Computer for the First Time.**Basics of Preventive Maintenance and Troubleshooting** Explain the Purpose of Preventive Maintenance, Identify the Steps of the Troubleshooting Process.

Fundamental Laptops and Portable Devices Identify Common Preventive Maintenance Techniques for Laptops and Portable Devices, Describe How to Troubleshoot Laptops and Portable Devices.

Fundamental Operating Systems Explain the Purpose of an Operating System, Describe and Compare Operating Systems to Include Purpose, Limitations, and Compatibilities, Determine

Operating System Based on Customer Needs, Install an Operating System, Identify and Apply Common Preventive Maintenance Techniques for Operating Systems, Troubleshoot Operating Systems.

Fundamental Networks Explain the Principles of Networking, Describe Types of Networks, Describe Basic Networking Concepts and Technologies, Describe the Physical Components of a Network, Describe LAN Topologies and Architectures.

Fundamental Security: Explain Why Security Is Important, Describe Security Threats, Identify Security Procedures, Identify Common Preventive Maintenance Techniques for Security, Troubleshoot Security.

Text books:

1. IT Essentials: PC Hardware and Software Companion Guide Fourth Edition,Cisco Networking Academy.

References:

1. Network security essentials application and standrads, by William stallings, 4th edition, prentice hall.
2. Mike Meyers' CompTIA A+ Guide to Managing and Troubleshooting PCs, Sixth Edition 6th Edition

IT1106 COMMUNICATION SKILLS LAB

Course Objectives:

- To make students recognize the sounds of English through Audio-Visual aids;
- To help students build their confidence and help them to overcome their inhibitions and self-consciousness while speaking in English;
- To familiarize the students with stress and intonation and enable them to speak English effectively; and
- To give learners exposure to and practice in speaking in both formal and informal contexts.

Course Outcomes:

- Students will be sensitized towards recognition of English sound patterns and the fluency in their speech will be enhanced;
- A study of the communicative items in the laboratory will help students become successful in the competitive world;
- Students will be able to participate in group activities like roleplays, group discussions and debates; and
- Students will be able to express themselves fluently and accurately in social as well professional context.

SYLLABUS

Introduction to Phonetics: The Sounds of English (Speech sound – vowels and consonants) - Stress and Intonation - Accent and Rhythm.

Listening Skills: Listening for gist and specific information - listening for Note taking, summarizing and for opinions - Listening to the speeches of eminent personalities.

Speaking Skills: Self-introduction - Conversation Skills (Introducing and taking leave) - Giving and asking for information - Role Play - Just A Minute (JAM) session - Telephone etiquette.

Reading and Writing skills: Reading Comprehension – Précis Writing - E-Mail writing - Punctuation.

Presentation skills: Verbal and non-verbal communication - Body Language - Making a Presentation

Reference Books

1. Ashraf Rizvi. Effective Technical Communication. Tata McGraw Hill Education Private Limited, New Delhi.
2. Speak Well. Orient Blackswan Publishers, Hyderabad.
3. Allan Pease. Body Language. Manjul Publishing House, New Delhi.

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IT1107 COMPUTER ENGINEERING WORKSHOP LAB

Course Objectives:

- Explain the internal parts of a computer, peripherals, I/O ports, connecting cables
- Demonstrate basic command line interface commands on LINUX
- Teach the usage of Internet for productivity and self-paced lifelong learning
- Describe about Compression, Multimedia and Antivirus tools
- Demonstrate Office Tools such as Word processors, Spreadsheets and Presentation tools

Course Outcomes:

- Assemble and disassemble components of a PC
- Construct a fully functional virtual machine, Summarize various LINUX operating system commands.
- Able to Troubleshoot hardware and software problems.

Syllabus

Module I – Hardware Concepts

1. Every student should identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor. Every student should disassemble and assemble the PC back to working condition.

Module II – Software Installations

1. Every student should individually install operating system like LINUX or MS windows on the personal computer. The system should be configured as dual boot with both windows and LINUX.
2. Hardware Troubleshooting: Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition.
3. Software Troubleshooting: Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition.
4. Cyber Hygiene: Students should learn about viruses on the internet and install antivirus software. Student should learn to customize the browsers to block pop ups, block active x downloads to avoid viruses and/or worms.
5. Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and popup blockers.

Module III – MS-Office

1. MS Word - Features to be covered: Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colours, Inserting Header and Footer, Using Date.
2. Creating project abstract Features to be covered: Formatting Styles, inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.
3. Creating a Newsletter: Features to be covered: Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs in word.
4. Spreadsheet Orientation: Accessing, overview of toolbars, saving spreadsheet files, Using help and resources. Creating a Scheduler: Gridlines, Format Cells, Summation, auto fill, Formatting Text.
5. Calculating GPA - Features to be covered: Cell Referencing, Formulae in spreadsheet – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, Sorting, Conditional formatting.
6. Creating Power Point: Student should work on basic power point utilities and tools in Latex and Ms Office/equivalent (FOSS) which help them create basic power point presentation. PPT Orientation, Slide Layouts, Inserting Text, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows, Hyperlinks, Inserting Images, Tables and charts.

IT1108 COMPUTER PROGRAMMING USING C LAB

Course Objectives:

- To impart writing skill of C programming to the students and solving problems.
- To write and execute programs in C to solve problems such as Modularize the problems into small modules and then convert them into programs.,
- To write and execute programs in C to solve problems such as arrays, files, strings, structures and different numerical methods.
- This reference has been prepared for the beginners to help them understand the basic to advanced concepts related to Objective-C Programming languages.

Course Outcomes:

- Understand various computer components, Installation of software. C programming development environment, compiling, debugging, and linking and executing a program using the development environment.
- Analysing the complexity of problems, Modularize the problems into small modules and then convert them into programs.
- Construct programs that demonstrate effective use of C features including arrays, strings, structures, pointers and files.
- Apply and practice logical ability to solve the real-world problems.
- Apply Numerical methods to Solve the complex Engineering problems.

Syllabus

Practice the following concepts with algorithm, flow chart and implementation.

1. C – Tokens, Data Types - Format Specifiers, I/O Statements.
2. Operators in C, their Precedence and Associativity, Arithmetic Expressions/Instructions, Type casting, Math.h functions.
3. Control Statements (Conditional): If and its Variants, Switch (Break).
4. Goto Statement, Control Statements (Looping): While, Do-While, For Loop, Continue & Break (Unconditional), Nested Loops
5. Arrays, One Dimensional Array: Declaration and Initialization, Accessing Array Elements.
6. Two Dimensional Array: Declaration and Initialization, Accessing Array Elements.
7. Strings: Read &Write, “String.h” Predefined Functions, without predefined functions.
8. Pointers: Declarations, Types, Pointers to Arrays, Pointers to Character Strings, Pointers to Pointers, Array of Pointers

9. Structures: Nested Structures, Pointers to Structures, Unions.
10. Functions: Function Declaration, Classification (Arguments and Return Type), Storage Classes.
11. Parameter Passing Techniques, Passing Parameters Types, Recursion
12. Files: Opening, Closing of Files, Reading and Writing of Files.
13. Binary Files, Random Accessing of Files, Enum, Typedef, Pre-processor Commands.
14. Numerical methods: Bisection method, Newton Raphson method, Lagrange's interpolation, Simpson's rule for numerical integration.

Reference Books:

1. Programming in ANSI C, E Balagurusamy, 6th Edition. McGraw Hill Education (India) Private Limited.
2. Introduction to Numerical Methods, SS Sastry, Prentice Hall



(With effect from 2022-23 AB)

B.Tech

INFORMATION TECHNOLOGY

(Common with B.Tech(CSE), B.Tech + M.Tech(CSE), B.Tech(AI), B.Tech(AI&ML), B.Tech(AI&DS), B.Tech(E&CE))

I Year - II Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
IT1201	BS	Engineering Mathematics–II	4	0	30	70	100	3
IT1202	BS	Engineering Physics	4	0	30	70	100	3
IT1203	ES	Elements of Electronics Engineering	4	0	30	70	100	3
IT1204	ES	Data Structures Using C	4	0	30	70	100	3
IT1205	ES	Digital Logic Design	4	0	30	70	100	3
IT1206	ES	Linux Administration Lab	0	3	50	50	100	1.5
IT1207	BS	Engineering Physics Lab	0	3	50	50	100	1.5
IT1208	ES	Data Structures Lab	0	3	50	50	100	1.5
Total Credits								**19.5**

IT1201 ENGINEERING MATHEMATICS – II

Course Objectives:

- The way of obtaining rank, eigen values and eigen vectors of a matrix.
- To know the importance of Cayley-Hamilton theorem and getting canonical form from a given quadratic form.
- To solve the system of equations by using direct and indirect methods.
- To solve first order and higher order differential equations by various methods.
- To obtain the Laplace transforms and inverse Laplace transforms for a given functions and their applications.

Course Outcomes:

- Find rank, eigen values and eigen vectors of a matrix and understand the importance of Cayley- Hamilton theorem.
- Reduce quadratic form to canonical forms and solving linear systems by direct and indirect methods.
- Demonstrate solutions to first order differential equations by various methods and solve basic applications problems related to electrical circuits, orthogonal trajectories and Newton's law of cooling
- Discriminate among the structure and procedure of solving higher order differential equations with constant and variable coefficients.
- Understand Laplace transforms and its properties and finding the solution of ordinary differential equations.

SYLLABUS

Linear Algebra: Rank of a matrix- Echelon form, Normal Form - Solution of Linear System of Equations - Consistency of Linear System of Equations - Direct & Indirect Methods: Gauss elimination method, LU Factorization method, Gauss Seidal Method. Complex Matrices: Hermitian, Skew-Hermitian and Unitary Matrices and their Properties.

Eigen Values and Eigen Vectors: Eigen Values and Eigen Vectors of a Matrix - Cayley-Hamilton theorem - Inverse and Powers of a Matrix using Cayley-Hamilton's theorem and its applications. Diagonalization of a Matrix - Quadratic Forms - Reduction of Quadratic Form to Canonical Form - Nature of a Quadratic Form.

Ordinary Differential Equations of First Order and its Applications: Formation of ordinary differential equations (ODEs) - Solution of an ordinary differential equation - Equations of the first order and first degree - Linear differential equation - Bernoulli's equation - Exact differential equations - Equations reducible to exact equations - Orthogonal Trajectories - Simple Electric (LR & CR) Circuits - Newton's Law of Cooling - Law of Natural growth and decay.

Differential Equations of Higher Order: Solutions of Linear Ordinary Differential Equations with Constant Coefficients - Rules for finding the complimentary function - Rules for finding the particular integral - Method of variation of parameters - Cauchy's linear equation - Legendre's linear equation - Simultaneous linear differential equations.

Laplace Transforms: Introduction - Existence Conditions - Transforms of Elementary Functions - Properties of Laplace Transforms - Transforms of Derivatives - Transforms of Integrals - Multiplication by tn - Division by t – Evaluation of integrals by Laplace Transforms - Inverse Laplace Transform - Applications of Laplace Transforms to Ordinary Differential Equations - Simultaneous Linear Differential Equations with Constant Coefficients - Second Shifting Theorem - Laplace Transforms of Unit Step Function, Unit Impulse Function and Laplace Transforms of Periodic Functions.

Text Book:

1. Scope and Treatment as in "Higher Engineering Mathematics", by Dr. B.S. Grewal, 43rd edition, Khanna publishers.

Reference Books:

1. Graduate Engineering Mathematics by V B Kumar Vatti., I.K. International publishing house Pvt. Ltd.
2. Advanced Engineering Mathematics by Erwin Kreyszig.
3. A text book of Engineering Mathematics, by N.P. Bali and Dr. Manish Goyal. Lakshmi Publications.
4. Advanced Engineering Mathematics by H.K. Dass. S. Chand Company.
5. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Graw Hill Company.

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IT1202 ENGINEERING PHYSICS

Course Objectives:

- To impart knowledge in basic concept of physics of Thermodynamics relevant to engineering applications.
- To grasp the concepts of physics for electromagnetism and its application to engineering. Learn production of Ultrasonics and their applications in engineering.
- To Develop understanding of interference, diffraction and polarization: connect it to a few engineering applications.
- To Learn basics of lasers and optical fibres and their use in some applications.
- To Understand concepts and principles in quantum mechanics and Nanophase Materials. Relate them to some applications.

Course Outcomes:

- Understand the fundamentals of Thermodynamics and Laws of thermodynamics. Understand the working of Carnot cycle and concept of entropy.
- Gain Knowledge on the basic concepts of electric and magnetic fields. Understand the concept of the nature of magnetic materials. Gain knowledge on electromagnetic induction and its applications.
- Understand the Theory of Superposition of waves. Understand the formation of Newton's rings and the working of Michelson's interferometer. Remember the basics of diffraction, Evaluate the path difference. Analysis of Fraunhofer Diffraction due to a single slit
- Understand the interaction of matter with radiation, Characteristics of Lasers, Principle, working schemes of Laser and Principle of Optical Fibre. Realize their role in optical fibre communication.
- Understand the intuitive ideas of the Quantum physics and understand dual nature of matter. Compute Eigen values, Eigen functions, momentum of Atomic and subatomic particles using Time independent one-Dimensional Schrodinger's wave equation. Understand the fundamentals and synthesis processes of Nanophase materials.

SYLLABUS

Thermodynamics: Introduction, Heat and Work, First law of thermodynamics and applications, Reversible and Irreversible process, Carnot cycle and Efficiency, Second law of thermodynamics, Carnot's Theorem, Entropy, Second law in terms of entropy, Entropy and disorder, Third law of thermodynamics (statement only).

Electromagnetism: Concept of electric flux, Gauss's law - some applications, Magnetic field - Magnetic force on current, torque on current loop, The Biot-Savart's Law, B near a long wire, B for a circular Current loop, Ampere's law, B for a solenoid, Hall effect, Faraday's law of induction, Lenz's law, Induced magnetic fields, Displacement current, Maxwell's equations (no derivation), Magnetic materials: Classification of magnetic materials and properties.

Ultrasonics: Introduction, Production of Ultrasonics – Piezoelectric and Magnetostriction methods, acoustic grating, applications of ultrasonics.

Optics-

Interference: Principles of superposition – Young's Experiment – Coherence - Interference in thin films (reflected light), Newton's Rings, Michelson Interferometer and its applications.

Diffraction: Introduction, Differences between interference and diffraction, Fresnel and Fraunhofer diffraction, Fraunhofer diffraction at a single slit (Qualitative and quantitative treatment).

Polarisation: Polarisation by reflection, refraction and double refraction in uniaxial crystals, Nicol prism, Quarter and Half wave plate, circular and elliptical polarization.

Lasers And Fibre Optics: Introduction, characteristics of a laser beam, spontaneous and stimulated emission of radiation, population inversion, Ruby laser, He-Ne laser, Semiconductor laser, applications of lasers Introduction to optical fibres, principle of propagation of light in optical fibres, Acceptance Angle and cone of a fibre, Numerical aperture, Modes of propagations, classification of fibres, Fibre optics in communications, Application of optical fibres.

Modern Physics-

Introduction, De Broglie concept of matter waves, Heisenberg uncertainty principle, Schrodinger time independent wave equation, application to a particle in a box. Free electron theory of metals, Kronig - Penney model (qualitative treatment), Origin of energy band formation in solids, Classification of materials into conductors, semi-conductors and insulators.

Nanophase Materials: Introduction, properties, Top-down and bottom-up approaches, Synthesis - Ball milling, Chemical vapour deposition method, sol-gel methods, Applications of nano materials.

Text Books:

1. Physics by David Halliday and Robert Resnick – Part I and Part II - Wiley.
2. A textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar - S. Chand
3. Engineering Physics by R.K. Gaurand S.L. Gupta–Dhanpat Rai

Reference Books:

1. Modern Engineering Physics by A.S. Vadudeva
2. University Physics by Young and Freedman

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IT1203 ELEMENTS OF ELECTRONICS ENGINEERING

Course Objectives:

- Introduce students to basics of semiconductors, their classification and properties
- To provide theory of PN junction diode, its characteristics and applications
- To introduce basics of rectifying circuits and bipolar junction transistor
- To provide basics of transistor biasing, transistor amplifiers and field effect transistors

Course Outcomes:

By the end of the course, the student should be able to:

- Explain the basics of semiconductors and their classification
- Understand the theory of PN junction diode, rectifying circuits and bipolar junction transistor
- Explain the concepts of transistor biasing, transistor amplifiers and field effect transistors

SYLLABUS

Introduction to Electronics and Semiconductors: Energy band theory, Conduction in Insulators, Semiconductors and metals, Electron emission from metals, Classification of semiconductors, Carrier concentration in an intrinsic semiconductor, Properties of intrinsic semiconductor, Drift and diffusion currents.

Semi-Conductor Diode: Theory of PN junction diode, Open circuited PN junction, V-I characteristics of a PN diode, Diode current equation, Transition and diffusion capacitances, Break down in PN diode, Applications of PN diodes. Zener diode, Zener regulator, Tunnel diode, Schottky diode.

Rectifying circuits: Half wave and full wave rectifiers, Bridge rectifiers, Efficiency, Ripple and regulation of each rectifier, Capacitor filters.

Bipolar Junction Transistor: Introduction, construction, Operation of PNP and NPN Transistors – Transistor Circuit configurations- Characteristics of a CE configurations – h parameters, low frequency small signal equivalent circuit of a Transistor.

Transistor Biasing and thermal stabilization: Transistor Biasing, Stabilization, Different methods of transistor biasing – Fixed bias, Collector feedback bias – self bias – Bias compensation.

Transistor Amplifiers: CE, CB, CC amplifier configurations –Multistage amplifier – A Two Stage RC coupled amplifier – frequency response curve and bandwidth.

Field Effect Transistors: Junction Field Effect Transistors (JFET) – JFET characteristics, JFET Parameters, Small signal equivalent circuit – MOSFETS – Depletion and Enhancement MOSFETS.

Text Books:

1. Electronic Device and Circuits by Sanjeev Guptha.

Reference Books:

1. Electronic Device and Circuits Theory by Robert L. Boylested Electronic Device and Circuits by David. A. Bell

IT1204 DATA STRUCTURES USING C

Course Objectives:

- Assess how the choice of data structures and algorithm design methods impacts the performance of programs.
- Choose the appropriate data structure and algorithm design method for a specified application.
- Solve problems using data structures such as linear lists, stacks, queues, binary trees, heaps binary search trees, and graphs and writing programs for these solutions.

Course Outcomes:

- Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithm.
- Demonstrate different methods for traversing trees.
- Compare alternative implementations of data structures with respect to performance.
- Discuss the computational efficiency of the principal algorithms for sorting and searching

SYLLABUS

Introduction to Data Structures: Review of C Programming, Recursive Definition and Processes, Recursion in C, Simulation of Recursion, Efficiency of Recursion, Abstract Data Types, Meaning and Definition of Data Structures, Arrays.

Stacks: Stack as an Abstract Data Type, Primitive Operations, Implementing Stack Operations using Arrays, Infix, Postfix and Prefix: Definitions, Evaluation and Conversions.

Queues: Queue as an Abstract Data Type, Sequential Representation, Types of Queues, Operations, Implementation using Arrays.

Linked List: Operations, Implementation of Stacks, Queues and priority Queues using Linked Lists+, Circular Lists: Insertion, Deletion and Concatenation Operations, Stacks and Queues as Circular Lists, Doubly Linked Lists.

Trees: Binary Trees - Definitions and Operations, Binary Tree Representation: Node Representation, Implicit array Representation, Binary Tree Traversal, Threaded Binary Trees and their Traversal, Trees and their Applications; Tree Searching: Insertion and Deletion of a node from a Binary Search Tree, Efficiency of Binary Search Tree operations.

Searching: Basic Searching Techniques: Dictionary as an Abstract Data Type, Algorithmic Notation, Sequential Searching and its Efficiency, Binary Search, Interpolation Search.

Sorting: General Background: Efficiency, Asymptotic Notations, Efficiency of Sorting, Bubble Sort and Quick Sort and their Efficiency, Selection Sorting, Binary Tree Sort, Heap Sort, Insertion Sorts, Shell Sort, Address calculation Sort, Merge and Radix Sorts.

Graphs and Their Application: Definition of Graphs, Representation of Graphs, Transitive closure, Linked Representation of Graphs, Topological Ordering of nodes, Graph Traversal and Spanning Forests, Undirected Graphs and their Traversals, Applications of Graphs, Minimal Spanning Trees.

Text Books:

1. Data Structures Using C andC++ Yddish Langsam, Moshe J. Augenstein and Aaron M.Tanenbaum, Prentice Hall Of India (2nd Edition)
2. Data Structures, Algorithms and Applications with C++, Sahani Mc-Graw Hill.

IT1205 DIGITAL LOGIC DESIGN

Course Objectives:

- To introduce the basic principles for design of combinational circuit and sequential circuits.
- To learn simple digital circuits in preparation for computer engineering.

Course Outcomes:

A student who successfully fulfils the course requirements will have demonstrated:

- An ability to define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.
- An ability to understand the different Boolean algebra theorems and apply them for logic functions.
- An ability to define the Karnaugh map for a few variables and perform an algorithmic reduction of logic functions.
- An ability to define the following combinational circuits: multiplexer, de-multiplexers encoders/decoders, comparators, arithmetic-logic units; and to be able to build simple circuits.
- An ability to understand asynchronous and synchronous sequential circuits, like counters and shift registers.
- An ability to understand memories like RAM and ROM, Programmable Logic Array and Programmable Array Logic.

SYLLABUS

Binary Systems: Digital Systems. Binary Numbers. Number Base Conversions. Octal and Hexadecimal Numbers. Complements. Signed Binary Numbers. Binary Codes. Binary Storage and Registers. Binary Logic

Boolean Algebra and Logic Gates: Basic Definitions. Axiomatic Definition of Boolean Algebra. Basic Theorems and Properties of Boolean Algebra. Boolean Functions. Canonical and Standard Forms. Other Logic Operations. Digital Logic Gates. Integrated Circuits.

Combinational Logic Design, Gate-Level Minimization: The Map Method. Four Variable Map. Five-Variable Map. Product of Sums Simplification. Don't-Care Conditions. NAND and NOR

Implementation. Other Two- Level Implementations. Exclusive-OR Function. Hardware Description Language (HDL).

Combinational Logic: Combinational Circuits. Analysis Procedure. Design Procedure. Binary Adder Subtractor. Decimal Adder. Binary Multiplier. Magnitude Comparator. Decoders. Encoders. Multiplexers. HDL For Combinational Circuits.

Sequential Logic Design, Synchronous Sequential Logic: Sequential Circuits. Latches Flipflops. Analysis of Clocked Sequential Circuits. HDL For Sequential Circuits. State Reduction and Assignment. Design Procedure.

Registers ad Counters: Registers. Shift Registers. Ripple Counters. Synchronous Counters. Other Counters. HDL for Registers and Counters.

Memory and Programmable Logic: Introduction. Random-Access Memory. Memory Decoding, Error Detection and Correction. Read-Only Memory. Programmable Logic Array. Programmable Array Logic. Sequential Programmable Devices.

Text Book:

1. DigitalDesign,3rdEdition, M.MorrisMano,PearsonEducation.

Reference Books:

1. Digital Logic Design Principles, Norman Balabanian& Bradley Carlson, John Wiley &Sons (Asia) Pvt.Ltd.,2002
2. Fundamentals of Digital Logic with VHDL Design, Stephen Brown and ZvonkoVranesic, TataMcGraw-HillEdition,2002.

IT1206 LINUX ADMINISTRATION LAB

Course Objectives:

- To understand LINUX operating system and its internals.
- To understand LINUX file system structure and its operations.
- To understand LINUX shell environment and its programming.
- To understand communication in LINUX and the corresponding primitives.

Course Outcomes:

- The student learns about LINUX features for multiuser, multitasking capabilities.
- The student learns about file system organization, file and directory manipulation, setting file permissions, and disk free space administration.
- The student learns about writing shell scripts for different applications.
- The student learns about how users communicate with each other in LINUX environment.

SYLLABUS

1) Study and practice on file system / handling files with commands, syntax, usage, application.
2) Practice on vi editor.
3) Study and practice on redirection operators with relevant commands, syntax, usage, application.
4) Study and practice on filters with relevant commands, syntax, usage, application.
5) Study and practice on Backup with relevant commands, syntax, usage, application.
6) Study and practice on internet related commands, syntax, usage, application.
7) Study and practice on shells/shell programming with relevant programming constructs, syntax, usage, application.
8) Study and practice on awk with relevant commands, syntax, usage, application.
9) Study and practice on regular expressions and the grep family with relevant commands, syntax, usage, application.
10) Study and practice on compilation process of C programs under UNIX.

References:

1. Unix concepts and applications by Sumitabha Das, TMH Publications.
2. Shell programming by YashwanthKanetkar.

IT1207 ENGINEERING PHYSICS LAB

Course Objectives:

- To enable the students to acquire skill, technique and utilization of the Instruments
- Draw the relevance between the theoretical knowledge and to imply it in a practical manner with respect to analyse various electronic circuits and its components.
- To impart practical knowledge in basic concepts of Wave optics, Lasers and fibre optics.
- To familiarize the handling of basic physical apparatus like Vernier callipers, screw gauge, spectrometers, travelling microscope, laser device, optical fibre, etc.

Course Outcomes:

- Ability to design and conduct experiments as well as to analyse and interpret
- Ability to apply experimental skills to determine the physical quantities related to Heat, Electromagnetism and Optics
- The student will learn to draw the relevance between theoretical knowledge and the means to imply it in a practical manner by performing various relative experiments.

SYLLABUS

1. Determination of Radius of Curvature of a given Convex Lens By forming Newton's Rings.
2. Determination of Wavelength of Spectral Lines in the Mercury Spectrum by Normal Incidence method.
3. Study the Intensity Variation of the Magnetic Field along axis of Current Carrying Circular Coil.
4. Determination of Cauchy's Constants of a Given Material of the Prism using Spectrometer.
5. Determination of Refractive Index of Ordinary ray □o and Extraordinary □e ray.
6. Determination of Thickness Given Paper Strip by Wedge Method.
7. Calibration of Low Range Voltmeter.
8. Calibration of Low Range Ammeter.
9. Determination of Magnetic Moment and Horizontal Component of Earth's Magnetic Field.
10. Lees Method - Coefficient of thermal Conductivity of a Bad Conductor.
11. Carey Foster's Bridge – Verification of laws of Resistance and Determination of Specific Resistance.

12. Melde’s Apparatus – Frequency of electrically maintained Tuning Fork.
13. Photoelectric cell-Characteristics.
14. Planks Constants.
15. Laser- Diffraction.

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IT1208 DATA STRUCTURES LAB

Course Objectives:

- To implement stacks and queues using arrays and linked lists.
- To develop programs for searching and sorting algorithms.
- To write programs using concepts of various trees.
- To implement programs using graphs.

Course Outcomes:

- Student will be able to write programs to implement stacks and queues.
- Ability to implement various searching and sorting techniques.
- Ability to implement programs using trees and graphs.

SYLLABUS

List of Programs:

1. Write a C program for sorting a list using Bubble sort and then apply binary search.
2. Write a C program for implementing the operations of a queue.
3. Write a C program to implement the operations on priority queues.
4. Write a C to implement the operations on circular queues.
5. Write a C program to implement the operations on stacks.
6. Write a C program for evaluating a given postfix expression using stack.
7. Write a C program for converting a given infix expression to postfix form using stack.
8. Write a C program to implement the operations on single linked list.
9. Write a C program for demonstrate operations on double linked list.
10. Write a C program for the representation of polynomials using circular linked list and for the addition of two such polynomials
11. Write a C program to create a binary search tree and for implementing the in order, Pre order, post order traversal using recursion
12. a) Write a C program for finding the transitive closure of a digraph
    b) Write a C program for finding the shortest path from a given source to any vertex in a digraph using Dijkstra's algorithm.
13. a) Write a C program for finding the Depth First Search of a graph.
    b) Write a C program for finding the Breadth First Search of a graph

References:

1. Data Structures Using C and C++ Yddish Langsam, Moshe J. Augenstein and Aaron M.Tanenbaum, Prentice Hall Of India (2nd Edition)
2. Data Structures, Algorithms and Applications with C++, Sahani Mc-Graw Hill.



(With effect from 2022-23 AB)

B.Tech

INFORMATION TECHNOLOGY

(Common with B.Tech(CSE), B.Tech + M.Tech(CSE), B.Tech(AI), B.Tech(AI&ML), B.Tech(AI&DS), B.Tech(E&CE))

II Year - I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
IT2101	ES	Discrete Mathematical Structures	4	0	30	70	100	3
IT2102	PC	Computer Organization and Architecture	4	0	30	70	100	3
IT2103	BS	Probability Statistics and Queuing Theory	4	0	30	70	100	3
IT2104	PC	Operating Systems	4	0	30	70	100	3
IT2105	PC	Object Oriented Programming Through Java	4	0	30	70	100	3
IT2106	PC	Computer Organization & Architecture Lab	0	3	30	70	100	1.5
IT2107	PC	Object Oriented Programming Through Java Lab	0	3	50	50	100	1.5
IT2108	PC	Operating Systems Lab	0	3	50	50	100	1.5
IT2109	SC	Intellectual Property Rights (Internal)	1	2	100	0	100	2
IT2110	MC	Environmental Science	0	0	-	100	100	0
Total credits								**21.5**

IT2101 DISCRETE MATHEMATICAL STRUCTURES

Course Objectives:

- To understand mathematical arguments using logical connectives and quantifiers and verify the validity of logical flow of arguments using propositional, predicate logic and truth tables.
- To understand about permutations and combinations.
- To understand various types of relations and discuss various properties of the relations.
- To study the graphs, graph isomorphism and spanning trees.
- To study about Boolean algebra and Finite State Machines.

Course Outcomes:

At the end of the course student will be able to

- Rewrite mathematical arguments using logical connectives and quantifiers and verify the validity of logical flow of arguments using propositional, predicate logic.
- Identify and give examples of various types of relations and describe various properties of the relations.
- Ability to solve problems using permutations and combinations.
- Determine isomorphism of graphs and spanning tree of a given graph using BFS/DFS algorithms. Also determine minimal spanning tree of a given graph.

SYLLABUS

The Foundations-Logic and Proofs: Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers Rules of Inference, Introduction to Proofs, Proof Methods and Strategy, Basic Structures-Sets, Functions, Sequences and Sums: Sets, Set Operations, Functions, Sequences and Summations.

The Fundamentals-Algorithms, the Integers and Matrices: Algorithms, The Growth of Functions, Complexity of Algorithms, The Integers and Division, Primes and Greatest Common Devisors, Integers and Algorithms, Applications of Number Theory, Matrices.

Induction and Recursion: Mathematical Induction, Strong Induction and Well-Ordering, Recursive Definitions and Structural Induction, Recursive Algorithms, Program Correctness. Counting: The Basics of Counting, The Pigeonhole Principle, Permutations and Combinations,

Binomial Coefficients, Generalized Permutations and Combinations, Generating Permutations and Combinations.

Advanced Counting Techniques: Recurrence Relations, Solving Linear Recurrence Relations, Divide-and-Conquer Algorithms and Recursion Relations, Generating Functions, Inclusion-Exclusion, and Applications of Inclusion-Exclusion.

Relations: Relations and their properties, n-ary relations, applications, Representation, closure, equivalence relations, Partial orderings.

Graphs: Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Colouring.

Trees: Introduction to Trees, Applications of Trees, Tree Traversal, Spanning Trees, Minimum Spanning Trees,

Boolean Algebra: Boolean Functions, Representing Boolean Functions, Logic Gates, Minimization of Circuits

Modelling Computation: Languages and Grammars, Finite-State Machines with Output, Finite-State Machines with No Output, Language Recognition, Turing Machines.

Text Book:

1. Discrete Mathematics & Its Applications with Combinatorics and Graph Theory by Kenneth H Rosen, Tata McGraw-Hill Publishing Company Ltd., New Delhi.

Reference Books:

1. Discrete Mathematics for Computer Scientists & Mathematicians by Joe L. Mott, Abraham Kandel, Theodore P. Baker, Prentice-Hall, India.
2. Discrete Mathematics by Richard Johnson Baug, Pearson Education, New Delhi.
3. Discrete and Combinatorial Mathematics by Ralph. G. Grimaldi, Pearson Education, New Delhi.

IT2102 COMPUTER ORGANIZATION AND ARCHITECTURE

Course Objectives:

- To study about structure and functional components of a computer.
- Understanding the hierarchical organization of a computer system which consists of instruction set of commands.
- Learn about the architecture of a computer from a programming view.
- To design a balance system that minimizes performance and utilization of all elements.

Course Outcomes:

By the end of the course, the student should be able to:

- Demonstrate knowledge about major components of a computer such as processor, memory and I/O modules along with their interconnections internally with outside world.
- have detailed idea about architecture of central processing unit, functions of control unit, memory, I/O devices and their issues.
- Understand simple and multiple processor organization and their issues.

SYLLABUS

Register Transfer and Micro operations: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations, Arithmetic Logic Shift Unit.

Basic Computer Organization and Design: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input- Output and Interrupt, Complete Computer Description, Design of Basic Computer, Design of Accumulator Logic.

Micro programmed Control: Control Memory, Address Sequencing, Micro program Example, Design of Control Unit.

Central Processing Unit: Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer (RISC), Architecture and Programming of 8085 Microprocessor

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISK Pipeline, Vector Processing, Array Processors.

Input/output Organization: Peripheral Devices, I/O interface, Asynchronous data transfer, Modes of transfer, priority Interrupt, Direct memory access, Input-Output Processor (IOP), Serial Communication.

Memory Organization: Memory Hierarchy, Main memory, Auxiliary memory, Associate Memory, Cache Memory, and Virtual memory, Memory Management Hardware.

Text Books:

1. Computer System Architecture, M. Morris Mano, Prentice Hall of India Pvt. Ltd., Third Edition, Sept.2008.
2. Computer Architecture and Organization, P.Chakraborty.
3. Microprocessor Architecture, Programming and Applications with the 8085by Ramesh S Gaonkar

Reference Books:

1. Computer Architecture and Organization, William Stallings, PHI Pvt. Ltd., Eastern Economy Edition, Sixth Edition, 2003.
2. Computer Organization and Architecture, Linda Null, Julia Lobur, Narosa Publications ISBN81- 7319-609-5
3. Computer System Architecture", John. P.Hayes.

IT2103 PROBABILITY, STATISTICS AND QUEUING THEORY

Course Objectives:

- To provide foundations of probabilistic and statistical analysis
- To provide an understanding on concepts of probability, random variables, probability distributions, sampling, estimation, hypothesis testing, regression, correlation, multiple regression, hypothesis testing, sample test, queuing methods
- To explore applications of probabilistic and statistical tools to solve real world problems.

Course Outcomes:

After completion of the course the student should be able to:

- Define and explain basic concepts in probability theory and how to translate real-world problems into probability models
- Solve standard problems that include random variables, discrete and continuous probability distributions
- Perform Test of Hypothesis and construct a confidence interval to estimate population parameters
- Compute and interpret the results of Correlation Analysis, Multivariate Regression, Chi-Square test for Independence and Goodness of Fit
- Explain basic concepts in Markov processes, M/M/1 and M/M/C queueing systems.

SYLLABUS

Probability: Definitions of probability, Addition theorem, Conditional probability, Multiplication theorem, Bayes‟ Theorem of Probability and Geometric Probability.

Random variables and their properties: Discrete Random Variable, Continuous Random Variable, Probability Distribution, Joint Probability Distributions their Properties, Transformation Variables, Mathematical Expectations, Probability Generating Functions.

Probability Distributions: Discrete Distributions: Binomial, Poisson Negative Binominal Distributions and Their Properties; **Continuous Distributions:** Uniform, Normal, Exponential Distributions And Their Properties.

Multivariate Analysis: Correlation, Correlation Coefficient, Rank Correlation, Regression Analysis, Multiple Regression, Attributes, Coefficient Of Association, Chi Square Test For Goodness Of Fit, Test For Independence.

Estimation: Sample, Populations, Statistic, Parameter, Sampling Distribution, Standard Error, Un-biasedness, Efficiency, Maximum Likelihood Estimator, Notion & Interval Estimation.

Testing of Hypothesis: Formulation of Null hypothesis, critic al region, level of significance, power of the test;

Sample Tests: Small Sample Tests: Testing equality of means, testing equality of variances, test of correlation coefficient, test for Regression Coefficient; Large Sample tests: Tests based on normal distribution

Queuing Theory: Queue description, characteristics of a queuing model, study state solutions of M/M/1: Model, M/M/1; N Model, M/M/C: Model, M/M/C: N Model, Case studies.

Text Books:

1. Probability & Statistics for Engineers and Scientists, Walpole, Myers, Myers, Ye. Pearson Education.
2. Probability, Statistics and Random Processes T.Veerarajan Tata McGraw – Hill

Reference Book:

1. Probability & Statistics with Reliability, Queuing and Computer Applications, Kishor S. Trivedi, Prentice Hall of India ,1999

IT2104 OPERATING SYSTEMS

Course Objectives:

- To understand evolution of Operating System.
- To understand operating system as a layer of abstraction above physical hardware that facilitates usage convenience and efficient resource management of computer system resources.
- To learn design and implementation of policies and mechanisms for OS subsystem.
- To investigate case studies to understand the design philosophies / paradigm for popular multiuser or single user operating system.

Course Outcomes:

- The student understands OS evolution, its structure and services provided by it.
- Learn process life cycle, process scheduling objectives, policies and mechanisms, process synchronization, inter process communication, deadlocks and other process subsystem related concepts.
- Learn memory hierarchy, allocation and deallocation policies and mechanism for main and auxiliary memory, file system design and implementation issues.
- investigate UNIX/ LINUX and Windows OS platforms w.r.t similarities and differences in design philosophies.

SYLLABUS

Introduction to Operating Systems: Over View of Operating Systems, Types of Operating Systems, Operating System Structures, Operating System Services, System Calls, Virtual Machines, Operating System Design and Implementation.

Process Management: Process Concepts, Operations on Processes, Cooperating Processes, Threads, Inter Process Communication, Process Scheduling, Scheduling Algorithms, Multiple-Processor Scheduling, Thread Scheduling.

Process Synchronization: The Critical Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classical Problems of Synchronization, Critical Regions, Monitors.

Deadlocks: System Model, Deadlock Characterization, Methods For Handling Deadlocks, Deadlock Prevention, Avoidance, Deadlock Detection, Recovery from Deadlocks.

Memory Management: Logical versus Physical Address, Swapping, contiguous memory allocation, paging, structure of the page table, segmentation, Virtual Memory, Demand Paging, Page Replacement, Allocation of Frames, Thrashing, Memory-Mapped files.

File Systems, Implementation, and Secondary-storage Structure: Concept of a file, Access Methods, Directory Structure, Protection, File System Structure, Allocation Methods, Free Space Management, Directory Management, Device Drivers, overview of Mass-storage structure, Disk structure, disk attachment, disk scheduling, swap-space management.

Case study: Overview of LINUX, Windows Operating systems.

Text Book:

1. Operating Systems, Abraham Silberschatz, Peter Baer Galvin, and Greg Gagne, John Wiley Publ., Seventh Edition.
2. Operating Systems; A Practical Approach. Rajiv Chopra.

Reference Books:

1. Modern Operating Systems, Andrew S. Tanenbaum, ,2nd edition, 1995, PHI.
2. Operating Systems, William Stallings 5th Edition -PHI
3. Operating Systems: A Design-Oriented Approach', Charles Crowley, 'Tata Hill Co.,1998 edition.

IT2105 OBJECT ORIENTED PROGRAMMING THROUGH JAVA

Course Objectives:

- This subject will help to improve the analytical skills of object-oriented programming
- Overall development of problem solving and critical analysis
- Formal introduction to Java programming language

Course Outcomes:

On successful completion of this course, the student should be able to:

- Show competence in the use of the Java programming language in the development of small to medium-sized application programs that demonstrate professionally acceptable coding and performance standard
- Understand the basic principles of the object-oriented programming
- Demonstrate an introductory understanding of graphical user interfaces, multi- threaded programming, and event-driven programming.

SYLLABUS

Introduction to Java: Basics of Java programming, Data types, Variables, Operators, Control structures including selection, Looping, Java methods, Overloading, Math class, Arrays in java.

Objects and Classes: Basics of objects and classes in java, Constructors, Finalizer, Visibility modifiers, Methods and objects, Inbuilt classes like String, Character, StringBuffer, File, this reference

Inheritance and Polymorphism: Inheritance in java, Super and sub class, Overriding, Object class, Polymorphism, Dynamic binding, Generic programming, Casting objects, Instance of operator, Abstract class, Interface in java, Package in java, UTIL package.

Event and GUI programming: Event handling in java, Event types, Mouse and key events, GUI Basics, Panels, Frames, Layout Managers: Flow Layout, Border Layout, Grid Layout, GUI components like Buttons, Check Boxes, Radio Buttons, Labels, Text Fields, Text Areas, Combo Boxes, Lists, Scroll Bars, Sliders, Windows, Menus, Dialog Box, Applet and its life cycle, Introduction to swing

I/O programming: Text and Binary I/O, Binary I/O classes, Object I/O, Random Access Files.

Multithreading in java: Thread life cycle and methods, Runnable interface, Thread synchronization, Exception handling with try-catch-finally, Collections in java, Introduction to JavaBeans and Network Programming.

Java Database Connectivity (JDBC): JDBC Product, Types of Drivers, Two-Tier Client/Server Model, Three-Tier Client/Server Model, Basic Steps of JDBC, Creating and Executing SQL Statement, The Result Set Object, Working with Database MetaData Interface

Reference Books:

1 Introduction to Java Programming (Comprehensive Version), Daniel Liang, Seventh Edition, Pearson.

2 Programming in Java, Sachin Malhotra & Saurabh Chaudhary, Oxford University Press.

3 Murach's Beginning Java 2, Doug Lowe, Joel Murach and Andrea Steelman, SPD.

4 Core Java Volume-I Fundamentals, Eight Edition, Horstmann & Cornell, Pearson Education.

5 The Complete Reference, Java 2 (Fourth Edition), Herbert Schild, TMH.

6 Java Programming, D. S. Malik, Cengage Learning.

IT2106 COMPUTER ORGANIZATION & ARCHITECTURE LAB

Course Objectives:

- to design and analyse the operational behaviour of IC gates, multiplexers, decoders, flip-flops, counters, shift registers, binary adders and subtractors and ALU.
- to implement assembly language programming using various trainers.
- to make students familiar with Pentium class PC architecture.

Course Outcomes:

After completion of the course the student should be able to:

- analyse the operational behaviour of various digital logic units such as multiplexers, decoders, flip-flops, counters, shift registers, binary adders and subtractors and ALU.
- write assembly language code using various trainers.
- understand Pentium class PC architecture.

SYLLABUS

I - Cycle: Digital Logic Design Experiments

TTL Characteristics and TTL IC Gates

Multiplexers & Decoders

Flip-Flops

Counters

Shift Registers

Binary Adders & Subtractors

A L U

II - CYCLE: 8085 Assembly Language Programming

8085 Assembly Language Programming according to theory course microprocessors-I using the following trainers:

Keyboard Monitor of 8085µP Trainer

Serial Monitor of 8085µP Trainer with Terminal

8085 Line Assembler of 8085µP Trainer with PC as Terminal

8085 Cross Assembler using In-Circuit Emulator (ICE) with 8085µP Trainer and PC as Terminal

Graded Problems are to be used according to the syllabus of computer organizationPentium class pc architecture familiarization hardware & software parts demonstration

Reference Books:

1. Computer System Architecture, M. Morris Mano, Prentice Hall of India Pvt. Ltd., Third Edition, Sept.2008
2. Microprocessor Architecture, Programming and Applications with the 8085 by Ramesh S Gaonkar.

IT2107 OBJECT ORIENTED PROGRAMMINGTHROUGH JAVA LAB

Course Objectives:

- To develop programs using basic OOPS concepts such as classes and objects.
- To implement programs using Inheritance concepts.
- To implement programs using Exception handling.
- To develop programs using operator overloading concepts.

Course Outcomes:

- Student will be able to use OOPs concepts.
- Ability to apply Inheritance concepts to several problems.
- Ability to use Exception Handling concepts.

List of Programs:

1. Program to define a structure of a basic JAVA program
2. Program to define the data types, variable, operators, arrays and control structures.
3. Program to define class and constructors. Demonstrate constructors.
4. Program to define class, methods and objects. Demonstrate method overloading.
5. Program to define inheritance and show method overriding.
6. Program to demonstrate Packages.
7. Program to demonstrate Exception Handling.
8. Program to demonstrate Multithreading.
9. Program to demonstrate I/O operations.
10. Program to demonstrate Network Programming.
11. Program to demonstrate Applet structure and event handling.
12. Program to demonstrate Layout managers.

IT2108 OPERATING SYSTEMS LAB

Course Objectives:

- To learn about UNIX/LINUX operating system environment.
- To learn about system calls for UNIX/LINUX Operating System.
- To understand resource management policies and mechanisms and their performance evaluation.

Course Outcomes:

- The student learns about multiprogramming, and multitasking capabilities of UNIX/LINUX.
- The student develops skill in writing C programs using system calls for process management, inter process communication and other aspects.
- The student learns to simulate OS resource management aspects like process scheduling, page replacement, disk scheduling, free space management and others to evaluate performance.

Syllabus

Module I

1. OS lab familiarization, Home Assignment on Unix commands, Vi editor
2. Simple shell programming exercises
3. Shell programming using decision making constructs, loop constructs, file and

directory manipulation

4. Simple C programs using command line arguments, system calls, library function calls, make utility
5. C programs using system call to create processes and study parent, child process mechanism
6. C programs to create process chaining, spawning
7. C programs to error handling using errno(), perror() function
8. C programs to use pipe system call for inter process communication

Module II

1. C programs to study process scheduling implementing FCFS, Shortest Job First, and Round Robin algorithms
2. C programs to study page replacement implementing FIFO, Optimal, and LRU page replacement algorithms

3. C programs to study deadlock avoidance and detection
4. C Programs to simulate free space management (first fit, best fit, worst fit).
5. C programs to study disk scheduling algorithms (i.e., SCAN, SSTF, LOOK, etc.,)

References:

1. Unix concepts and applications by Sumitabha Das, TMH Publications.
2. Unix programming by Stevens, Pearson Education.
3. Shell programming by YashwanthKanetkar.
4. Operating SystemConcepts by Silberschatz, and Peter Galvin.

IT2109 INTELLECTUAL PROPERTY RIGHTS

Course Objectives:

- To introduce the students to Intellectual Property Rights (IPR) which is a key component in modern knowledge management processes
- To create consciousness on IPR in students at an early stage of their education so that they develop an appreciation for ethical and rightful use of existing knowledge
- To make them understand how to take ownership of knowledge they may develop as a result of their creative innovations, take ownership and either drive themselves in becoming entrepreneurs or become responsible knowledge users in society
- To expose students some of the recent debates on the societal implications of IPR and its role in national/international trade and socio-economic development.

Course Outcomes:

Learners will be able to

- identify the types of intellectual property protection available for their research outcome
- conduct patent search and analyse patentability of the invention
- understand the basic structure of Patent document
- understand the registration and prosecution of different IPs
- understand the basics of IP commercialization and techno/commercial/legal issues in IPR commercialization

SYLLABUS

Introduction: Concept of property, Intellectual Property (IP) and Intellectual Property Rights (IPR), Importance of IP, Value creation through IP, Advantages of IP protection, Competitive advantage, Promotion of social good, Prevention of duplicates, counterfeit products and IP.

Evolution of IP system: Historical view of IP system in India and abroad, Legal basis and rationale behind development of IP system, WTO and TRIPS agreement, Role of WIPO.

Types of IPR: Major forms of IP in India and globally, Acts enacted in India related to IP.

Patent: Concept, Life of patent, Rights of Patentee, Criteria of patentability- novelty, non-obviousness, and utility, Non-patentable inventions.

Patent filing and prosecution: Prior art search, Process of obtaining a patent in India, Provisional and complete specification, Convention application, Patent Cooperation Treaty (PCT), Patent Infringement and Enforcement.

Trademark: Types of trademarks, Trademark and Brand, Trademark Registration, Trademark Infringement.

Copyright: Copyrights and related rights, Copyright registration, Copyright infringement, Section 52 of Indian Copyright Act.

Industrial Design: What is Industrial design, Design registration, Design infringement.

Trade Secret: What are Trade Secrets, How trade secrets are maintained in trade and business.

Other forms of IP: Semiconductor Integrated Circuits Layout Design, Geographical Indications, Protection of Plant Varieties & Farmers' right, Traditional knowledge.

IP commercialization: Licensing & Royalty; Technology Transfer; IP assignment, Compulsory License.

Emerging areas: Pat informatics, IP and bank loan, IP insurance, IP audit, IP valuation, IP management, Use of artificial intelligence in IP enforcement, Open innovation.

Text Books:

1. Ganguli Prabuddha, Gearing up for Patents The Indian Scenario", Universities Press (1998)
2. Ganguli Prahuddha "Intellectual Property Rights-Unleashing the Knowledge Economy". Tata McGraw Hill (2001)
3. Geographical Indications of Goods Act 1990 Ganguli Piabaddha "Geographical Indications-its evolving contours accessible in http ips. nminsoda/files/2012/05/main book pdf (2009)

Reference Books:

1. Ganguli Prabuddha and Jahade Siddharth, "Nanotechnology Intellectual Property Rights Research, Design, and Commercialisation", CRC Press, Taylor and Francis Group, USA (2012)
2. Beyond Intellectual Property: Toward Traditional Resource Rights for Indigenous Peoples and Local Communities [Paperback J,Darrell A. Posey and Graham Dotfield, IDRC Books; annotated edition (June (1996)
3. Netancl Neil Weinstock, Copyright's Paradox, Oxford University Press (2010)
4. The Indian Patents Act 1970 (as amended in 2005)
5. The Indian Copyright Act 1950 as amended in 2017)
6. Indian Trademarks Act 1999
7. The Indian Industrial Designs Act 2000
8. The Protection of Plant Varieties and Farmers' Right Act 2001
9. Inventing the Future: An Introduction to Patents for small and medium sized enterprises, WIPO publication No 917 www.wipo.int/ebookshop
10. Looking Good: An Introduction to Industrial Designs for Small and Medium sized Enterprises; WIPO publication No.498 www.wipo.int/ebookshop

IT2110 ENVIRONMENTAL SCIENCE

Course Objectives:

The objectives of the Environmental Science course are to

- Familiarize the fundamental aspects of environment and the environmental management'
- Provide information of some of the important international conventions which will be useful during the future endeavours after graduation.
- Make realize the importance of natural resources management for the sustenance of the life and the society.
- Apprise the impact of pollution getting generated through the anthropogenic activities on the environment
- Provide the concept of Sustainable Development, energy and environmental management
- Impart knowledge on the new generation waste like e-waste and plastic waste.

Course Outcomes:

After completion of the course the students will have

- Knowledge on the fundamental aspects of environment and the environmental management
- The knowledge on the salient features of the important international conventions
- Understanding of the importance of natural resources management for the sustenance of the life and the society.
- Familiarity on various forms of pollution and its impact on the environment.
- Understand the elements of Sustainable Development, energy and environmental management
- Knowledge on the new generation waste like e-waste and plastic waste.

SYLLABUS

Introduction: Structure and functions of Ecosystems-Ecosystems and its Dynamics-Value of Biodiversity-impact of loss of biodiversity, Conservation of bio-diversity. Environmental indicators - Global environmental issues and their impact on the ecosystems. Salient features of international conventions on Environment: Montreal Protocol, Kyoto protocol, Ramsar Convention on Wetlands, Stockholm Convention on Persistent Organic Pollutants, United Nations Framework Convention on Climate Change (UNFCCC),

Natural Resources Management: Importance of natural resources management-Land as resource, Land degradation, Soil erosion and desertification, Effects of usage of fertilizer, herbicides and pesticide- watershed management.

Forest resources: Use and over-exploitation, Mining and dams – their effects on forest ecosystems and the living beings.

Water resources: Exploitation of surface and groundwater, Floods, droughts, Dams: benefits and costs.

Mineral Resources: Impact of mining on the environment and possible environmental management options in mining and processing of the minerals.

Sustainable resource management (land, water, and energy), and resilient design under the changing environment.

Environmental Pollution: Local and Global Issues. Causes, effects and control measures. Engineering aspects of environmental pollution control systems.

Air pollution: impacts of ambient and indoor air pollution on human health. Water pollution: impacts water pollution on human health and loss of fresh water resources. Soil pollution and its impact on environment. Marine pollution and its impact on blue economy. Noise pollution.

Solid waste management: Important elements in solid waste management- Waste to energy concepts. Air (prevention and control of pollution) Act, Water (prevention and control of pollution) Act and their amendments. Salient features of Environmental protection Act, 1986.

Sustainable Development: Fundamentals of Sustainable Development– Sustainability Strategies and Barriers – Industrialization and sustainable development. Circular economy concepts in waste (solid and fluid) management.

Energy and Environment: Environmental Benefits and challenges, Availability and need of conventional energy resources, major environmental problems related to the conventional energy resources, future possibilities of energy need and availability. Solar Energy: process of photovoltaic energy conversion, solar energy conversion technologies and devices, their principles, working and applications, disposal of solar panel after their usage. Biomass energy: Concept of biomass energy utilization, types of biomass energy, conversion processes, Wind Energy, energy conversion technologies, their principles, equipment and suitability in context of India.

Management of plastic waste and E-waste: Sources, generation and characteristics of various e- and plastic wastes generated from various industrial and commercial activities; Waste management practices including onsite handling, storage, collection and transfer. E-waste and plastic waste processing alternatives. E-Waste management rules and Plastic waste management rules, 2016 and their subsequent amendments.

Text Books:

1. Bharucha,Erach (2004). Textbook for Environmental Studies for Undergraduate Courses of all Branches of Higher Education, University Grants Commission, New Delhi.
2. Basu, M., Xavier, S. (2016). Fundamentals of Environmental Studies, Cambridge University Press, India
3. Masters, G. M., &Ela, W. P. (1991). Introduction to environmental engineering and science. Englewood Cliffs, NJ: Prentice Hall.
4. Enger, E. and Smith, B., Environmental Science: A Study of Interrelationships, Publisher: McGraw-Hill Higher Education; 12th edition, 2010.

Reference Books:

1. Sharma, P. D., & Sharma, P. D. (2005). Ecology and environment. Rastogi Publications
2. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
3. Clark R.S. (2001). Marine Pollution, Clanderson Press Oxford (TB)
4. Jadhav, H & Bhosale, V.M. (1995). Environmental Protection and Laws. Himalaya Pub. House, Delhi 284 p.
5. MoEF&CC, Govt. of India, CPCB: E-waste management rules, 2016 and its amendments 2018.
6. MoEF&CC, Govt. of India, CPCB: Plastic waste management rules, 2016.



(With effect from 2022-23 AB)

B.Tech

INFORMATION TECHNOLOGY

(Common with B.Tech(CSE), B.Tech + M.Tech(CSE), B.Tech(AI), B.Tech(AI&ML), B.Tech(AI&DS), B.Tech(E&CE))

II Year - II Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
IT2201	ES	Microprocessors	4	0	30	70	100	3
IT2202	PC	Design and Analysis of Algorithms	4	0	30	70	100	3
IT2203	PC	Database Management Systems	4	0	30	70	100	3
IT2204	PC	Formal Languages & Automata Theory	4	0	30	70	100	3
IT2205	HSS	Managerial Economics	4	0	30	70	100	3
IT2206	PC	Algorithms Lab through C++.	0	3	50	50	100	1.5
IT2207	PC	Database Management Systems Lab	0	3	50	50	100	1.5
IT2208	SC	Web Technologies	1	2	50	50	100	2
IT2209	MC	Professional Ethics & Universal Human Values	0	0	0	100	100	0
IT2210	MC	NCC/NSS	0	2	-	-	-	0
Total credits								**20**
Internship-I								

IT2201 MICROPROCESSORS

Course Objectives:

- To discuss the architectures of 8085, 8086 microprocessors, their instruction sets and related ALP programs.
- To discuss interfacing semiconductor memories, interfacing peripheral to Intel 8086.
- To study interfacing data converters to 8086 and discuss about micro controller 8051 architecture.

Course Outcomes:

- Understand the basic architectures of 8085 and 8086 microprocessors.
- Ability to write ALP programs using instruction sets.
- Understand the various interfacing concepts and micro controllers.

SYLLABUS

Introduction to Microprocessors and Microcomputers: A Brief Architecture and Programming of 8085Microprocessor.

Architecture: Instruction Set and Programming of 8086Microprocessor

Interfacing Semiconductor Memories and I/O Devices: Semiconductor Memories: Classification Internal Organization& Functional Description, Interfacing SRAMs and EPROMs to8086, Interfacing Characteristics of I/Devices, I/O Device addressing methods, I/O Device Programming Methods.

Interfacing Peripherals to Intel8086 -1: Parallel I/O Interface- 8255, Serial I/O Interface –8251, Timer Interface -8253/8254

Interfacing Peripheral to Intel 8086 - 2: Keyboard / Display Interface – 8279, Interrupt Controller Interface – 8259

Interfacing Data Converters to 8086: D/A Conversion Methods, A/D Conversion methods, Interfacing DAC, Interfacing ADC.

Introduction to Micro controllers: Intel 8051Architecture and Programming

Text Books:

1. Microprocessor Architecture, Programming, and Applications with the 8085 Ramesh S.Gaonkar, 4thEdition, PenramInternational,1999
2. The 80x86 Family, Design, Programming and Interfacing, John E.Uffenbeck, 3rdEdition,Pearson Education Inc.,2002
3. KennethJ.Ayala, 8051 Microcontroller Architecture, Programming And Applications, 2ndEdition, Penram InternationalPublications,1999

Reference Books:

1. BARRYB.BREY, The Intel Microprocessors 8086 / 8088, 80186 / 80188, 80286, 80386 and 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium4, Architecture, Programming and Interfacing, 8th Edition, Pearson Education Inc.,2009
2. WalterA.Tribeland, Avtar Singh, The 8088 and 8086 Microprocessors, Programming, interfacing, Software, Hardware, and Applications, 4thEdition, Pearson Education Inc.,20033. Microprocessors and Interfacing, Programming and Hardware, 2ndEdition, Douglass V. Hall, TMH Edition,1999
3. SanjayK Bose,Hardware and Software of Personal Computers, New Age International (P)Ltd.,1991 MykePredko, Programming and Customizing the 8051 Microcontroller, TMH,1999

IT2202 DESIGN AND ANALYSIS OF ALGORITHMS

Course Objectives:

Upon completion of this course, students will be able to do the following:

- Analyse the asymptotic performance of algorithms.
- Write rigorous correctness proofs for algorithms.
- Demonstrate a familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations

Course Outcomes:

Students who complete the course will have demonstrated the ability to do the following:

- Argue the correctness of algorithms using inductive proofs and invariants.
- Analysis worst-case running times of algorithms using asymptotic analysis.
- Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and conquer algorithms. Derive and solve recurrences describing the performance of divide and-conquer algorithms.
- Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic programming algorithms, and analysis them.
- Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms, and analysis them.

SYLLABUS

Introduction: What is an Algorithm, Algorithm Specification, Pseudocode Conventions Recursive Algorithm, Performance Analysis, Space Complexity, Time Complexity, Amortized Complexity, Amortized Complexity, Asymptotic Notation, Practical Complexities, Performance Measurement.

Divide and Conquer: General Method, Defective Chessboard, Binary Search, Finding the Maximum and Minimum, Merge Sort, Quick Sort, Performance Measurement, Randomized Sorting Algorithms.

The Greedy Method: The General Method, Knapsack Problem, Job Sequencing with Deadlines, Minimum-cost Spanning Trees, Prim’s Algorithm, Kruskal’s Algorithms, An Optimal Randomized Algorithm, Optimal Merge Patterns, Single Source Shortest Paths.

Dynamic Programming: All - Pairs Shortest Paths, Multistage graphs, optimal binary search tree, String editing, 0/1 Knapsack, Reliability Design.

Backtracking: The General Method, The 8-Queens Problem, Sum of Subsets, Graph Colouring, Hamiltonian Cycles, Knapsack problem

Branch and Bound: Least cost (LC) Search, The 15-Puzzle, Control Abstraction for LC-Search, Bounding, FIFO Branch-and-Bound, LC Branch and Bound, 0/1 Knapsack Problem, LC Branch-and Bound Solution, FIFO Branch-and-Bound Solution, Traveling Salesperson problem.

Limitations of Algorithm Power: Lower-Bound Arguments, Decision Trees, P, NP and NP – complete problems – Challenges of Numerical Algorithms.Limitations of Algorithms Power: Backtracking – Branch-and Bound– Approximation Algorithms for NP-hard Problems – Algorithms for solving Nonlinear Equations.

Text Books:

1. Fundamentals of computer algorithms E. Horowitz S. Sahni, Sanguthevar Rajasekaran, University Press.
2. Introduction to Algorithms by Thomas H. Corman, Charles E. Leiserson, Ronald R. Rivest & Clifford Stein, Prentice Hall of India, New Delhi, New Delhi.

Reference Books:

1. Data structures and algorithm analysis in C++ / Mark Allen Weiss, Florida International University. — Fourth edition.
2. Introduction to Design & Analysis of Algorithms by Anany Levitin, Pearson Education, New Delhi, 2003
3. Introduction to Algorithms by Thomas H. Corman, Charles E. Leiserson, Ronald R. Rivest & Clifford Stein, Prentice Hall of India, New Delhi, New Delhi.
4. The Design and Analysis of Computer Algorithms, Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman

IT2203 DATABASE MANAGEMENT SYSTEMS

Course Objectives:

- To learn the evolution of DBMS Versus File systems, data models, and layers of abstraction.
- To understand conceptual and physical aspects of database design.
- To learn formal and commercial query language specifications.
- To understand concurrency control, recovery management, and other related issues.

Course Outcomes:

- The student will understand ER-modelling for conceptual database design and relational model.
- The student is introduced to formal and commercial query languages: Relational Algebra, calculus and SQL.
- The student will learn schema refinement and normalization.
- The student understands locking protocols concurrency control, and crash recovery methods.

SYLLABUS

Introduction: File system versus a DBMS, Advantages of a DBMS, Describing and Storing Data in a DBMS, The Relational model, Levels of abstraction, Data Independence, Transaction management, Structure of a DBMS.

Introduction to Database Design and The Relational Model: Database Design and ER Diagrams, Entities, Attributes and Entity Sets, Relationships & Relationship Sets, Additional Features of the ER Model, Conceptual Design with ER Model, Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity Constraints, Querying Relational Data, Logical Database Design: ER to Relational, Introduction to Views, Destroying/ Altering Tables and Views.

Relational Algebra and SQL: Preliminaries, Relational Algebra, The form of a Basic SQL Query, UNION, INTERSECT and EXCEPT, Nested Queries, Aggregate Operators, Null Values, Complex Integrity Constraints in SQL, Triggers and Active Databases, Embedded SQL, Dynamic SQL, JDBC.

Database Design: Schema Refinement and Normal Forms, Introduction to Schema Refinement, Functional Dependencies, Reasoning about FD's, Normal Forms, Properties of Decomposition, Normalization, Other kinds of Dependencies.

Transaction Management: The ACID Properties, Transactions & Schedules, Concurrent Execution of Transactions, Lock-Based Concurrency Control.

Concurrency Control: 2PL, Serializability and Recoverability, Introduction to Lock Management, Lock Conversions, Dealing with Deadlocks, Specialized Locking Techniques, Concurrency Control without Locking.

Crash Recovery: Introduction to ARIES, The Log, Other Recovery-Related Structures, The Write-Ahead Log Protocol, Check pointing, Recovering from a System Crash, Media Recovery.

Text Books:

1. Database Management Systems; Raghu Ramakrishnan, Johannes Gehrke 4th Edition, McGraw-Hill.

Reference:

1. Database System Concepts; A. Silberschatz, H. Korth 5th Edition, McGraw-Hill

IT2204 FORMAL LANGUAGES AND AUTOMATA THEORY

Course Objectives:

- To introduce the concepts in automata theory and theory of computation to design grammars and recognizers for different formal languages.
- To employ finite state machines to solve problems in computing.
- To introduce finite state machines, context free grammars and Turing Machines and their properties as the basis for the formal expressivity of computer languages for solving linguistic decision problems.
- To understand the concepts of tractability and decidability, the concepts of NP-completeness and NP-hard problem and also the challenges for Theoretical Computer Science and its contribution to other sciences.

Course Outcomes:

- Ability to think analytically and develop intuitiveunderstanding of the core concepts in automata theory and formal languages.
- An ability to design grammars and automata (recognizers) for different language classes, identify formal languagesand membership properties.
- Ability to Understand the functioning of Finite-State Machines and its variants, Pushdown Automata and Turing Machines.
- Ability to distinguish among NP hard and NP completeness in related areas.

SYLLABUS

Introduction to Grammars and Languages: Definitions of alphabet, strings, language, grammar, types of grammar, types of machines, generation of languages from grammar, construction of grammar from the given description of languages, Chomsky Hierarchy of languages.

Finite State Machine (FSM): Definition of finite state machine, Representation of FSMs. Classification of FSM's and their construction, Conversion from NFA to DFA, Elimination of ε – transitions from NFA, Equivalence of two FSM's, optimization of finite state machine (Equivalence theorem method and Table filling method), Finite state machine with output: Moore and Mealy machines. Applications of FSM.

Regular Expression and Languages: Regular Expression, Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Properties of Regular Languages: Pumping Lemma for regular Languages, Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, Equivalence and Minimization of Automata.

Context Free Grammars and Languages: Context Free Grammars, Parse Trees, Applications of Context-Free Grammars, Ambiguity in Grammars and Languages, Normal Forms, Pumping Lemma for CFL, Closure properties of CFL, Decision properties for CFL.

Push down Automata: Definition of push down automata, The Languages of a PDA, push down automata, Equivalence of PDA's and CFG's, push down automata to context free grammar, context free grammar to push down automata, Deterministic Pushdown Automata.

Turing Machines: The Definition of Turing Machine, Turing Machine Model, Representation of Turing Machines, Language Acceptability by Turing Machines, Design of Turing Machines, Description of Turing Machines, Techniques for TM Construction, Variants of Turing Machines, Turing Machines and Type 0 Grammars.

Undecidability: A Language That Is Not Recursively Enumerable, An Undecidable Problem That Is RE, Undecidable Problems About Turing Machines, Decidable & Undecidable Problems, Post Correspondence Problem.

Text Books:

1. Introduction to automata theory, languages and computation, John.E.H.P croft/ Rajeev Motwani & JD Ullman—pearson education- III edition
2. Theory of computation, K.L.P.Mishra and N.Chandrasekhar, PHI

Reference Books:

1. Theory of computation, formal languages and automata theory, G P Saradhi Varma, B.Thirupathi Rao –Sci Tech publications.

IT2205 MANAGERIAL ECONOMICS

Course Objectives:

- To bring about an awareness about the nature of Managerial Economics and its linkages with other disciplines.
- To understand the Micro and Macro Environment of Business.
- To familiarize the prospective engineers with the concepts and tools of Managerial Economics with an objective to understand the real world of business.

Course Outcomes:

After completion of the course, student will be able to:

- Understand the various economic activities in business and industry.
- Analyse the real-world business problems.
- Make optimal business decisions for the effective and efficient management of Organisations.

SYLLABUS

Significance of Economics and Managerial Economics:

Economics: Definitions of Economics- Wealth, Welfare and Scarcity definitions Classification of Economics- Micro and Micro Economics.

Managerial Economics: Definition, Nature and Scope of Managerial Economics, Differences between Economics and Managerial Economics, Main areas of Managerial Economics, Managerial Economics with other disciplines.

Demand and Utility Analysis:

Demand - Definition, Meaning, Nature and types of demand, Demand function, Law of demand - Assumptions and limitations. Exceptional demand curve.

Elasticity of demand - Definition, Measurement of elasticity, Types of Elasticity

(Price, Income, Cross and Advertisement), Practical importance of Price elasticity of demand, Role of income elasticity in business decisions, Factors governing Price Elasticity of demand.

Utility Analysis: Utility- Meaning, Types of Economic Utilities, Cardinal and Ordinal Utility, Total Utility, Marginal Utility, The law of Diminishing Marginal Utility and its Limitations.

Theory of Production and Cost analysis:

Production - Meaning, Production function and its assumptions, use of production function in decision making; **Cost analysis** - Nature of cost, Classification of costs - Fixed vs. Variable costs, Marginal cost, Controllable vs. Non - Controllable costs, Opportunity cost, Incremental vs. Sunk costs, Explicit vs. Implicit costs, Replacement costs, Historical costs, Urgent vs. Postponable costs, Escapable vs. Unavoidable costs, Economies and Diseconomies of scale.

Market Structures: Definition of Market, Classification of markets; Salient features or conditions of different markets - Perfect Competition, Monopoly, Duopoly , Oligopoly, Importance of kinked demand curve ;Monopolistic Competition.

Pricing and Business Cycles:

Pricing Analysis: Pricing – Significance; Different Pricing methods- Cost plus pricing, Target pricing, Marginal cost pricing, Going -rate pricing, Average cost pricing, Peak load pricing , Pricing of joint Products, Pricing over the life cycle of a Product, Skimming pricing Penetration pricing, Mark- up and Mark- down pricing of retailers.

Business cycles - Definition, Characteristics, Phases, Causes and Consequences; Measures to solve problems arising from Business cycles.

Text Books:

1. Sankaran,S., Managerial Economics, Marghan Publications, 2015, Chennai.
2. Aryasri, A.R., Managerial Economics and Financial Analysis, MC Graw Hill Education, New Delhi,2015.

Reference Books:

1. Dwivedi, D.N., Managerial Economics, Vikhas Publishing House Pvt. Ltd. 6th Edition, New Delhi,2004.
2. Dewett, K.K., Modern Economic Theory, S.Chand& Company Ltd., New Delhi, 2005.

IT2206 ALGORITHMS LAB (Through C++)

Course Objectives:

- The laboratory component will emphasize two areas:
- Implementation of algorithms covered in class: This will involve running the algorithms under varying input sets and measuring running times, use of different data structures for the same algorithm (wherever applicable) to see its effect on time and space, comparison of different algorithms for the same problem etc.
- Design of Algorithms: This will involve design and implementation of algorithms for problems not covered in class but related to topics covered in class.
- The exact set of algorithms to design and implement is to be decided by the instructor. In addition, there will be at least one significantly large design project involving some real world application. An efficient design of the project should require the use of multiple data structures and a combination of different algorithms/techniques.

Course Outcomes:

The student should be able to:

- Design algorithms using appropriate design techniques (brute-force, greedy, dynamic programming, etc.)
- Implement a variety of algorithms such assorting, graph related, combinatorial, etc., in a high level language.
- Analyze and compare the performance of algorithms using language features.
- Apply and implement learned algorithm design techniques and data structures to solve real-world problems.

Programs List:

1. a) Create a CPP class called Student with the following details as variables within it.

   (i) Register_number

   (ii) Student_name

   (iii) Programme_name

   (iv) Phone _number

   Write a program to create nStudent objects and print the Register_number, Student_name, Programme_name, and Phone_numberof these objects with suitable headings.

   b). Write a program to implement the Stack using arrays. Write Push (), Pop(), and Display() methods to demonstrate its working.

2. a). Design a superclass called Staff with details as StaffId, Name, Phone, Salary. Extend this class by writing three subclasses namely Teaching (domain, publications), Technical (skills),

and Contract (period). Write a CPP program to read and display at least 3 staff objects of all three categories.

b). Write a class called Customer to store their name and date_of_birth. The date_of_birth format should be dd/mm/yyyy. Write methods to read customer data as and display as using StringTokenizer class considering the delimiter character as "/".

3. a). Write a program to read two integers aandb. Compute a/b and print, when b is not zero. Raise an exception when b is equal to zero.

b). Write a program that implements a multi-thread application that has three threads. First thread generates a random integer for every 1 second; second thread computes the square of the number and prints; third thread will print the value of cube of the number.

4. Sort a given set of n integer elements using Quick Sort method and compute its time complexity. Run the program for varied values of n> 5000 and record the time taken to sort. Plot a graph of the time taken versus non graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using CPP how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.

5. Sort a given set of n integer elements using Merge Sort method and compute its time complexity. Run the program for varied values of n> 5000, and record the time taken to sort. Plot a graph of the time taken versus non graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using CPP how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.

6. Implement the Knapsack problem using (a) Dynamic Programming method (b) Greedy method.

7. Write a program-from a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm..

8. Find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal'salgorithm. Use Union-Find algorithms in your program.

9. Find Minimum Cost Spanning Tree of a given connected undirected graph using Prim's algorithm.

10. Write programs to

(a) Implement All-Pairs Shortest Paths problem using Floyd's algorithm.

(b) Implement Travelling Sales Person problem using Dynamic programming.

11. Design and implement inCPP, to find a subset of a given set S = {Sl, S2,.....,Sn} of n positive integers whose SUM is equal to a given positive integer d. For example, if S ={1, 2, 5, 6, 8} and d= 9, there are two solutions {1,2,6}and {1,8}. Display a suitable message, if the given problem instance doesn't have a solution.

12. Design and implement in CPP to find all Hamiltonian Cycles in a connected undirected Graph G of n vertices using backtracking principle.

References:

1. T. H. Cormen, C. L. Leiserson, R. L. Rivest, and C. Stein, Introduction to Algorithms, MIT Press.
2. J. Kleinberg and E. Tardos, Algorithm Design, Addison-Wesley.
3. Harry R. Lewis and Larry Denenberg, Data Structures and Their Algorithms, Harper Collins.
4. A. Gibbons, Algorithmic Graph Theory, Cambridge University Press.
5. Michael T. Goodrich and Roberto Tamassia, Algorithm Design: Foundations, Analysis, and Internet Examples, John Wiley.
6. R. Sedgewick, Algorithms in C (Parts 1-5), Addison Wesley.
7. M. H. Alsuwaiyel, Algorithm Design Techniques and Analysis, World Scientific.
8. Gilles Brassard and Paul Bratley, Algorithmics: theory and practice, Prentice-Hall.
9. Udi Manber, Introduction to Algorithms: A Creative Approach, Addison-Wesley.
10. Sara Baase and Allen Van Gelder, Computer Algorithms: Introduction to Design and Analysis, Addison-Wesley.

IT2207 DATABASE MANAGEMENT SYSTEMS LAB

Course Objectives:

- To introduce to a commercial DBMS such as ORACLE.
- To learn and practice SQL commands for schema creation, data manipulation.
- To learn conceptual and physical database design based on a case study.
- To apply database design stages by studying a case study.

Course Outcomes:

By the end of the course, the student should be able to:

- The student is exposed to a commercial RDBMS environment such as ORACLE.
- The student will learn SQL commands for data definition and manipulation.
- The student understands conceptual through physical data base design.
- The student takes up a case study and applies the design steps.

SYLLABUS

Features of a commercial RDBMS package such as ORACLE/DB2, MS Access, MYSQL & Structured Query Language (SQL) used with the RDBMS.

I. Laboratory Exercises Should Include:

a. Defining Schemas for Applications,
b. Creation of Database,
c. Writing SQL Queries,
d. Retrieve Information from Database,
e. Creating Views
f. Creating Triggers
g. Normalization up to Third Normal Form
h. Use of Host Languages,
i. Interface with Embedded SQL,
j. Use of Forms
k. Report Writing

II. Some sample applications are given below:

1. Accounting Package for Shops,

2. Database Manager for Magazine Agency or Newspaper Agency,
3. Ticket Booking for Performances,
4. Preparing Greeting Cards & Birthday Cards
5. Personal Accounts - Insurance, Loans, Mortgage Payments, Etc.,
6. Doctor's Diary & Billing System
7. Personal Bank Account
8. Class Marks Management
9. Hostel Accounting
10. Video Tape Library,
11. History of Cricket Scores,
12. Cable TV Transmission Program Manager,
13. Personal Library.
14. Sailors Database
15. Suppliers and Parts Database

Reference Books:

1. Database Management Systems; Raghu Ramakrishnan, Johannes Gehrke 4th Edition, McGrawHill

2. Database System Concepts; A. Silberschatz, H. Korth 5th Edition, McGraw-Hill

IT2208 ` WEB TECHNOLOGIES (SC)

Course Objectives:

- To facilitate the graduates with the ability to visualize, gather information, articulate,analyze, solve complex problems, and make decisions. These are essential to address the challenges of complex and computation intensive problems increasing their productivity.
- To facilitate the graduates with the technical skills that prepare them for immediate employment and pursue certification providing a deeper understanding of the technology in advanced areas of computer science and related fields, thus encouraging to pursue higher education and research based on their interest.
- To facilitate the graduates with the soft skills that include fulfilling the mission, setting goals, showing self-confidence by communicating effectively, having a positive attitude, get involved in team-work, being a leader, managing theircareer and their life.

Course Outcomes:

- Able to understand the working principles of the computer system and its components, apply the knowledge to build, asses, and analyze the software and hardware aspects of it.
- Develops comprehensive skills of Programming Languages, Software process models, methodologies, and able to plan, develop, test, analyze, and manage the software and hardware intensive systems in heterogeneous platforms individually or working in teams.
- Able to use the professional, managerial, interdisciplinary skill set, and domain specific tools in development processes, identify the research gaps, and provide innovative solutions to them.

Syllabus

1. Design the following static web pages required for an online book store web site.
   a) HOME PAGE: The static home page must contain three frames.
   b) LOGIN PAGE
   c) CATOLOGUE PAGE: The catalogue page should contain the details of all the books available in the web site in a table.
   d) REGISTRATION PAGE
2. Write JavaScript to validate the following fields of the Registration page.
   a) First Name (Name should contains alphabets and the length should not be less than 6 characters).
   b) Password (Password should not be less than 6 characters length).
   c) E-mail id (should not contain any invalid and must follow the standard pattern name@domain.com)
   d) Mobile Number (Phone number should contain 10 digits only).
   e) Last Name and Address (should not be Empty).
3. Develop and demonstrate the usage of inline, internal and external style sheet using CSS
4. Develop and demonstrate JavaScript with POP-UP boxes and functions for the following problems:

   a) Input: Click on Display Date button using onclick( ) function

   Output: Display date in the textbox

b) Input: A number n obtained using prompt

Output: Factorial of n number using alert

c) Input: A number n obtained using prompt

Output: A multiplication table of numbers from 1 to 10 of n using alert

d) Input: A number n obtained using prompt and add another number using confirm

Output: Sum of the entire n numbers using alert

5. Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next in the list. Add CSS to customize the properties of the font of the capital (colour,bold and font size).
6. Write an HTML page including any required JavaScript that takes a number from text field in the range of 0 to 999 and shows it in words. It should not accept four and above digits, alphabets and special characters.
7. Develop and demonstrate PHP Script for the following problems:
   a) Write a PHP Script to find out the Sum of the Individual Digits.
   b) Write a PHP Script to check whether the given number is Palindrome or not
8. Create an XML document that contains 10 users information. Write a Java Program, which takes User Id as input and returns the user details by taking the user information from XML document using DOM parser or SAX parser.
9. Implement the following web applications using (a) PHP (b) Servlets (c) JSP
   a) A web application that takes a name as input and on submit it shows a hello page where name is taken from the request. It shows the start time at the right top corner of the page and provides a logout button. On clicking this button, it should show a logout page with Thank You message with the duration of usage (hint: Use session to store name and time).
   b) Write a PHP Program to display current Date, Time and Day.
   c) A web application that takes name and age from an HTML page. If the age is less than 18, it should send a page with “Hello, you are not authorized to visit the site” message, where should be replaced with the entered name. Otherwise, it should send “Welcome to this site” message.
   d) A web application that lists all cookies stored in the browser on clicking “List Cookies” button. Add cookies if necessary.
10. Implement the web applications with Database using (a) PHP, (b) Servlets and (c) JSP.
11. Modify the above PHP program to use an xml instead of database
12. Write a program to design a simple calculator using
    (a) JavaScript
    (b) PHP
    (c) Servletand
    (d) JSP.

References:

1. Internet and Web Technologies by Raj Kamal, Tata McGraw-Hill.

2. Programming the World Wide Web by Robert W. Sebesta, Pearson Education.

IT2209 PROFESSIONAL ETHICS AND UNIVERSAL HUMAN VALUES

Course Objectives:

The objective of the course is Sixfold:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- This course will illuminate the students in the concepts of laws and its applicability to engineers
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection, Development of commitment and courage to act and also enable the students to imbibe and internalize the Values and Ethical Behaviour in the personal and professional lives
- To enable the students to imbibe the Values and Ethical Behaviour in the personal and Professional lives
- The students will learn the rights and responsibilities Individual, employee, team member and a global citizen

Course Outcomes:

By the end of the course Student will be able to:

- Grasp the meaning of the concept – Law and also Get an overview of the laws relating to Engineers and also Apprehend the importance of being a law-abiding person and They would have better critical ability
- Self-explore by using different techniques to live in harmony at various levels
- Analyse themselves and understand their position with respect to the moral and ethical character needed for a successful and satisfactory work life
- Students are expected to become more aware of themselves and their surroundings (Family, society, nature)
- They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
- They would also become sensitive to their commitment towards what they have understood (Human values, human relationship and human society

PROFESSIONAL ETHICS AND UNIVERSAL HUMAN VALUES
SYLLABUS

Need, Basic Guidelines, Content and Process for Value Education

Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation - as the process for self-exploration, Continuous Happiness and Prosperity - A look at basic Human Aspirations, Right understanding, Relationship and Physical Facility - the basic requirements for fulfilment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfil the above human aspirations: understanding and living in harmony at various levels. Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-

existence) rather than as arbitrariness in choice based on liking-disliking, Include practice sessions and case studies.

Understanding Harmony in the Human Being - Harmony in Myself!

Understanding human being as: a co-existence of the sentient 'I' and the material 'Body', the needs of Self ('I') and 'Body' - happiness and physical facility, the Body as an instrument of 'I' (I being the doer, seer and enjoyer), the characteristics and activities of 'I' and harmony in 'I', the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail, P to ensure Sanyam and Health, Include practice sessions and case studies.

Understanding Harmony in the Family and Society - Harmony in Human – Human Relationship

Understanding values in human-human relationship: meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship, the meaning of Trust; Difference between intention and competence, the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship, the harmony in the society (society being an extension of family), Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society, Universal Order from family to world family, Include practice sessions and case studies.

Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

Understanding the harmony in the Nature, Interconnectedness and mutual fulfilment among the four orders of nature recyclability and self-regulation in nature, Understanding Existence as Co-existence of mutually interacting units in all – pervasive space, Holistic perception of harmony at all levels of existence, Include practice sessions and case studies.

Concept of Law and Law of Torts

Understanding Essentials of a Valid Contract and the basics of contract law protecting rights and obligations, Introduction to the Law of Torts and the basics to protect oneself and the company Law affecting the Workplace Employers Responsibilities/Duties Hiring Practices, Introduction to Intellectual Property Law, Professional Code of Conduct for Engineers, Relationship between Law and Ethics, Include practice sessions and case studies.

Implications of the above Holistic Understanding of Harmony on Professional Ethics

Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations, Include practice sessions and case studies.

Text Books

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and
    a. Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in
    a. Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2
3. R. Subramanian, "Professional Ethics", Oxford University Press.
4. S.B. Srivasthva, "Professional Ethics & Human Values", SciTech Publications (India) Pvt. Ltd. New Delhi.
5. D.R. Kiran, "Professional Ethics & Human Values", TATA Mc Graw Hill Education.
6. Saroj Kumar, "Business Law" and Avtar Singh, "Law of Contract"

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.
2. A. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book), Mohandas Karamchand Gandhi "The Story of My Experiments with Truth", E. FSchumacher. "Small is Beautiful", Slow is Beautiful–Cecile Andrews, J C Kumarappa "Economy of Permanence", Pandit Sunderlal"Bharat Mein Angreji Raj" and Dharampal, "Rediscovering India
4. G K Kapoor, "Business Law" and Sen & Mitra, "Business & Commercial Laws" and Calvin Frank Allen, "Business law for Engineers"
5. Hilgard, E. R.; Atkinson, R. C. & Atkinson, R.L. (1975). Introduction to Psychology. 6th Edition. New Delhi: Oxford and IBH Publishing Co. Pvt. Ltd.
6. Govindarajan, M; Natarajan, G. M. & Senthilkumar, V.S. (2013). Professional Ethics & Human Values. Prentice Hall: New Delhi
7. Gogate, S. B. (2011). Human Values & Professional Ethics. Vikas Publishing: New Delhi.
8. Charles E Harris Jr., Michael S Pritchard, Michael J Rabins, "Engineering Ethics, Concepts Cases: 4e, Cengage learning, 2015.
9. Caroline Whitbec, "Ethics in Engineering Practice & Research: 2e, Cambridge University Press 2015.

Guidelines for Obtaining MINOR in Information Technology:

Students belonging to other departments have to complete the following courses to obtain MINOR degree in Information Technology:

4. A student belonging to other department have to study CPNM and Python Programming as Compulsory courses and any **TWO** of the following open electives as follows:
   OE I: Block Chain Technology

   OE II: Recommender Systems

   OE III: Information Retrieval

   OE IV: Business Analytics

   OE V: Bio Informatics

OR

One or two MOOCS courses from NPTEL related to Information Technology without repetition from subjects within the curriculum can be used in Lieu of any of the above Open electives.

5. The duration of NPTEL courses should **NOT** be less than 12 weeks.
6. The MOOCS course(s) chosen by students of other departments for obtaining a MINOR in IT should be taken prior permission/ approval from the Chairperson – BoS of the department of **IT&CA/CS&SE, AUCE(A)**.

Guidelines for Obtaining HONORS in Information Technology:

1. The student shall earn additional 15 credits beyond 160 credits from the same branch/ department/ discipline registered for major degree.
   (iv) The students having 7.0 CGPA without any backlog subjects will be permitted to register for HONORS.
   (v) If a student is detained due to lack of attendance either in Major or in Honors, registration shall be cancelled.
   (vi) Honors is to be completed simultaneously with B. Tech program.

2. To obtain Honors in Information Technology the following subjects are to be taken for obtaining Honors:

   (vii) Social Media Analytics
   (viii) Malware Analysis
   (ix) Reinforcement Learning
   (x) Software Metrics
   (xi) MOOCs for 3 credits of 12 weeks duration related to any one of the above courses.
   (xii) MOOCs may be treated as optional to obtain Honors degree in IT. If a student completes MOOCs with good grade, then it may be considered as betterment for any of the above five Courses (1 to 5)

The above five courses and MOOCs may be completed or pursued during 3rd and 4th years of his/her study of B. Tech program



(With effect from 2022-23 AB)

B.Tech

INFORMATION TECHNOLOGY

III Year - I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
IT3101	PC	Data Communications & Computer Networks	4	0	30	70	100	3
IT3102	PC	Artificial Intelligence	4	0	30	70	100	3
IT3103	PC	Object Oriented Software Engineering	4	0	30	70	100	3
IT3104	PE	Professional Elective - I	4	0	30	70	100	3
IT3105	OE	Open Elective - I	4	0	30	70	100	3
IT3106	PC	Data Communications & Computer Networks Lab	0	3	50	50	100	1.5
IT3107	PC	Object Oriented Software Engineering Lab	0	3	50	50	100	1.5
IT3108	SC	Soft Skills	1	2	50	50	100	2
IT3109	INT	Internship - I	0	0	50	50	100	2
Summer Internship 2 Months (Mandatory) after 2nd year (to be evaluated during III Year I Semester)								
Total Credits								**22**

IT3101 DATA COMMUNICATIONS & COMPUTER NETWORKS

Course Objectives:

- To study basics of data communication systems.
- To study the various types of transmission media.
- To study the various hardware concepts related to data communications.
- To make the students understanding of basic requirements of network hardware, software and its architecture.

Course Outcomes:

- Ability to understand concepts related to data communication hardware and its interface.
- Ability to understand concepts related to Signal encoding techniques and multiplexing.
- The student must be able to understand the concepts related to MAC sub layer.
- Understand the concepts related to network and transport layer.

Syllabus:

Introduction to Data Communications: A Communications Model, Network Models, Analog and Digital Data Transmission, Transmission Impairments.

Data Communication Interface: Asynchronous and Synchronous Transmission. Data Link Control Flow Control, Error Detection, Error Control, High-Level Data Link Control (HDLC).

Signal Encoding Techniques: Digital data to Digital signal, Digital to Analog Signal, Analog data to Digital Signal, and Analog Data to Analog signal.

Multiplexing: Frequency-Division Multiplexing, Synchronous Time-Division Multiplexing: Characteristics, Digital Carrier Systems Statistical Time-Division Multiplexing: Characteristics.

Medium Access Control Sublayer: Wireless LAN's:802.11Architecture and Protocol Stack, 802.11Frame structure.

Network Layer: Network Layer Design Issues, Shortest path routing algorithm, Congestion Control Algorithms, IP Protocol, IP Address.

Transport layer: Transport Service, Elements of Transport Protocols, TCP and UDP Protocols, Simple Network Management Protocol(SNMP).

Text Books:

1. Data Communications and Networking, Behrouz A Forouzan, Tata McGraw-Hill Co Ltd, Second Edition, ISBN: 0-07-049935-7.

2. Computer Networks, Andrews S Tanenbaum, 5th Edition, Pearson Edu.

Reference Book:

1. Data and Computer Communications, Eighth Edition, William Stallings, Pearson Education, Inc.

IT3102 ARTIFICIAL INTELLIGENCE

Course Objectives:

- To learn about AI problems, techniques and their modelling as state space search, problem characteristics, Production System categories.
- To learn different uninformed and heuristic search strategies for solving AI problems with examples.
- To learn theorem proving with predicate logic, resolution, rule based inference with forward and backward chaining.
- Inheritable knowledge representation using slot-filler structures and dealing with different forms of uncertain and implicit knowledge.
- To introduce essential concepts of plan generation, Natural Language understanding and Expert Systems.

Course Outcomes:

By the end of the course the Student understands, applies, evaluates and creates AI solutions as they are

- able to characterize and model AI problems in a state space search framework and identify appropriate production system category to solve them.
- able to understand and evaluate pros & cons of different heuristic search strategies and apply appropriate heuristic search for specific problem solving scenario.
- able to represent domain knowledge in the form of predicates / rules and applies logic and inference for deducing the validity of a given assertion.
- able to create problem specific slot-filler knowledge structures and apply statistical, fuzzy and non-monotonic reasoning methods aptly to solve real world problems involving any type of uncertainty.
- able to understand basic concepts and approaches to natural language processing, plan generation and expert system development.

Syllabus:

Introduction to Artificial Intelligence: Artificial Intelligence, AI Problems, AI Techniques, Defining the Problem as a State Space Search, Production Systems, control strategies, Un-informed search using BFS and DFS, Heuristic search, Problem Characteristics, Production system categories for AI problem solving.

Heuristic Search Techniques: Issues in The Design of Search Programs, Generate-And- Test, Hill Climbing and its variants, Best-First Search, A* Algorithm, Problem Reduction, AO*Algorithm, Constraint Satisfaction, Means-Ends Analysis.

Knowledge Representation using Predicate Logic and Rules: Propositional Logic, First Order Predicate Logic: Representing Instance and is-a Relationships, Computable Functions and Predicates, Resolution in propositional logic, Resolution in predicate logic with Clause form, Unification & Resolution algorithm, Question answering, Procedural Vs Declarative Knowledge, Logic programming with Prolog, Forward Vs Backward Reasoning and combining them, Matching Techniques, Matching with variables, RETE Algorithm, Conflict resolution.

Reasoning under Uncertainty: Introduction to Non-Monotonic Reasoning, Logics for Non-monotonic reasoning, Depth first search with Dependency-directed backtracking, Justification-based Truth Maintenance System, Statistical Reasoning: Bayes Theorem for probabilistic inference,

Certainty Factors and Rule-Based Systems, Bayesian Belief Networks, Dempster- Shafer Theory, Fuzzy Logic.

Structured Representations of Knowledge: Semantic Nets, representing non-binary predicates, Partitioned Semantic Nets, Frames as sets and instances, Slots as full-fledged Objects, Property Inheritance through tangled hierarchies, Conceptual Dependency, Conceptual Dependency Graphs, Scripts, examples in natural language understanding, merits and demerits of strong slot-filler structures.

Natural Language Processing: Steps in Natural Language Processing, Syntactic Processing and Augmented Transition Nets, Semantic Analysis and grammars, Discourse and pragmatic processing; Planning: Components of a Planning System, Goal Stack Planning, Non-linear Planning using Constraint Posting, Hierarchical Planning, Reactive Systems.

Experts Systems: Overview of an Expert System, Applications of expert systems, Components of an Expert Systems, Expert system development, Types of Expert Systems: Rule Based, Frame Based, Neural Network based, Black Board Architectures, Case studies of successful expert systems, Expert System Shells, Knowledge Acquisition and Validation Techniques.

Text Books:

1. Artificial Intelligence, Elaine Rich and Kevin Knight, Tata McGraw -Hill Publications.
2. Introduction To Artificial Intelligence & Expert Systems, Patterson, PHI publications.

Reference Book:

1. Artificial Intelligence, George F Luger, Pearson Education Publications.
2. Artificial Intelligence : A modern Approach, Russell and Norvig, Prentice Hall.

IT3103 OBJECT ORIENTED SOFTWARE ENGINEERING

Course Objectives:

- The students would be able to get the concepts of Object Orientation and software engineering perceptions and software process models.
- The students would be able to understand requirements engineering processes, Unified Modelling Language and its notations and diagrams.
- The students would be able to understand various architectural styles and the concepts of various architectural patterns and some design patterns.
- The students would be able to understand various types of testing and quality assurance issues.
- The students would be able to gain understanding about software process and project management activities.

Course Outcomes:

- The students will be able to understand the best practices of Object Oriented software engineering and will be able apply various life cycle activities like Analysis, Design, Implementation, Testing and Maintenance.
- The students would be able to analyse, elicit and specify software requirements through a productive working relationship with various stakeholders of the project.
- The students would be able to create various design models for a software system to meet the user needs.
- Students can apply the knowledge, techniques, and skills in the development of a software product.
- The students would be able to evaluate the software through various types of testing and perform software process and project management and quality assurance activities.

Syllabus:

Introduction to Object Oriented Software Engineering: Nature of the Software, Types of Software, Software Engineering Projects, Software Engineering Activities, Software Quality, Introduction to Object Orientation, Software Process Models-Waterfall Model, Opportunistic Model, Phased Released Model, Spiral Model, Evolutionary Model, Concurrent Engineering Model

Requirements Engineering: Domain Analysis, Problem Definition and Scope, Requirements Definition, Types of Requirements, Techniques for Gathering and Analysing Requirements, Requirement Documents, Reviewing, Managing Change in Requirements.

Unified Modelling Language & Use Case Modelling: Introduction to UML, Modelling Concepts, Types of UML Diagrams with Examples; User-Centred Design, Characteristics of Users, Developing Use- Case Models of Systems, Use-Case Diagram, Use- Case Descriptions, Basics of User Interface Design, Usability Principles, User Interfaces.

Class Design and Class Diagrams: Essentials of UML Class Diagrams, Associations and Multiplicity, Other Relationships, Generalization, Instance Diagrams, Advanced Features of Class Diagrams, Interaction and Behavioural Diagrams: Interaction Diagrams, State Diagrams, Activity Diagrams, Component and Deployment Diagrams.

Software Design and Architecture: Process of Design, Principles Leading to Good Design, Techniques for Making Good Design Decisions, Good Design Document; Pattern Introduction, Design Patterns: Abstraction-Occurrence Pattern, General Hierarchical Pattern, Play-Role Pattern,

Singleton Pattern, Observer Pattern, Delegation Pattern, Adaptor Pattern, Façade Pattern, Immutable Pattern, Read-Only Interface Pattern and The Proxy Pattern; Software Architecture Contents of Architecture Model, Architectural Patterns: Multilayer, Client-Server, Broker, Transaction Processing, Pipe & Filter and MVC Architectural Patterns.

Software Testing: Overview of Testing, Testing Concepts, Testing Activities, Testing Strategies, Unit Testing, Integration Testing, Function Testing, Structural Testing, Class Based Testing Strategies, Use Case/Scenario Based Testing, Regression Testing, Performance Testing, System Testing, Acceptance Testing, Installation Testing, OOTest Design Issues, Test Case Design, Quality Assurance, Root Cause Analysis, Post-Mortem Analysis.

Software Process Management: Introduction to Software Project Management, Rationale Management, Configuration Management, Activities of Software Project Management, Structure of Project Plan, Software Engineering Teams, Software Cost Estimation, Project Scheduling, Tracking and Monitoring.

Text Books:

1. Object-Oriented Software Engineering Practical software development using UML and Java by Timothy C. Leth bridge & Robert, Langaniere Mcgraw-Hill

2. Software Engineering, K.K. Agarwal, New Age Publications2008

3. Object-Oriented Software Engineering: Using UML, Patterns and Java, Bernd Bruegge and Allen H. Dutoit, 2nd Edition, Pearson Education Asia.

References:

1. Software Engineering: A Practitioner's Approach, Roger S Pressman.

2. A Practical Guide to Testing Object-Oriented Software, John D. McGregor; David A.Sykes, Addison-Wesley Professional.

IT3106 DATA COMMUNICATIONS & COMPUTER NETWORK LAB

Course Objectives:

- This course provides students with hands on training regarding the design, troubleshooting, modelling and evaluation of computer networks.
- To study the various hardware concepts related to data communications
- To make the students understand the basic requirements of network hardware, software and its architecture.
- To understand the various Error detection & control techniques
- To learn Socket programming techniques

Course Outcomes:

- About networking concepts and connecting systems
- To setup Local Area Network using packet tracer software
- To experiment in a real tested networking environment, network design and troubleshooting topics and tools.
- Simulator Error control and flow control techniques
- To write socket program and client server applications.

Syllabus:

Module I: Packet tracer software

1. Study of different types of Network cables and practically implement the cross-wired cable and straight through cable using clamping tool.
2. Connect the computers in Local Area Network.
3. Study of basic network command Network configuration commands.
4. Configure a Network topology using packet tracer software.

Module II: Network simulator

1. Implementation of Error Detection/Error Correction Techniques
2. Implementation of Stop and Wait Protocol and sliding window
3. Implementation and study of Goback-N and selective repeat protocols
4. Implementation of High-Level Data Link Control
5. Study of Socket Programming and Client-Server model using Java
6. Write a socket program for Echo/Ping/Talk commands using Java
7. Study of Network simulator (NS) and simulation of Congestion Control Algorithms

IT3107 OBJECT ORIENTED SOFTWARE ENGINEERING LAB

Course Objectives:

- The purpose of the Software Engineering Lab course is to familiarize the students with modern software engineering methods and tools, The course is realized as a project-like assignment that can, in principle, by a team of two/three students working full time. Typically the assignments have been completed during the semester requiring approximately 60-80 hours from each project team.
- The goal of the Software Engineering Project is to have a walk through from the requirements, design to implementing and testing. An emphasis is put on proper documentation. Extensive hardware expertise is not necessary, so proportionate attention can be given to the design methodology.
- Despite its apparent simplicity, the problem allows plenty of alternative solutions and should be a motivating and educating exercise. Demonstration of a properly functioning system and sufficient documentation is proof of a completed assignment.
- Term projects are projects that a group student or might take through from initial specification to implementation. The project deliverables include.

Course Outcomes:

- Ability to define a problem and to translate end-user requirements into system and software requirements.
- Ability to generate a high-level design of the system from the software requirements.
- Ability to draw various design diagrams (UML, Architectural Designs, Database Design and User Interface Designs) for the requirements gathered.
- Ability to implement the designed problem in Object Oriented Programming Language.
- Will have experience and/or awareness of testing problems, test whether all the requirements specified have been achieved or not and will be able to develop a simple testing report.

Syllabus:

1. Documentation including

   A. A problem statement

   B. A requirements document

      a. A Requirements Analysis Document.

      b. A System Requirements Specification.

      c. A Software Requirements Specification.

2. A design document

   a. A Software Design Description and a System Design Document.

3. A Test specification.

4. Manuals/guides for

A. Users and associated help frames

B. Programmers

C. Administrators (installation instructions)

5. A project plan and schedule setting out milestones, resource usage and estimated costs.
6. A quality plan setting out quality assurance procedures
7. An implementation.

References:

1.Project-based software engineering: An Object-oriented approach, Evelyn Stiller, Cathie LeBlanc, Pearson Education

2.Visual Modelling with Rational Rose 2002 and UML, Terry Quatrini, Pearson Education

3.UML2 Toolkit, Hans -Erik Eriksson, etc; Wiley



(With effect from 2022-23 AB)

B.Tech

INFORMATION TECHNOLOGY

III Year - II Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
IT3201	PC	Internet of Things	4	0	30	70	100	3
IT3202	PC	Data Warehousing & Data Mining	4	0	30	70	100	3
IT3203	PC	Cryptography & Network Security	4	0	30	70	100	3
IT3204	PE	Professional Elective - II	4	0	30	70	100	3
IT3205	OE	Open Elective - II	4	0	30	70	100	3
IT3206	PC	Internet of Things Lab	0	3	50	50	100	1.5
IT3207	PC	Data warehouse & Data Mining Lab	0	3	50	50	100	1.5
IT3208	PC	Cryptography & Network Security Lab	0	3	50	50	100	1.5
IT3209	SC	Python Programming	1	2	50	50	100	2
Industrial / Research Internship 2 months								
Total Credits								**21.5**

IT3201 INTERNET OF THINGS

Course Objectives:

- Understand IoT conceptual framework and design standardisation of IoT/M2M architectural layers and domains.
- Learning the usage of messaging protocols between connected devices and the web.
- Identify the functions and usage of data analytics and cloud services for IoT applications and business processes.
- Elucidate sensor technology for sensing the real world using analog and digital sensors.
- Develop the codes, design and test the embedded devices for IoT and M2M using IDEs and development platforms.

Course Outcomes:

At the end of the course, student will be able to

- Understand the IoT Standards and design principles.
- Understand various web-communication protocols and their practical usage.
- Able to use IoT cloud-based services using the Xively, Nimbits.
- Able to learn various types of sensors and actuators, interfacing and use in IoT environment.
- Able to use number of device platforms of IDEs, such as Arduino, Intel Galileo, RPi, BB and mBed, provide development tools, libraries and framework, and are used for the development of embedded Software.

Syllabus:

The Internet of Things: An Overview of Internet of things, Internet of Things Conceptual Frame work, IoT architectural View, Technology behind IoT, Sources of IoT, M2M Communication, Examples of IoTs, Design Principles for Connected Devices Internet Connectivity: IoT/M2M System Layers and Design Standardization.

Design for Web Connectivity: Web communication protocols for connected devices, Message Communication protocols for connected devices, Web Connectivity for Connected-Devices Network using Gateway, SOAP, REST, HTTP RESTFUL, and Web Sockets, Principles, Internet connectivity, Application Layer Protocols: HTTP, HTTPS, FTP, Telnet.

Data Acquiring, Organizing, Processing and Analytics: Data Acquiring and Storage, Organizing the Data, Transactions, Business Processes, Integration and Enterprise Systems. Analytics, Knowledge acquiring, managing and storing process.

Data Collection, Storage and Computing Using a Cloud Platform: Cloud Computing Paradigm for Data Collection, Storage and Computing. Everything as a service and Cloud Service Models, IOT cloud-based services using the Xively, Nimbits and other platforms.

Sensor Participatory Sensing, RFID, Wireless Sensor Networks: Sensors Technology, Participatory Sensing, Actuator, Sensor Data Communication Protocols, RFID, WSN.

Prototyping and Designing the Software for IoT Applications: Prototyping embedded device Software, Devices, Gateways, Internet and Web/Cloud Services Software Development, Prototyping Online Component APIs and WebAPIs.

IoT Case Studies: Design Layers, Design Complexity and Designing Using Cloud PaaS. IoT Applications for Smart Homes, Cities, Environmental Monitoring and Agriculture. Connected Car and Its applications.

Text Books:

1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education
2. Internet of Things, A.Bahgya and V.Madisetti, Univesity Press,2015

Reference Books:

1. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally,Wiley.
2. Getting Started with the Internet of Things,CunoPfister , Oreilly.

IT3202 DATA WAREHOUSING AND DATA MINING

Course Objectives:

- To understand the evolution of data warehousing and data mining systems
- To provide an understanding of data objects, similarity and dissimilarity metrics and
- preprocessing techniques.
- To impart knowledge about the basics of data warehousing and modelling using data
- cubes, OLAPs, AOI.
- To familiarize the concepts of mining frequent patterns based on Associations.
- To discuss about pattern mining using classification and clustering methods.

Course Outcomes:

- Understands data objects, attribute types, metrics, cleaning and transformation of data.
- Ability to represent and comprehend information with data warehousing technologies for multidimentional modelling and generalisation using Cubes, OLAPS and AOI.
- Grasp the concepts of Association mining using Apriori and FP- Growth.
- Learn about various approaches to supervised learning like classification approach.
- Learn about various approaches to unsupervised learning like clustering approach.

Syllabus:

Introduction to Data Mining: Importance of Data Warehousing and Data Mining, Kinds of

data, Kinds of patterns, Technologies, Applications, Major Issues in Data Mining

Getting to know your data: Data Objects and Attributes Types, Statistical Descriptions of Data,

Estimating Data Similarity and Dissimilarity, Data Visualization.

Data Preprocessing: Quality data, Data Cleaning, Data Integration, Data Reduction, Data

Transformation, Discretization and Concept Hierarchy Generation.

Data Warehouse and OLAP Technology: Basic Concepts of Data warehouse, Data Modelling using Cubes and OLAP, DWH Design and usage, Implementation using Data Cubes and OLAPs, Data Generalization with AOI.

Mining Frequent Patterns Based on Associations and Correlations: Basic Concepts,

Frequent Item set Mining Methods: Apriori Algorithm, Association Rule Generation,

Improvements to A Priori, FP- Growth Approach, Pattern Evaluation Methods.

Classification and Prediction: Basic Concepts, Decision Tree Induction, Bayes Classification, Rule- Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy, Classification by Back Propagation, K-nearest neighbour classifier.

Cluster Analysis: Basic Concepts and issues in clustering, Requirements for Cluster Analysis,

Partitioning Methods, Hierarchical Methods, Density Based Methods, Grid Based Methods, Evaluation of Clustering Solutions.

Text Books:

1. Data Mining- Concepts and Techniques by Jiawei Han, Micheline Kamber and Jian Pei–Morgan Kaufmann publishers –--3rd edition

2. Data Mining Techniques, A.K.Pujari, University Press.

References:

1. Data mining concepts byTan, Steinbech, and Vipin Kumar - Pearson Edu Publishers.

CS3203 CRYPTOGRAPHY AND NETWORK SECURITY

Course Objectives:

- To understand the basic concepts of Cryptography and Network Security.
- To be able to understand message security, confidentiality and database security
- To learn about the various types of malwares and attacks.
- To learn about Intrusions, intrusion detection system and understand buffer overflow
- To understand various protocols used in network and various protection mechanisms against network attacks/Threats

Course Outcomes:

- After successful completion of the course, the students would be able to
- Realize the need and importance of network security, understand and apply the concepts
- of security towards data over network.
- Understand the principles of cryptography and network security and apply the knowledge
- to design cryptographic concepts and algorithms.
- Understand and analyze various types of malwares and several network attacks.
- Evaluate several intrusions and understand buffer overflow attacks.
- Understand and apply security standards and implement various network security
- protocols.

Syllabus:

Cryptography : Concepts and Techniques Need for Security, Security Approaches, Principles of Security, Threats-Attacks and Attack Types-Services-Mechanisms, Basic Mathematics for cryptography- Factorization, Prime numbers, Primality Testing, Modular Arithmetic, Discrete logarithms, Residues, Fermat's and Euler's Theorem, Chinese Reminder theorem

Symmetric and Asymmetric Cryptography Network Security Model: Plain Text-Cipher Text-Encryption-Decryption-Key, Key Range and Key Size, Classic Cryptography: Stream ciphers, Substitution-Transposition, Steganography. Basic Concept of Symmetric Cryptography, Algorithm Types and Modes, DES-AES-RC4, Principles of Public-Key Cryptography, Message Authentication, Hash functions, RSA, Concepts of Digital Signature.

Key Management and Integrity: Symmetric Key Distribution, Diffie-Hellman Key exchange, Public Key Distribution, Public Key infra structure(PKI) Digital Certificates (public key), Basic principles of Access control.

E-mail and IP Security: E-mail security -PGP/SMIME, IP Security and architecture, IPV6

Internet Security Protocols and Standards: Basic concepts, Secure Socket Layer

(SSL) and Transport Layer Security(TLS), Secure hyper text transfer protocol(SHTTP), Time

stamping protocol(TSP), Wireless Application Protocol(WAP), Secure Electronic

Transaction(SET), security in GSM, Security in 3G.

Firewalls, Intrusion Detection System and Virtual Private Networks:

Types of Firewalls, Firewall Architectures, IDS- Signature and Anomaly based IDS, Basics of VPN, VPN architecture

Network Vulnerabilities :

Different types of Vulnerabilities in Network, Introduction to IP Spoofing, ICMP, ARP, DDOS, Buffer Overflow attacks.

Text Books:

1. Cryptography And Network Security by Atul kahate, McGrawHill
2. Network Security Essentials- Applications and Standards by William Stallings, 3 rd Edition, Pearson

Reference Books:

1. Cryptography and Network Security by William Stallings, Pearson Education Asia, New Delhi.
2. Network Security Essentials Applications and Standards, by William Stallings, Pearson Education Asia, New Delhi.

IT3206 INTERNET OF THINGS LAB

Course Objectives:

- To familiarize with different types of loT hardware platforms and programming
- To learn various sensors and their interfacing with loT hardware using C and Python.
- To master Internet of Things protocols and their practical applications.
- To learn how to write Cloud application for IoT.
- To design and development of a mini IoT application project.

Course Outcomes:

- Able to write Python programs with Intel Galileo Gen 2/Raspberry Pl/Node MCU board.
- Able to interface different types of sensors/actuators to Intel Galileo Gen 2/Raspberry Pl /Node MCU boards.
- Able to implement and use of loT Protocols in various applications.
- Able to manage loT applications on Cloud.
- Able to design and develop mini loT project with sensor and deploy in Cloud environment.

Syllabus;

List of Experiments:

Cycle 01

1. Understanding and setting up the Base IoT Hardware and Working with Python on Intel Galileo Gen 2 /Raspberry Pl
2. Interacting with Digital Outputs with Python on Intel Galileo Gen 2/Raspberry Pl
3. Working with a RESTful API and Pulse Width Modulation on Intel Galileo Gen 2/Raspberry Pl.
4. Implementing IoT Protocols CoAP, MQTT, WebServer on Intel Galileo Gen 2/Raspberry Pl
5. Retrieving Data from the Real World with Sensors
6. Interfacing analog accelerometer and digital accelerometer with Intel Galileo Gen 2/Raspberry Pl.
7. Measuring ambient temperature with an analog sensor
8. Measuring temperature and humidity with a digital sensor
9. Working with the Cloud
    a. (a)Publishing data to the cloud with dweepy.
    b. (b)Building a web-based dashboard with Freeboard.
    c. (c)Using MQTT with Mosquitto and Eclipse Paho
10. Interfacing with Intel Galileo Gen 2/Raspberry Pl.
11. Interfacing and Controlling Servo Motor
12. Interfacing with Stepper Motor.

Cycle 02

Mini Project

1.Implementing Smart Home Systems using Galileo Gen 2/Raspberry Pl/Node MCU

2.Implementing Smart Soil monitoring System Galileo Gen 2/Raspberry Pl/Node MCU

3.Any other mini projects on loT.

Text books:

1.Internet of Things with Python - Interact with the world and rapidly prototype loT applications using Python by Gaston C. Hillar, Packt Publishing,2016

2.Internet of Things with Intel Galileo, Miguel de Sousa, Packt Publishing,2015

3.Internet of Things with Raspberry Pi and Arduino by Rajesh Singh. Anita Gehlot, CRC Press, 2020

Reference books:

1. Building Arduino Projects for the Internet of Things: Experiments with Real-World Applications, Adeel Javed

IT3207 DATA WAREHOUSING AND DATA MINING LAB

Course Objectives:

- To study the various data analysis techniques in R Programming language.
- To apply the various data mining techniques available in WEKA for generating knowledge such as Association Analysis, Classification and Clustering to various standard datasets and own datasets.

Course Outcomes:

- Student will be able to write R programs to perform several data analytics operations on datasets
- Ability to extract patterns by applying appropriate data mining techniques from different types of datasets using WEKA.

Syllabus:

List of Experiments:

I. Exploratory data analysis using R

1. Load the 'iris. CSV' file and display the names and type of each column. Find statistics such as min, max, range, mean, median, variance, standard deviation for each column of data.
2. Write R program to normalize the variables into 0 to 1 scale using min-max Normalisation.
3. Generate histograms for any one variable (sepal length/ sepal width/ petal length/ petal width) and generate scatter plots for every pair of variables showing each species in different color .
4. Generate box plots for each of the numerical attributes. Identify the attribute with the highest variance.
5. Study of homogeneous and heterogeneous data structures such as vector, matrix, array, list, data frame in R.
6. Write R Program using 'apply' group of functions to create and apply normalization function on each of the numeric variables/columns of iris dataset to transform them into a value around 0 with z-score normalization.
7. a) Use R to apply linear regression to predict evaporation coefficient in terms of air velocity using the data given below:

Air Velocity (cm/sec) 20,60,100,140,180,220,260,300,340,380

Evaporation Coefficient(sqmm/sec).

0.18, 0.37, 0.35, 0.78, 0.56, 0.75, 1.18, 1.36,1.17, 1.65

b) Analyze the significance of residual standard-error value, R-squared value, F- statistic. Find the correlation coefficient for this data and analyze the significance of the correlation value.

c) Perform a log transformation on the 'Air Velocity 'column, perform linear regression again, and analyze all the relevant values.

8. Write R Program using 'apply' group of functions to create and apply normalization function on each of the numeric variables/columns of iris dataset to transform them a value around 0 with z-score normalization.

II. WEKA Knowledge Extraction toolkit

9. Create an ARFF (Attribute-Relation File Format) file and read it in WEKA. Explore the purpose of each button under the preprocess panel after loading the ARFF file. Also, try to interpret using a different ARFF file, weather.arff, provided withWEKA.

10. Performing data preprocessing in Weka Study Unsupervised Attribute Filters such as Replace Missing Values to replace missing values in the given dataset, Add to add the new attribute Average, Discretize to discretize the attributes

into bins. Explore Normalize and Standardize options on a dataset with numerical attributes.

11. Classification using the WEKA toolkit

Demonstration of classification process using id3 algorithm on categorical dataset(weather).

Demonstration of classification process using naïve Bayes algorithm on categorical dataset ('vote').

Demonstration of classification process using Random Forest algorithm on datasets containing large number of attributes.

12. Classification using the WEKA toolkit – Part2

Demonstration of classification process using J48 algorithm on mixed type of dataset after discretizing numeric attributes.

Perform cross-validation strategy with various fold levels. Compare the accuracy of the results.

13. Performing clustering in WEKA

Apply hierarchical clustering algorithm on numeric dataset and estimate cluster quality. Apply DBSCAN algorithm on numeric dataset and estimate cluster quality.

14. Association rule analysis in WEKA

Demonstration of Association Rule Mining on supermarket dataset using Apriori Algorithm with different support and confidence thresholds.

Demonstration of Association Rule Mining on supermarket dataset using FP-

Growth Algorithm with different support and confidence thresholds.

References:

1. Practical data science with R, Nina Zumel and John Mount- Dreamtech Press.

IT3209 PYTHON PROGRAMMING (SC)

Course Objectives:

- familiarize students with key data structures in Python including lists and dictionaries and apply them in context of searching, sorting, text and file handling
- introduce students to calculation of statistical measures using Python such as measures of central tendency, correlation
- familiarize students with important Python data related libraries such as Numpy and Pandas and use them to manipulate arrays and data frames introduce students to data visualization in Python through creation of line plots, histograms, scatter plots, box plots and others
- Implementation of basic machine learning tasks in Python including pre-processing data, dimensionality reduction of data using PCA, clustering, classification and cross-validation.

Course Outcomes:

- After completion of the course the student should be able to:
- implement searching, sorting and handle text and files using Python data structures such as lists and dictionaries.
- calculate statistical measures using Python such as measures of central tendency, correlation.
- use Python data related libraries such as Numpy and Pandas and create data visualizations
- Use and generate Data Visualization techniques in Python.
- implement basic machine learning tasks pre-processing data, compressing data, clustering, classification and cross-validation.

Syllabus

1. Python Programs on lists & Dictionaries
2. Python Programs on Searching and sorting
3. Python Programs on Text Handling
4. Python Programs on File Handling
5. Python Programs for calculating Mean, Mode, Median, Variance, Standard Deviation
6. Python Programs for Karl Pearson Coefficient of Correlation, Rank Correlation
7. Python Programs on NumPy Arrays, Linear algebra with NumPy
8. Python Programs for creation and manipulation of Data Frames using Pandas Library
9. Write a Python program for the following.
    a) Simple Line Plots,
    b) Adjusting the Plot: Line Colours and Styles, Axes Limits, Labelling Plots,
    c) Simple Scatter Plots,
    d) Histograms,
    e) Customizing Plot Legends,
    f) Choosing Elements for the Legend,
    g) Boxplot
    h) Multiple Legends,
    i) Customizing Colorbars,
    j) Multiple Subplots,

k) Text and Annotation,
l) Customizing Ticks

10. Python Programs for Data pre-processing: Handling missing values, handling categorical data, bringing features to same scale, selecting meaningful features

11. Python Program for Compressing data via dimensionality reduction: PCA

12. Python Programs for Data Clustering

13. Python Programs for Classification

14. Python Programs for Model Evaluation: K-fold cross validation.

Reference Books:

1. Core Python Programming, Second Edition, Wesley J. Chun, Prentice Hall.

2. Chris Albon, ―Machine Learning with Python Cookbook-practical solutions from pre-processing to Deep learning‖, O'REILLY Publisher,2018.

3. Mark Summerfield, Programming in Python 3--A Complete Introduction to the Python Language, Second Edition, Additson Wesley.

4. Phuong Vo.T.H , Martin Czygan, Getting Started with Python Data Analysis, Packt Publishing Ltd.

5. Armando Fandango, Python Data Analysis, Packt Publishing Ltd.

6. Magnus Vilhelm Persson and Luiz Felipe Martins, Mastering Python Data Analysis, Packt Publishing Ltd.

7. Sebastian Raschka & Vahid Mirjalili, ―Python Machine Learning‖, Packt Publisher, 2017.



(With effect from 2022-23 AB)

B. Tech

INFORMATION TECHNOLOGY

IV Year - I Semester

Course code	Category	Course Title	Hours per week		Internal Marks	External Marks	Total Marks	Credits
			L	P				
IT4101	PE	Professional Elective– III	4	0	30	70	100	3
IT4102	PE	Professional Elective - IV	4	0	30	70	100	3
IT4103	PE	Professional Elective - V	4	0	30	70	100	3
IT4104	OE	Open Elective– III	4	0	30	70	100	3
IT4105	OE	Open Elective - IV	4	0	30	70	100	3
IT4106	HSSE	HSS Elective	4	0	30	70	100	3
IT4107	SC	Android App Programming	1	2	50	50	100	2
IT4108	INT	Internship -II	0	0	50	50	100	2
Industrial / Research Internship 2 months(Mandatory) after 3rd year (to be evaluated during IV Year I Semester)								
Total Credits								**22**

IT4107 ANDROID APP PROGRAMMING (SC)

Course Objectives:

The main objectives of this course are to:

- Provide basic knowledge on Android OS and tools required to develop android applications.
- Create applications on Android User Interface using Views, Pictures and Menus.
- Demonstrate various components that make up the user interface (UI) of an Android application.
- Explore views further to display images using various image views as well as display options in Android application.
- Introduce various techniques to store user data, file manipulation onto storage, and content sharing among different applications in an android device.

Course Outcomes:

After successful completion of the course, students will be able to:

- Equipped with the basic knowledge to explore sophisticated techniques for developing an Android application.
- Create user Interfaces in Android and how user interacts with the UIs using Views.
- Develop applications to display images using Views
- Develop applications to persist data using shared preferences, files and content providers
- Develop applications to communicate through Messaging and invoking Mailing services in Android**.**

Syllabus:

Getting started with android Programming: What is Android: Android Versions, Features of Android, Architecture of Android, Obtaining the required tools: Android Studio, Android SDK, creating Android Virtual Devices. Using Android Studio for development: Exploring the IDE, using code completion, Debugging and publishing application

Activities, Fragments and Intents: Understanding Activities, Linking Activities Using Intents, Fragments, Displaying Notifications.

The Android User Interface: Components of a Screen, adapting to Display Orientation, Managing Changes to Screen Orientation, Utilizing the Action Bar, Creating the User Interface Programmatically.

User Interface with Views: Using Basic Views, Using Picker Views, Using List Views to Display Long Lists, Understanding Specialized Fragments.

Pictures and Menus with Views: Using Image Views to Display Pictures, Using Menus with Views, Using Web View.

Data Persistence: Saving and Loading User Preferences, Persisting Data to Files, Creating and Using Databases.

Content Providers: Sharing data in Android, using a Content Provider, Creating Your Own Content Providers. Messaging: SMS Messaging, Sending E-Mail.

Text Book:

1. Beginning Android Programming with Android Studio, J. F. DiMarzio, 4th Edition, Wiley India (Wrox), 2017.

References:

1. Learning Mobile App Development, A Hands-on Guide to Building Apps with iOS and Android, J. Iversen, M. Eierman, Adison-Wesley, 2013

2. Android Studio Application Development: Create visually appealing applications using the new IntelliJ IDE Android Studio, B. C. Zapata, Packt Publishing, 2013.

3. Android Studio 3.0 Development Essentials - Android 8 Edition, N. Smith, CreateSpace Independent Publishing Platform, Year: 2017



(With effect from 2022-23 AB)

B.Tech

INFORMATION TECHNOLOGY

IV Year - II Semester

Course code	Category	Course Title	Internal Marks	External Marks	Total Marks	Credits
IT4201	PROJ	Project work	100	100	200	14
					Total Credits	**14**

PROFESSIONAL ELECTIVES (IT)

1. PRINCIPLES OF PROGRAMMING LANGUAGES
2. COMPILER DESIGN
3. SOFTWARE PROJECT MANAGEMENT
4. DISTRIBUTED SYSTEMS
5. GRID COMPUTING
6. SENSOR NETWORKS
7. CLOUD COMPUTING
8. DIGITAL IMAGE PROCESSING
9. MACHINE LEARNING
10. BIG DATA ANALYTICS
11. NATURAL LANGUAGE PROCESSING
12. SOFT COMPUTING
13. DEEP LEARNING
14. E-COMMERCE
15. EMBEDDED SYSTEMS

PRINCIPLES OF PROGRAMMING LANGUAGES

PROFESSIONAL ELECTIVE

SYLLABUS

Course objectives:

- To learn the underlying principles and concepts of programming language.
- To understand the programming language translation process.
- To expose students to the important paradigms of programming.
- To understand the concepts of distributed processing and network programming

Course outcomes:

- Ability to compare different programming languages.
- Ability to discuss the significant achievements in programming language history.
- Ability to assess the programming languages in scientific manner
- Ability to understand the concepts of distributed processing and basics of networking

Syllabus:

Language design issues: Study programming Languages, History of programming Languages, role of programming Languages, Programming Environments.

Impact of Machine Architectures: Operation of a Computer, Virtual Computers and Binding Times; Language Translation Issues: Programming Language Syntax, Stages in Translation, Formal Translation Models, Recursive Descent Parsing; Modeling Language Properties: Formal Properties of Languages, Language Semantics.

Elementary Data Types: Properties of Types and Objects, Scalar Data Types, Composite Data Types Encapsulation: Structured Data Types, Abstract Data Types, Encapsulation by Subprograms, Type Definitions. Inheritance: Abstract Data Types Revisited, Inheritance, Polymorphism

Sequence Control: Implement and Explicit Sequence Control, Sequence with Arithmetic Expressions, Sequence Control Between Statements, Sequencing with Non-arithmetic Expressions.

Subprogram Control: Subprogram Sequence Control Attributes of Data Control, Parameter Transmission, Explicit Common Environment.

Storage Management: Elements Requiring Storage, Programmer- and System - Controlled Storage, Static Storage Management, Heap Storage Management

Distributed Processing: Variations on Subprogram Control, Parallel Programming, Hardware Developments, and Software Architecture. Network Programming: Desktop Publishing, The World Wide Web.

Text Books

1. Programming languages – Design and Implementation by Terrence W. Pratt Marvin V. Zelkowitz.3 rd Edition, Prentice Hall of India.

Reference Books

1.Concepts of Programming Languages by Robert L. Sebesta, 4th Edition,PearsonEducation.

2.Fundamentals of Programming Languages, Design & Implementation by SeyedH .Roosta. Vikas publications.

3.Programming Languages by Paradigm and Practice – Doris Appleby Julius J. Vendekopple Tata McGraw Hill Edition

COMPILER DESIGN

PROFESSIONAL ELECTIVE

SYLLABUS

Course Objectives:

- To explain the basic understanding of grammars and language definition and introducing various phases of designing a compiler.
- To make the student to understand the concepts underlying the design and implementation of language processors and its mechanisms.
- To extend the knowledge of parser by parsing LL parser and LR parser.
- To enrich the knowledge in various phases of compiler ant its use, code optimization techniques, loop optimization techniques, machine code generation, and use of symbol table.

Course Outcomes:

- Ability to understand grammars, language definitions and various phases of designing a compiler.
- Ability to understand Language processors and different parsers.
- Ability to learn the new code optimization techniques to improve the performance of a program in terms of speed & space.
- Ability to do usage of registers in efficient manner during the program execution.
- Ability to acquire the knowledge of modern compiler & its features.

Syllabus

Introduction: Introduction to Compilers and Language processors, Programming Language basics, Structure & Different Phases of a Compiler, Review of Compiler Structure, Structure of Optimizing Compilation, Compiler construction tools, Boot strapping, Cross compilers.

Finite Automata & Lexical Analysis : Introduction to Lexical Analysis, Lexical Analyzers, Approaches to design Lexical Analysers, Language for specifying lexical analyzers, Introduction to Finite automata, Regular Expressions & Languages, Recognition of Tokens, Transition Diagrams, Implementation of lexical analyzers, Lexical Analyzer Generator LEX.

Syntax Analysis: Syntactic Specification of Programming Languages, Context Free Grammars & Languages, Introduction to Parsers. Top-down parsing techniques: Brute force parsing, Recursive Descent Parsing, Predictive Parsing, Bottom–up Parsing: Shift reduce parsing, Operator parsing, LR (k) parsing.

Semantic Analysis and Intermediate Code Generation: Semantic Actions, Syntax Directed Translations, Translation on the parse Tree, Implementation of Syntax Directed Translator, Intermediate Codes, Syntax Directed translation to Postfix code, Syntax Trees, Intermediate Code Generation, Three Addr5ess Code-Translation of Expressions, Type Checking & Type Conversions.

Code Optimization: Principal sources of Code Optimization, Loop Optimization, Basic Blocks & Flow Graphs, DAG Representation of Basic Blocks, Applications of DAG, Local Optimization, Unreachable Code Elimination, Dead Code Elimination, Data Flow Analysis, Data Flow Equations & Computations, Peep-Hole Optimization. Machine Dependent Optimizations, Overview of

Informal Compiler Algorithm Notation (ICAN), If Simplification, Loop Simplification, Loop Inversion, Branch Optimization and Prediction

Code Generation and Code Scheduling: Issues in Code Generation, Input to Code Generator, Instruction Selection, Register Allocation, Simple Target Machine Model, Program and Instruction Costs, Register allocation & Assignments, Code Generation Algorithm, Code Generators, Optimal Code Generation for Expressions, Code Generation From DAG.

Symbol Tables, Runtime Environment and Error Handling: Contents of a Symbol Table, Data Structures for Symbol Tables; Run time Environments, Implementation of a simple Stack allocation, Heap Management, Block Structured Languages; Error Detection & Recovery, Lexical Phase Errors, Syntactic & Semantic Errors, Error Handling Routines.

Text Books:

1. Principles of Compiler Design by Aho,D. Ullman, Lam and Ravi Sethi, Pearson Education Second Edition
2. Advanced Compiler Design and Implementation, Steven Muchnic, Elsevier Publications.

Reference Books:

1. Compiler Construction by Kenneth. C. Louden, Vikas Pub. House.
2. Compiler Design, A.A. Pentambekar, Technical Publications
3. Modern Compiler Design, Grune.D, Van Reeuwijk K, Bal H.E, Jacobs C J H, Lan gendoen K, Springer,

SOFTWARE PROJECT MANAGEMENT

PROFESSIONAL ELECTIVE

SYLLABUS

Course Objectives:

- To understand the Software Project Planning and Evaluation techniques.
- To plan and manage projects at each stage of the software development life cycle (SDLC).
- To learn about the activity planning and risk management principles.
- To manage software projects and control software deliverables.
- To develop skills to manage the various phases involved in project management and people management.
- To deliver successful software projects that support organization ‘s strategic goals.

Course Outcomes:

At the end of the course, the students should be able to

- Understand Project Management principles while developing software.
- Gain extensive knowledge about the basic project management concepts, framework and the process models.
- Obtain adequate knowledge about software process models and software effort estimation techniques.
- Estimate the risks involved in various project activities.
- Define the checkpoints, project reporting structure, project progress and tracking mechanisms using project management principles.
- Learn staff selection process and the issues related to people management

Syllabus:

Introduction to Software Project Management: Introduction to Project and Project Management, Reasons for IT project failure, Triple constraint of IT project management, Management spectrum of project, Overview of project life cycle models, Project manager skills and job description conceptualization and initiation of IT project, Business case.

Project Charter: Introduction, Project management process and their correlation with project life cycle phases, Introduction to Project Integration management and seven processes, Project Charter.

Project Scope Management: Introduction, Processes of scope management.

Project Human Resource Management: Introduction, Organizational structure – Function, Project and Matrix, Keys to managing people motivation theories and improving effectiveness, Project team selection.

Project Time and Cost Management: Introduction, Development of project schedule, CPM and PERT, Activities their sequencing and dependencies, Project network diagrams, Development of Gantt Charts, Earned Value Management, Introduction to Constructive Cost Model (COCOMO).

Project Risk Management: Introduction, Risk Management Process, Risk Identification for IT projects, Qualitative and Quantitative approaches to Risk Analysis, Risk Strategies, Risk Monitoring and Control, Risk Response and Evaluation Project Quality Management.

Project Communication Management: Introduction, Project Communication Plan, Project metrics, Information distribution, Performance Reporting. Project Change Management: Introduction, Impact of change, Change as a process, Change Management plan, Dealing with resistance and conflict, Configuration management.

Project Procurement Management: Introduction, Processes Planning Purchases and Acquisition, Contracting, Request Seller Responses, Select Sellers, Contract Administration, Contract Closure, Outsourcing of products and services.

Project Leadership and Ethics: Introduction, Project Leadership, Modern approaches, Styles of leadership, Ethical leadership, Making sound ethical decisions in the situations of conflict. Closure of a Project: Introduction, Project implementation, Administrative closure, Project Evaluation.

Text Book:

1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition, Tata McGraw Hill, New Delhi, 2012.

References:

1. Robert K. Wysocki ―Effective Software Project Management – Wiley Publication, 2011.
2. Walker Royce: ―Software Project Management- Addison-Wesley, 1998.
3. Gopalaswamy Ramesh, ―Managing Global Software Projects – McGraw Hill Education (India), Fourteenth Reprint 2013

DISTRIBUTED SYSTEMS

PROFESSIONAL ELECTIVE

SYLLABUS

Course Objectives:

The objective of this course is:

- To learn and understand distributed system design issues
- To study and examine communication protocols and models for distributed systems
- To study and analyze centralized and distributed algorithms for synchronization, processor allocation, fault tolerance and real time systems
- To study design and implementation issues for distributed file systems
- To examine and evaluate the approaches for distributed shared memory

Course Outcomes:

After completion of this course, the student shall be able to:

- Understand the advantages and usage of distributed systems over centralized systems
- Choose an appropriate communication protocol and model for implementing a distributed system.
- Evaluate alternate policies for processor allocation, fault tolerance and real time systems
- Choose appropriate distributed file system models for distributed applications
- Critically examine and choose appropriate distributed shared memory model

Syllabus:

Introduction to Distributed Systems: What is a Distributed System?, Hard ware concepts, Software concepts, Design issues.

Communication in Distributed Systems: Layered Protocols, ATM networks, The Client – Server model, Remote Procedure Call, Group communication.

Synchronization in Distributed System: Clock Synchronization, Mutual Exclusion, Election algorithms, Atomic transactions, Deadlocks in Distributed Systems.

Process Management: Threads, System Models, Processors allocation, Scheduling in Distributed System, Fault Tolerance, Real Time Distributed System.

Distributed File Systems: Distributed File System Design, Distributed File System implementation, Trends in Distributed File System.

Distributed Shared Memory: Introduction, What is Shared memory? Consistency models, Page based Distributed Shared Memory, Shared –Variable Distributed Shared Memory, Object based Distributed Shared Memory.

Text Book:

1. Distributed Operating Systems by Andrew S. Tanenbaum, Pearson Education

Reference Books:

1. Advanced Concepts in Operating Systems by Mukesh Singhal and Niranjan G.Shivaratri,Tata McGraw Hill
2. Distributed Systems- Concepts and Design by George Coulouris, Jean Dollimore, Tim Kindberg, Pearson Education

GRID COMPUTING

PROFESSIONAL ELECTIVE

SYLLABUS

Course Objectives:

The student should be made to:

- Understand how Grid computing helps in solving large scale scientific problems.
- Gain knowledge on the concept of virtualization that is fundamental to cloud computing.
- Learn how to program the grid and the cloud.
- Understand the security issues in the grid and the cloud environment.

Course Outcomes:

At the end of the course, the student should be able to:

- Apply grid computing techniques to solve large scale scientific problems
- Apply the concept of virtualization
- Use the grid and cloud tool kits
- Apply the security models in the grid and the cloud environment.

Syllabus:

Introduction The Data Centre, the Grid and the Distributed / High Performance Computing, Cluster Computing and Grid Computing, Metacomputing – the Precursor of Grid Computing, Scientific, Business and e-Governance Grids, Web Services and Grid Computing, Business Computing and the Grid – a Potential Win – win Situation, e-Governance and the Grid.

Technologies and Architectures for Grid Computing Clustering and Grid Computing, Issues in Data Grids, Key Functional Requirements in Grid Computing, Standards for Grid Computing, Recent Technological Trends in Large Data Grids

World Wide Grid Computing Activities, Organizations and Projects Standard Organizations, Organizations Developing Grid Computing Tool Kits, Framework, and Middleware, Grid Projects and Organizations Building and Using Grid Based Solutions, Commercial Organizations Building and Using Grid Based Solutions.

Web Services and the Service Oriented Architecture (SOA) History and Background, Service Oriented Architecture, how a Web Service Works, SOAP and WSDL, Description, Creating Web Services, Server Side. OGSA and WSRF OGSA for Resource Distribution, Stateful Web Services in OGSA, WSRF (Web Services Resource Framework), Resource Approach to Stateful Services, WSRF Specification.

Globus Toolkit History of Globus Toolkit, Versions of Globus Toolkit, Applications of GT4-Cases, GT4-Approaches and Benefits, Infrastructure Management, Monitoring and Discovery, Security, Data, Choreography and Coordination, Main Features of GT4 Functionality – a Summary, GT4 Architecture, GT4 Command Line Programs, GT4 Containers

The Grid and the Databases Issues in Database Integration with the Grid, The Requirements of a Grid-enabled Database, Storage Request Broker (SRB), How to Integrate the Databases with the Grid? The Architecture of OGSA-DAI for Offering Grid Database Services

Cluster Computing: Approaches to Parallel Computing, how to Achieve Low Cost Parallel Computing through Clusters, Definition and Architecture of a Cluster,

Cluster Middleware: An Introduction Levels and Layers of Single System Image (SSI), Cluster Middleware Design Objectives, Resource Management and Scheduling, Cluster Programming Environment and Tools . Early Cluster Architectures and High Throughput Computing Clusters: Early Cluster Architectures, High Throughput Computing Clusters, Condor.

Text Books:

1. C.S.R.Prabhu – ―Grid and Cluster Computing‖-PHI(2008) Chapters: 1 to 13, 16, 17.

Reference Books:

1. Jankiram, "Grid Computing Models: A Research Monograph", TMH (2005)

SENSOR NETWORKS

PROFESSIONAL ELECTIVE

SYLLABUS

Course Objectives:

- To understand the concepts of sensor networks
- To understand the MAC and transport protocols for ad hoc networks
- To understand the applications and security concepts of sensor networks

Course Outcomes:

- Ability to understands concepts related to Wireless Sensor Networks and Single node architecture.
- Ability understands concepts related to MAC Protocol and Network architecture.
- Ability understands concepts related to Link layer protocol, naming and addressing.
- Understands the concepts of Data-centric, content-based networking, Transport layer and Quality of Service.

Syllabus:

Introduction: The vision of Ambient Intelligence, Application examples, Types of applications, Challenges for Wireless Sensor Networks (WSNs), Sensor networks vs Enabling Technologies for WSNs, **Single node architecture:** Hardware components, Energy consumption of sensor nodes, Some examples of sensor nodes, Operating systems and execution environments

Network Architecture: Sensor network scenarios, Optimization goals and figures of merit, Design principles for WSNs, Physical layer and transceiver design considerations in WSNs

MAC Protocols: Fundamentals of (wireless) MAC protocols, Low duty cycle protocols and wakeup concepts, Contention-based protocols, Schedule-based protocols.

Link layer protocols: Fundamentals: tasks and requirements, Error control, Framing, Link management

Naming and addressing: Fundamentals, Address and name management in wireless sensor networks, Assignment of MAC addresses

Data-centric and content-based networking: Introduction, Data-centric routing, Data aggregation, Data-centric storage

Transport layer and Quality of Service: The transport layer and QoS in wireless sensor networks, Coverage and deployment, Reliable data transport, Single packet delivery.

Text Books:

1. Protocols and Architectures for Wireless Sensor Networks, Holger Karl, Andreas Willig., John Wiley & Sons Ltd, 2005.
2. Network Management Fundamentals, Alexander Clemm CISCO Press 2007.

CLOUD COMPUTING
PROFESSIONAL ELECTIVE
SYLLABUS

Course Objectives:

- To define Cloud Computing and expose the students to the frontier areas of Cloud Computing.
- To provide an in-depth and comprehensive knowledge of the Cloud Computing fundamental issues, technologies, applications and implementations.
- To introduce various levels of services that can be achieved by cloud.
- To gain knowledge on virtualization techniques.
- To understand the working methodology of existing clouds, such as, Amazon, Google and Azure.

Course Outcomes:

- Articulate the main concepts, key technologies, strengths, and limitations of cloud computing and the possible applications for state-of-the-art cloud computing.
- Identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, laaS, public cloud, private cloud, hybrid cloud, etc.
- Classify the Levels of Virtualization and mechanism of tools and Analyze Cloud Architectures.
- Assess Control Storage Systems.
- Get an idea and set up Private Clouds.

SYLLABUS:

History of Computing Paradigms: Overview of Distributed Computing, Cluster Computing, Grid Computing, Ubiquitous Computing, Peer-to-Peer Computing. Distributed System Models and Enabling Technologies

Introduction to Cloud Computing: Cloud Computing and Service Models- Public, Private, and Hybrid Clouds, Cloud Ecosystem and Enabling Technologies, Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS) and Software-as-a-Service (SaaS)

Virtual Machines and Virtualization: Implementation Levels of Virtualization, VMM Design Requirements and Providers, Virtualization Support at the OS Level, Middleware Support for Virtualization, Virtualization Structures/Tools and Mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management

Public Cloud Platform-Architectures and Programming: Google App Engine (GAE). Amazon Web Services (AWS), Microsoft Windows Azure. Service Oriented Architecture: REST, Publish Subscribe Model

Storage Systems: Storage Models, File Systems, and Databases, Distributed File Systems, General Parallel File System, Google File Systems, Apache Hadoop, Locks and Chubby: A Locking Service, Transaction Processing and NoSQL Databases, Big Table, Mega Store

Case Studies: The Grep The Web Application, Aneka Application of Maya Rendering Case Study

Text Books:

1. Kai Hwang, Geoffrey C. Fox, Jack K. Dongarra, Distributed and Cloud Computing: From parallel processing to Internet of Things, Morgen Kauffmann 2013.
2. Cloud Computing Theory and Practice, Dan C. Marinescu.

References:

1. Cloud Computing: A Hands-On Approach, Arshdeep Bagha & Vijay Madisetti, University Press, 2022 Edition
2. Cloud Computing: A Practical Approach Anthony T. Velte Toby J.Velte, Ph.D. Robert Elsenpeter
3. Cloud Computing Bible, Barrie Sosinsk
4. Cloud Computing Course (nptel.ac.in)

DIGITAL IMAGE PROCESSING

PROFESSIONAL ELECTIVE

SYLLABUS

Course Objectives:

- To explain fundamentals of Image processing concepts.
- To provide mathematical foundation of image enhancement, image compression and image segmentation.
- To explain the students about Morphology and its applications in image processing.
- To explain various methods and techniques for image transformation.

Course Outcomes:

By the end of the course, the student should be able to :

- Understand the concepts of digital images and operations on the images
- Develop algorithms for fundamental concepts in Image processing.
- Perform image enhancement, image compression and image segmentation using various methods.
- Ability to implement Image transformation techniques

Syllabus:

Fundamentals of Image Processing: Image Acquisition, Image Model, Sampling,

Quantization, Relationship Between Pixels, Distance Measures, Connectivity, Image

Geometry, Photographic Film. Histogram: Definition, Decision Of Contrast Basing On Histogram, Operations Basing on Histograms Like Image Stretching, Image Sliding, Image Classification. Definition and Algorithm of Histogram Equalization.

Image Enhancement in Spatial Domain: Arithmetic and Logical Operations, Pixel or Point Operations, Size Operations; Smoothing Filters-Mean, Median, Mode Filters – Comparative Study.

Edge enhancement in spatial domain: Edge enhancement filters, Directorial Filters,

Sobel, Laplacian, Robert, KIRSCH Homogeneity & DIFF filters, PREWITT Filter, Contrast based edge enhancement techniques, Comparative study, Low pass filters, High pass filters, Sharpening filters, Comparative study, Color fundamentals and color model

Image Compression: Run Length Encoding, modified run length encoding, Contour

Coding, Huffman Code, Compression Due to Change in Domain, Compression Due to Quantization Compression at the Time of Image Transmission. Brief Discussion on: - Image Compression Standards.

Image Segmentation: Definition of segmentation, Characteristics of Segmentation,

Detection of Discontinuities, Thresholding. Pixel Based Segmentation Method. Region

Based Segmentation Methods, Segmentation by Pixel Aggregation, Segmentation by Sub Region Aggregation, Histogram Based Segmentation, Spilt and Merge Technique, Segmentation of moving objects.

Morphology: Dilation, Erosion, Opening, Closing, Hit-And-Miss Transform, Thinning, Thickening, Skeletons, Pruning Extensions to Gray – Scale Images Application of Morphology in I.P

Image Transforms: A Detail Discussion On Fourier Transform, DFT, FFT, Properties of

Fourier transform, WALSH Trans Form, WFT, HADAMARD Transform, DCT Image

Enhancement in Frequency Domain: Design of Low Pass, High Pass, EDGE

Enhancement, Smoothening Filters in Frequency Domain. Butter Worth Filter, Homomorphic Filters in Frequency Domain Advantages of Filters in Frequency Domain, Comparative Study of Filters in Frequency, Domain and Spatial Domain.

Text Book:

1. Digital Image Processing, Rafael C. Gonzalez and Richard E. Woods, Addision Wesley

Reference Books:

1. Fundamentals Of Electronic Image Processing By Arthyr – R – Weeks, Jr.(PHI)
2. Image Processing, Analysis, And Machine Vision By Milan SonkaVaclanHalavac Roger Boyle, Vikas Publishing House.
3. Digital Image Processing, S. Jayaraman, S. Esakkirajan & T. Veera Kumar, TMH
4. Fundamentals of Digital Image Processing, Chris Solomon, Tobi Breckon, WileyBlackwell

MACHINE LEARNING

PROFESSIONAL ELECTIVE

SYLLABUS

Course Objectives:

This course introduces the essential concepts and techniques of machine learning to the students and more specifically

- provides a good foundation to machine learning concepts and paradigms
- introduces Bayes Decision theory and Maximum likelihood estimation for learning model parameters as a tradeoff between bias and variance
- Explains multi-variate data exploration methods like missing value imputation, dimensionality reduction for classification and regression.
- introduce semi-parametric approaches for mixture models with clustering and Expectation Maximization
- introduces non-parametric methods for density estimation, smoothening, regression, etc
- Demonstrates the applicability of Decision Trees, linear discriminants and SVMs for classification and regression and explains the comparative analysis of their performance.

Course Outcomes:

After completion of the course, the student should be able to:

- understand different types of ML, applications of ML in different domains, VC dimension and PAC learning for concept learning and supervisory model selection
- create Bayesian discriminant functions for decision regions with maximum likelihood estimation of parameters considering bias-variance tradeoff
- Understand and apply methods for missing value imputation, parameter estimation and dimensionality reduction on Multi-variate datasets
- Explore data applying various approaches like Expectation Maximization, clustering and non-parametric methods like nearest neighbors
- Able to solve classification and regression problems with Decision Trees, linear discriminants and SVMs and analyze the performance of classification algorithms

Syllabus:

Introduction to Machine Learning, Types and applications of Machine learning, **Supervisory Learning**: Learning classes from examples, Vapnik-Charvonenkis (VC) Dimension, Probably Approximately Correct(PAC) Learning, noise, learning multiple classes, regression, model selection and generalization, dimensions of supervised machine learning algorithms.

Bayesian Decision Theory: Classification, losses and risks, discriminant functions, Association Rules, **Parametric Methods**: Maximum likelihood estimation, evaluating an estimator with bias and variance, Bayes' estimator, parametric classification, regression, tuning model complexity: bias vs variance dilemma, model selection procedures

Multivariate methods: Multivariate data, parameter estimation, missing value imputation, Multivariate normal distribution, Multivariate classification, Tuning complexity, Discrete

features, Multivariate regression, **Dimensionality Reduction**: Subset selection, PCA, Factor Analysis, SVD and Matrix factorization, multi-dimensional scaling, LDA

Clustering: Mixture densities, K-means clustering, Expectation Maximization algorithm, Supervised learning after clustering, Feature embedding, Laplacian Eigenmaps, Spectral clustering, Hierarchical clustering, choosing number of clusters.

Non-parametric methods: Non-parametric density estimation methods like Histograms, kernel estimators, K-nearest neighbor estimators, generalization to multivariate data, nonparametric classification, condensed nearest neighbors, Distance based classification, outlier detection, non-parametric regression: smoothing models, choosing smoothing parameters.

Decision Trees and Assessing Classification algorithms: Decision Tree purpose and structure, Uni-variate Trees for classification and regression, rule extraction from trees, Learning Rules from data, Multivariate trees, **Assessing and comparing classification Algorithms**: Cross-validation and resampling methods, measuring error, interval estimation, Hypothesis testing, assessing performance of a classifier, comparing two classification algorithms.

Linear Discrimination: Generalizing linear model, two class and multi-class geometry of linear discriminant, pairwise separation, gradient descent, logistic discrimination for binary and multi-class problems, discrimination by regression, learning to rank.

Kernel Machines: features of Support vector machines, optimal separating hyperplane, Soft margin hyperplane for non-separable spaces, kernel Trick, Vectorial kernels, SVM for regression.

Text Book:

1. Introduction to Machine Learning by Ethem Alpaydin, Prentice-Hall of India, 3rd Edition, 2019.

Reference Books:

1. Machine Learning, Peter Flach, Cambridge University Press, 2012
2. Machine Learning, Tom Mitchell , McGraw Hill, 1997

BIG DATA ANALYTICS

PROFESSIONAL ELECTIVE

SYLLABUS

Course Objectives:

This course is aimed at enabling the students to

- Provide an overview of an exciting growing field of big data analytics.
- Introduce the tools required to manage and analyse big data like Hadoop, NoSQL, Map Reduce, HIVE, Cassandra, Spark.
- Teach the fundamental techniques and principles in achieving big data analytics with scalability and streaming capability.
- Optimize business decisions and create competitive advantage with Big Data analytics

Course Outcomes:

After the completion of the course, student will be able to

- Illustrate on big data and its use cases from selected business domains.
- Interpret and summarize on NoSQL, Cassandra
- Analyze the HADOOP and Map Reduce technologies associated with big data analytics and explore Big Data Applications Using Hive.
- Make use of Apache Spark, RDDs etc. to work with datasets and real time processing with Spark streaming .

Syllabus:

Introduction big data: why big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data, big data technologies, introduction to Hadoop, open source technologies, cloud and big data, mobile business intelligence, Crowd sourcing analytics, inter and trans firewall analytics.

Introduction to NoSQL: aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schema less databases, materialized views, distribution models, sharding, master-slave replication, peer- peer replication, sharding and replication, consistency, relaxing consistency, version stamps, Working with Cassandra, Table creation, loading and reading data.

Data formats, analyzing data with Hadoop: scaling out, Architecture of Hadoop distributed file system (HDFS), fault tolerance with data replication, High availability, Data locality , Map Reduce Architecture, Process flow, Java interface, data flow, Hadoop I/O, data integrity, compression, serialization.

Introduction to Hive: data types and file formats, HiveQL data definition, HiveQL data manipulation, Logical joins, Window functions, Optimization, Table partitioning, Bucketing, Indexing, Join strategies.

Apache spark: Advantages over Hadoop, lazy evaluation, In memory processing, DAG, Spark context, Spark Session, RDD, Transformations- Narrow and Wide, Actions, Data frames, RDD to Data frames, Catalyst optimizer, Data Frame Transformations, Working with Dates and Timestamps, Working with Nulls in Data,

Working with Complex Types: Working with JSON, Grouping, Window Functions, Joins, Data Sources, Broadcast Variables, Accumulators, Deploying Spark- On-Premises Cluster Deployments, Cluster Managers- Standalone Mode, Spark on YARN, Spark Logs, The Spark UI- Spark UI History Server, Debugging and Spark First Aid

Spark-Performance Tuning: Stream Processing Fundamentals, Event-Time and State full Processing - Event Time, State full Processing, Windows on Event Time- Tumbling Windows, Handling Late Data with Watermarks, Dropping Duplicates in a Stream, Structured Streaming Basics - Core Concepts, Structured Streaming in Action, Transformations on Streams, Input and Output.

Text Books:

1. Big Data, Big Analytics: Emerging, Michael Minnelli, Michelle Chambers, and AmbigaDhiraj
2. SPARK: The Definitive Guide, Bill Chambers & MateiZaharia, O'Reilley, 2018Edition
3. Business Intelligence and Analytic Trends for Today's Businesses", Wiley,2013
4. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World Polyglot Persistence", Addison-Wesley Professional,2012
5. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley,2012
6. Big Data Analytics - Chandramouli Subramanian, Asha A George, C R Rene Robin D Doreen Hephzibah Miriam, J Jasmine Christina Magdalene, University Press, 2024

Reference Books:

1. "Hadoop Operations", O'Reilley, Eric Sammer,2012
2. "Programming Hive", O'Reilley, E. Capriolo, D. Wampler, and J. Rutherglen,2012
3. "HBase: The Definitive Guide", O'Reilley, Lars George,2011
4. "Cassandra: The Definitive Guide", O'Reilley, Eben Hewitt,2010
5. "Programming Pig", O'Reilley, Alan Gates,2011

NATURAL LANGUAGE PROCESSING

PROFESSIONAL ELECTIVE

SYLLABUS

Course Objectives:

This course introduces the fundamental concepts and techniques of Natural Language Processing (NLP).

- Students will gain an in-depth understanding of the computational properties of natural languages and the commonly used algorithms for processing linguistic information.
- The course examines text representations and NLP algorithms using both the traditional symbolic and the more recent statistical and distributional approaches.
- Enable students to develop NLP models for text classification, information extraction, and dialog systems
- Provides a comprehensive study on NLP applications in a wide variety of domains

Course Outcomes:

After completion of this course the student will be able to:

- Understand the basic concepts and challenges of NLP and different stages of NLP-Pipeline
- Understand and analyze various representational approaches starting from vectorization-based to distribution-based embeddings for processing natural language text
- Build and interpret machine learning and deep learning models for Text Classification
- Understand basic concepts of information extraction for building different variants of NER systems and the concepts and challenges underlying the development of dialog systems / chatbots.
- Understand the approach and analyze the effectiveness of NLP applications in different domains.

Syllabus:

Introduction to NLP and NLP Pipeline:

NLP tasks and applications, building blocks of language, NLP challenges, Basic approaches to NLP -Heuristics based NLP, Machine Learning for NLP, Deep Learning for NLP. NLP Pipeline- Data Acquisition, Text Extraction and Cleanup, Pre-processing, Feature Engineering, Building the model, Evaluation.

Text Representation:

Vector space models, Basic Vectorization approaches, Distributed representations, Distributed representations beyond words and characters, Universal Text Representations, visualizing embeddings.

Text Classification:

Applications of text classification, Pipeline for building Text classification systems, One pipeline-many classifiers- Naïve Bayes, Logistic regression, SVM, Using Neural Embeddings

in Text Classification, Deep Learning for Text Classification, Interpreting text classification models, Learning with no or less data and adapting to new domains, case study on corporate ticketing.

Information Extraction:

Information Extraction-IE Applications, IE Tasks, General IE Pipeline, Keyphrase Extraction, Named Entity Recognition, Building an NER System, Building an NER System using existing library, using active learning, Named Entity Disambiguation and Linking, Relationship Extraction and other IE tasks.

Chatbots:

Chatbots- Applications, Taxonomy of Chatbots, Pipeline for building Dialog Systems, Components of a Dialog system, other dialog pipelines with end-to-end approach, Deep Reinforcement learning for dialog generation, human-in-the-loop, case study on recipe recommender, open-ended generative chatbots

BRIEF OVERVIEW ON NLP APPLICATIONS:

Search and Information Retrieval- Components of Search Engine, Topic Modeling, Text Summarization, Recommender Systems for textual data, Machine Translation, Question- Answering Systems.

NLP APPLIED TO SOCIAL MEDIA AND E-COMMERCE:

Applications and challenges of NLP for Social Media, Issues related to NLP for social media data, NLP for supporting e-commerce acivities, Search in E-commerce, Building E-commerce catalog, Review analysis, recommendations for e-commerce

Text Books:

1. Sowmya Vajjala, Bodhisattwa Majumder, Anuj Gupta and Harshit Surana, "*Practical Natural Language Processing*", O'Reilly Media Inc., 2021, ISBN: 978-93-8588-918-9.

Reference Books:

1. Lewis Tunstall, Leandro von Werra, Thomas Wolf, "Natural Language Processing with Transformers: Building Language Applications with Hugging Face", O'Reilly Media Inc., 2022
2. Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, 2ndEdition, Daniel Jurafsky, James H. Martin -Pearson Publication,2014.

SOFT COMPUTING
PROFESSIONAL ELECTIVE
SYLLABUS

Course Objectives:

- To explain the role of Soft Computing in addressing the imprecision and uncertainty in real world scenarios.
- To explain fuzzy systems, fuzzy logic and its applications.
- To explain Artificial Neural Networks and various categories of ANN.
- Design hybrid system to revise the principles of soft computing in various applications.
- To explain Genetic algorithms and rough set.

Course Outcomes:

By the end of the course, the student should be able to obtain:

- Ability to represent Uncertainty / imprecision data.
- Understand perceptrons and counter propagation networks.
- Ability to select a suitable method of Soft Computing to solve a particular problem.
- Ability to build hybrid systems using Soft Computing techniques.
- Analyze the genetic algorithms and their applications.

Syllabus:

Soft Computing: Introduction to Fuzzy Computing, Neural Computing, Genetic Algorithms, Associative Memory, Adaptive Resonance Theory, Different Tools and Techniques, Usefulness and Applications.

Fuzzy Sets and Fuzzy Logic: Introduction, Fuzzy Sets Versus Crisp Sets, Operations on Fuzzy Sets, Extension Principle, Fuzzy Relations and Relation Equations, Fuzzy Numbers, Linguistic Variables, Fuzzy Logic, Linguistic Hedges, Applications,

Interference in fuzzy logic: fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzifications and Defuzzificataions, Fuzzy Controller, Fuzzy Controllers, Fuzzy Pattern Recognition, Fuzzy Image Processing, Fuzzy Database.

Artificial Neural Network: Introduction, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, re-current networks. Various learning techniques, perception and convergence rule, Auto-associative and hetro-associative memory, Hebb's Learning, Adaline, Perceptron.

Multilayer Feed Forward Network: Back Propagation Algorithms, Different Issues Regarding Convergence of Multilayer Perceptron, Competitive Learning, Self-Organizing, Feature Maps, Adaptive Resonance Theory, Associative Memories, Applications.

Evolutionary and Stochastic Techniques: Genetic Algorithm (GA), Genetic Representations, (Encoding) Initialization and Selection, Different Operators of GA, Analysis of Selection Operations, Hypothesis of Building Blocks, Schema Theorem and Convergence of Genetic Algorithm, Simulated Annealing and Stochastic Models, Boltzmann Machine, Applications.

Rough Set: Introduction, Imprecise Categories Approximations and Rough Sets, Reduction of Knowledge, Decision Tables and Applications. Hybrid Systems: Neural Network-Based Fuzzy Systems, Fuzzy Logic-Based Neural Networks, Genetic Algorithm for Neural Network Design and Learning, Fuzzy Logic and Genetic Algorithm for Optimization, Applications

Text Books:

1. Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications, S.Rajsekaran and G.A. VijayalakshmiPai, Prentice Hall of India.
2. Rough Sets, Z.Pawlak, Kluwer Academic Publisher, 1991.
3. Intelligent Hybrid Systems, D. Ruan, Kluwer Academic Publisher, 1997

References Books:

1. Artificial Intelligence and Intelligent Systems, N.P.Padhy, Oxford University Press.
2. Neural Fuzzy Systems, Chin-Teng Lin & C. S. George Lee, Prentice Hall PTR. Addison-Wesley
3. Learning and Soft Computing, V. Kecman, MIT Press, 2001
4. Fuzzy Sets and Fuzzy Logic, Klir & Yuan, PHI, 1997

DEEP LEARNING

PROFESSIONAL ELECTIVE

SYLLABUS

Course Objectives:

From the course the student will learn

- Knowledge and expertise for building deep learning models.
- Various architectures for deep learning and their suitability to specific problems
- Program development and evaluation support from Tensorflow
- Q-learning and the other methods for deep reinforcement learning
- Different types of auto-encoders for unsupervised feature extraction

Course Outcomes:

At the end of the course, student will be able to

- Build feed forward neural networks with appropriate options using Tensorflow
- Write Tensorflow programs for learning using convolution neural networks.
- Apply the concepts of recurrent NNs with LSTM and attention for learning word embeddings and NLP tasks
- Apply various methods for deep reinforcement learning
- Use the appropriate type of auto-encoders for problem solving.

Syllabus:

Feed forward neural networks:perceptrons, cross-entropy loss estimation, derivatives and Stochastic Gradient descent, NN implementation issues, matrix representation of NNs, Data independence,

Tensorflow: preliminaries, simple TF program, Multi-layered NNs, setting checkpoints, tensordot, initialization of TF variables, simplifying TF graph creation. PyTorch basics and uses

Convolutional Neural Networks: Filters, strides and padding, simple TF Convolution program, Multilevel Convolution, convolution details, biases, layers with convolution, pooling

Recurrent NNs and Word Embeddings: Word Embeddings for Language Models,Building feed forward LMs, Improving Feed forward models, Overfitting, Recurrent Neural networks, Long-Short term Memory cells, TF implementation

Sequence to sequence Learning: Seq2Seq paradigm, writing a Seq2Seq Machine Translation program, Attention in Seq2Seq,Multilength Seq2Seq, Implementation in TF

Deep Reinforcement Learning: Value Iteration, Q-learning,Basic deep Q-learning,Policy gradient methods,Actor-critic methods, Experience replay

Unsupervised NN Models: Basic autoencoding, Convolutional autoencoding, variational autoencoding, Generative adversarial networks.

Text Book:

1. Eugene Charniak, “Introducing to Deep Learning”, MIT press, 2018
2. Sherin Thomas,Sudhanshu Passi, “PyTorch Deep Learning hands-On”, Packt publishers
3. Ian Goodfellow, YoshuaBengio and Aaron Courville, “Deep Learning”, MIT press, 2016

Reference Books:

1. Jeremy Howard and Sylvain Gugger, “Deep Learning for coders with Fastai and Pytorch”, OReilly, 2020
2. John Krohn, etal, “Deep Learning Illustrated”, Pearson edu. India, 2020

E-COMMERCE

PROFESSIONAL ELECTIVE

SYLLABUS

Course Objectives:

- Introduce students to electronic commerce and its various applications
- Provide knowledge of electronic payment systems and risks involved, electronic data interchange, inter-organizational and intra-organizational commerce
- Introduce students to concepts of information based marketing including online marketing, advertising on internet, consumer search
- Provide knowledge of multimedia concepts including digital video and electronic commerce, video conferencing and video processing.

Course Outcomes:

- Understand the framework of electronic commerce and its various applications
- Explain the types of electronic payment systems and risks involved in such systems
- Understand online marketing and information based marketing concepts including consumer search, information retrieval, advertising on internet.

Syllabus:

Introduction: Electronic Commerce-Frame Work, Anatomy of E-Commerce Applications, E-Commerce Consumer Applications, E-Commerce Organization Applications. Consumer Oriented Electronic Commerce - Mercantile Process Models.

Electronic Payment Systems – Types of Electronic Payment Systems, Digital Token-Based, Smart Cards, Credit Cards, Risks in Electronic Payment Systems, Designing Electronic Payment Systems

Electronic Data Inter Change, Inter Organizational Commerce - EDI, EDI Implementation, Value Added Networks.

Intra Organizational Commerce, Macro Forces and Internal Commerce, Work Flow Automation and Coordination, Customization and Internal Commerce, Supply Chain Management.

Business Cases for Document Library, Digital Document Types, Corporate Data Ware-Houses.

Advertising And Marketing: Information Based Marketing, Advertising On Internet, Online Marketing Process, Market Research. Consumer Search and Resource Discovery, Information Search and Retrieval, Commerce Catalogues, Information Filtering.

Multimedia-Key Multimedia Concepts, Digital Video and Electronic Commerce, Desktop Video Processing, Desktop VideoConferencing.

Text Book:

1. Frontiers of Electronic Commerce, Kalakata and Whinston,Pearson.

Reference Books:

1. E-Commerce fundamentals and Applications, Hendry Chan, Raymond Lee, Tharam Dillon, Ellizabeth Chang, JohnWiley.

2. E-Commerce, S.Jaiswal,Galgotia.

3. E-Commerce, Efrain Turbon, Jae Lee, David King, H.MichaelChang.

4. E-Commerce - Business, Technology and Society, Kenneth C.Taudon, Carol uyericoTraver.

EMBEDDED SYSTEMS

PROFESSIONAL ELECTIVE

SYLLABUS

Course Objectives:

- To study the basics of embedded systems and its examples.
- To study the 8051 Microcontroller architecture and its instruction set.
- To discuss various software architectures in embedded systems.
- To discuss Inter Task Communication procedures in RTOS and design issues of RTOS.
- To study various embedded software development tools and debugging techniques.

Course Outcomes:

- Student will be understanding the basic architecture of 8051 micro controllers.
- ability to write ALP programs using 8051 instruction set.
- Ability to understand the concepts related to RTOS and its Inter Task Communication methods.
- Ability to understand various design issues of RTOS.
- Understand about embedded software development tools.

Syllabus:

Introduction to Embedded Systems: Examples, Typical Hardware, Memory, Microprocessors, Busses; Introduction to 8051 Microcontroller, Architecture, Instruction set, Programming. Interrupts: Interrupt Basics, Shared-Data problem, Interrupt Latency.

Software Architectures: Round-Robin Architecture, Round-Robin with Interrupts Architecture, Function-Queue Scheduling Architecture, Real-Time Operating Systems Architecture, Selection of Architecture.

Real Time Operating System: Tasks and Task States, Tasks and Data, Semaphores and Shared Data, Semaphore Problems, Semaphore variants.

Inter Task Communication: Message Queues, Mailboxes, Pipes, Timer Functions, Events, Memory Management, Interrupt Routines in RTOS Environment.

Design issues of RTOS: Principles, Encapsulation Semaphores and Queues, Hard Real-time Scheduling Considerations, Saving Memory Space, Saving Power.

Embedded Software Development Tools: Host and Target Machines, Linker/Locator for Embedded Software, Getting Embedded Software into the Target System.

Embedded Software Debugging Techniques: Testing on your Host Machine, Instruction Set Simulators, Laboratory Tools used for Debugging.

Introduction to the Internet of Things: History of IoT, IoT Architecture, M2M – Machine to Machine, Web of Things, IoT protocols, The Layering concepts, IoT Communication Pattern, IoT protocol Architecture.

Text Books:

1. The 8051 Microcontroller Architecture, Programming & Applications, Kenneth J. Ayala, Penram International.
2. An Embedded Software Primer, David E. Simon, Pearson Education, 2005.
3. Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems, Marina Ruggieri & Homayoun Nikookar, River Publishers Series in Communications.

Reference Book:

1. Embedded Systems: Architecture, Programming and Design, Raj Kamal, Tata McGraw-Hill Education, 2008

OPEN ELECTIVES

1. CYBER SECURITY & DIGITAL FORENSICS
2. BLOCKCHAIN TECHNOLOGY
3. MOBILE COMPUTING
4. MOBILE ADHOC NETWORKS
5. RECOMMENDER SYSTEMS
6. NOSQL DATABASES
7. DATA SCIENCE
8. INFORMATION RETRIEVAL
9. DATABASE AND WEB APPLICATION SECURITY
10. BUSINESS ANALYTICS
11. HUMAN COMPUTER INTERACTION
12. BIO-INFORMATICS
13. INDUSTRY 4.0

OPEN ELECTIVES for other departments - (MINOR)

1. BLOCK CHAIN TECHNOLOGY
2. RECOMMENDER SYSTEMS
3. INFORMATION RETRIEVAL
4. BUSINESS ANALYTICS
5. BIO INFORMATICS

CYBER SECURITY & DIGITAL FORENSICS
OPEN ELECTIVE
SYLLABUS

Course Objectives:

- Understand the threats in networks and security concepts.
- Apply authentication applications in different networks.
- Understand security services for email.
- Awareness of firewall and it applications.

Course Outcomes:

By the end of the course, the student should be able to:

- Differentiate among different types of security attacks.
- Define computer forensics.
- Identify the process in taking digital evidence.
- Describe how to conduct an investigation using methods of memory, operating system, network and email forensics with different forensic tools.

Syllabus:

Introduction to Information Security Fundamentals and Best Practices: Protecting Your Computer and its Contents, Securing Computer Networks--Basics of Networking, Compromised Computers, Secure Communications and Information Security Best Practices, Privacy Guidelines, Safe Internet Usage.

Ethics in Cyber Security & Cyber Law: Privacy, Intellectual Property, Professional Ethics, Freedom of Speech, Fair User and Ethical Hacking, Trademarks, Internet Fraud, Electronic Evidence, Cybercrimes.

Penetration Testing: Overview of the web from a penetration testers perspective, Exploring the various servers and clients, Discussion of the various web architectures, Discussion of the different types of vulnerabilities, defining a web application test scope and process, Defining types of penetration testing.

Web Application Security: Common Issues in Web Apps, what is XSS, SQL injection, CSRF, Password Vulnerabilities, SSL, CAPTCHA, Session Hijacking, Local and Remote File Inclusion, Audit Trails, Web Server Issues.

Forensics & Network Assurance: Forensic Technologies, Digital Evidence Collection, Evidentiary Reporting, Layered Defense, Surveillance and Reconnaissance, Outsider Thread Protection

Information Risk Management: Asset Evaluation and Business Impact Analysis, Risk Identification, Risk Quantification, Risk Response Development and Control, Security Policy, Compliance, and Business Continuity. Forensic investigation using Access Data FTK, En- Case

Cyber Incident Analysis and Response: Incident Preparation, Incident Detection and Analysis. Containment, Eradication, and Recovery. Proactive and Post-Incident Cyber Services, CIA triangle.

Text Books:

1. Cyber Security & Digital Forensics by Anas Zakir, Clever Fox Publishing, Publication Date-2022
2. "Beginners Guide To Ethical Hacking and Cyber Security ", by Abhinav Ojha, Khanna Publishers, First Edition, Publication Date-2023

Reference Books:

1. The Official CHFI Study Guide for Computer Hacking Forensic Investigator by Dave Kleiman
2. CISSP Study Guide, 6th Edition by James M. Stewart

BLOCKCHAIN TECHNOLOGY

OPEN ELECTIVE

SYLLABUS

Course Objectives:

- To understand the basic concepts block chain technology and to explore the driving force behind the crypto currency Bitcoin.
- To understand about the different methods of Decentralization using Block Chain and different Bitcoins and Alternative Coins.
- To understand about Ethereum and applications using Smart contracts and Block Chain Applications.
- To get familiarity with future currencies and to create own crypto token.

Course Outcomes:

At the end of the course the student will be able to:

- Explore the primitives of the distributed computing and cryptography related to blockchain
- Understand the types, benefits and limitation of block chain.
- Enumerate the Bitcoin features and its alternative options.
- Understand the modern currencies and its market usage.
- Implement and deploy the smart contracts in different environments like Ethereum.
- Usage of smart contracts in various real world application domains.

Syllabus:

Block Chain and its History: History of blockchain, Types of blockchain, Blockchain Components – Permissioned Blockchain Permission less Blockchain – Consortium Blockchain – basics of Consensus Algorithms, Architecture & Properties of Blockchain.

Decentralization and Consensus Algorithms: Decentralization using blockchain, Methods of decentralization, Routes to decentralization, Decentralized organizations, Distributed systems, Distributed ledger, Merkle tree, structure of a block, Consensus

Algorithms- Proof of Work, Proof of Stack, Proof of Burn, Proof of Elapsed Time, Proof of Activity, Proof of Concept.

Bitcoin and Alternative Coins: Bitcoin, Transactions, Bitcoin payments, Bitcoin properties – Transaction life cycle – creation of coin –sending payments – double spending using blockchain – bitcoin anonymity – Ether: Ethercoin properties, Alternative Coins, Bitcoin limitations, Namecoin, Litecoin, Primecoin, Zcash

Ethereum and smart contracts: Ethereum Architecture, solidity programming basics, Smart Contract, Deploying Smart Contracts, Integration with UI.

Blockchain Applications: Blockchain-Outside of Currencies: Internet of Things, Government, Health, Finance, Media, Secure Voting and Digital Identity, Real Estate, Education.

Text Books:

1. Mastering Blockchain - Distributed ledgers, decentralization and smart contracts explained, Author- Imran Bashir, Packt Publishing Ltd, Second Edition, ISBN 978-1- 78712-544-5, 2017
2. Bitcoin and Cryptocurrency Technologies, Author- Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder, Princeton University, 2016
3. Blockchain Technology, Author- Chandramouli Subramanian, Asha A George, Abhilash K A, Meena Karthikeyan, University Press (India) Private Limited, 2021

Reference Book:

1. Blockchain Basics: A Non-Technical Introduction in 25 Steps, Author- Daniel Drescher, Apress, First Edition, 2017

MOBILE COMPUTING

OPEN ELECTIVE

SYLLABUS

Course Objectives:

- To introduce the basic concepts and principles in mobile computing. This includes major techniques involved, and networks & systems issues for the design and implementation of mobile computing systems and applications.
- To explore both theoretical and practical issues of mobile computing.
- To provide an opportunity for students to understand the key components and technologies involved and to gain hands-on experiences in building mobile applications.

Course Outcomes:

On successful completion of course learner will be able:

- To identify basic concepts and principles in mobile communication & computing, cellular architecture.
- To describe the components and functioning of mobile networking.
- To classify variety of security techniques in mobile network.
- To describe and apply the concepts of mobility management

SYLLABUS:

Introduction: Mobile Communications, Mobile Computing – Paradigm, Promises/Novel Applications and Impediments and Architecture, Mobile and Handheld Devices, Limitations of Mobile and Handheld Devices, GSM - Services, System Architecture, Protocols, Localization, Calling, Handover, Security, New Data Services, GPRS-network operation, data services and applications

(Wireless) Medium Access Control (MAC): Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA, Wireless LAN/(IEEE 802.11)

Mobile Network & Transport Layers: IP and Mobile IP Network Layers, Packet Delivery and Handover, Management, Location Management, Registration, Tunnelling and Encapsulation, Route Optimization, DHCP, Indirect TCP, Snooping TCP, Mobile TCP, Other Transport Layer Protocols for Mobile Networks

Database Issues: Database Hoarding & Caching Techniques, Client-Server Computing & Adaptation Transactional Models, Query processing, Data Recovery Process & QoS Issues

Data Dissemination and Synchronization: Communications Asymmetry, Classification of Data Delivery Mechanisms, Data Dissemination, Broadcast Models, Selective Tuning and Indexing Methods, Data Synchronization – Introduction, Software and Protocols.

Mobile Ad hoc Networks (MANETs): Introduction, Applications & Challenges of a MANET, Routing, Classification of Routing Algorithms, Algorithms such as DSR,AODV,DSDV, etc., Mobile Agents, Service Discovery

Protocols and Platforms for Mobile Computing:

Basic of WAP, Bluetooth, XML, J2ME, JavaCard, PalmOS, Windows CE, SymbianOS, Linux for Mobile Devices, Android.

Text Books:

1. Jochen Schiller, "Mobile Communications", Addison-Wesley, Second Edition, 2009
2. Raj Kamal, "Mobile Computing", Oxford University Press, 2007, ISBN: 0195686772

Reference Books:

1. ASOKE K TALUKDER, HASAN AHMED, ROOPA R YAVAGAL, "Mobile Computing, Technology Applications and Service Creation" Second Edition, Mc Graw Hill.
2. UWE Hansmann, Lother Merk, Martin S. Nocklous, Thomas Stober, "Principles of Mobile Computing," Second Edition, Springer.

MOBILE ADHOC NETWORKS

OPEN ELECTIVE

SYLLABUS

Course Objectives:

- To understand the concepts of mobile adhoc networks
- To understand the concepts of wireless LANs, wireless adhoc networks, types and their routing protocols.
- To introduce students to mobile communications and mobile computing.
- To understand basics of HIPERLAN, Wireless ATM technologies.

Course Outcomes:

By the end of the course, the student should be able to obtain:

- Ability to understand the state-of-the-art research in the emerging subject of Mobile Adhoc Networks
- Understand GSM, TDMA, CDMA, IS-95 technology
- Understand wireless LANs, IEEE 802.11 WLANs.
- Understand Wireless ATM and HIPERLAN, Adhoc networking and WPAN.

Syllabus:

GSM and TDMA Technology: Introduction, What is GSM, Mechanisms to support a Mobile Environment, Communications in the Infrastructure.

CDMA Technology, IS-95, and IMT-2000: Introduction, Reference Architecture for North American Systems, What is CDMA, IMT-2000.

Mobile Data Networks: Introduction, The Data-Oriented CDPD Network, GPRS and Higher Data Rates, Short Messaging Service in GSM, Mobile Application Protocols.

Introduction to Wireless LANs: Introduction, Historical Overview of the LAN Industry, Evolution of the WLAN Industry, New Interest from Military and Service Providers, A New Explosion of Market and Technology, Wireless Home Networking.

IEEE 802.11 WLANs: Introduction, What is IEEE 802.11, The PHY Layer, MAC sub layer, MAC Management sub layer.

Wireless ATM and HIPERLAN: Introduction, What is Wireless ATM, What is HIPERLAN, HIPERLAN-2.

Ad Hoc Networking and WPAN: Introduction, What is IEEE 802.15 WPAN, What is HomeRF, What is Bluetooth, Interference between Bluetooth and 802.11

Wireless Geolocation Systems: Introduction, What is Wireless Geolocation, Wireless Geolocation System Architecture, Technologies for Wireless Geolocation, Geolocation Standards for E-911 Services, Performance measures for Geolocation Systems.

Text Book:

1. Principles of Wireless networks Kaveth Pahlavan, K.Prasanth Krishnamurthy, Pearson Publications, Asia, 2002

RECOMMENDER SYSTEMS

OPEN ELECTIVE

SYLLABUS

Course Objectives:

To understand the

- Basic concepts of recommender systems
- Various approaches for building Recommender systems
- Personalization algorithms, evaluation tools, and user experiences
- Various attacks and privacy aspects on collaborative recommender systems
- Several applications of Recommender systems

Course Outcomes:

By the end of the course, the student should be able to:

- Describe basic concepts behind Recommender Systems
- Explain a variety of approaches for building recommender systems
- Describe system evaluation methods from both algorithmic and users' perspectives
- Describe various attacks and privacy aspects on collaborative recommender systems.
- Describe applications of recommender systems in various domains

Syllabus:

Collaborative recommendations: User-based nearest neighbor recommendation, Item - based nearest neighbor recommendation, About ratings, Model-based and Preprocessing-based approaches, Recent practical approaches and Systems.

Content- based approaches: Opportunities for hybridization, Monolithic hybridization design, Parallelized hybridization design, Pipelined hybridization design.

Evaluating recommender systems: recommendation: Content representation and content similarity, Similarity-based retrieval, other text classification methods.

Knowledge-based recommendation: Introduction, Knowledge representation and reasoning, Interacting with constraint--based recommenders, Interacting with case-based recommenders, Example applications.

Hybrid recommendation Introduction , General properties of evaluation research, Popular evaluation designs, Evaluation on historical datasets, Alternate evaluation designs.

Attacks on collaborative recommender systems: A first example, Attack dimensions , Attack types, Evaluation of effectiveness and countermeasures, Countermeasures, Privacy aspects - distributed collaborative filtering.

Online consumer decision making: Introduction , Context effects, Primacy/recency effects, Further effects, Personality and social psychology.

Recommender systems and the next-generation web: Trust aware recommender systems, Folksonomies and more, Ontological filtering, Extracting semantics from the web.

Text Book:

1. Recommender Systems: An Introduction by Dietmar Jannach, Markus Zanker, Alexander Felfernig, Gerhard Friedrich, Cambridge University Press.

Reference Book:

1. Recommender Systems: The Textbook by Charu C. Aggarwal, Springer Publications.

NoSQL DATABASES

OPEN ELECTIVE

SYLLABUS

Course Objectives:

Upon successful completion of this course, a student will be able to:

- Define NoSQL, its characteristics and history, and the primary benefits for using NoSQL data.
- Define the major types of NoSQL databases including a primary use case and advantages/disadvantages of each type
- Create wide-column, document, key-value, graph and object-oriented databases, add content, and run queries.
- Describe the NoSQL data architecture patterns
- Perform basic database administration tasks.
- Develop NoSQL desktop and cloud database solutions.

Course Outcomes:

On completion of this course, the student will be able to :

- Enumerate different features of NOSQL Databases
- Compare different data models
- Design a Key-Value Database for a real world problem
- Design a Document Database for a real world problem
- Design a Graph Database for a real world problem

SYLLABUS

Introduction to NoSQL. The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Standard Model, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters,The Emergence of NoSQL.

Aggregate Data Models, Aggregates, Consequences of Aggregate Orientation, Key-Value and Document Data Models, Column-Family Stores, Summarizing Aggregate-Oriented Databases.

More Details on Data Models, Relationships, Graph Databases, Schemaless Databases, Materialized Views, Modeling for Data Access, Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication, Consistency, Update Consistency, Read Consistency, Relaxing Consistency, The CAP Theorem, Relaxing Durability, Quorums

Key-Value Databases, Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preferences, Shopping Cart Data, When Not to Use, Relationships among Data, Multi operation Transactions, Query by Data, Operations by Sets

Document Databases, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web

Analytics or Real-Time Analytics, E-Commerce Applications, When Not to Use, Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure

Column-Family Stores, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Counters.

Graph Databases, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Connected Data, Routing, Dispatch, and Location-Based Services Recommendation Engines

Text Books:

1. Sadalage, P. & Fowler, M., NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence. (1st Ed.). Upper Saddle River, NJ: Pearson Education, In, 2012.

Reference Books:

1. Gauravvaish, Getting started with NoSQL, PACKT publishing, ISBN: 978184969488
2. Redmond, E. & Wilson, J., Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQL Movement (1st Ed.), 2012
3. Raleigh, NC: The Pragmatic Programmers, LLC. ISBN-13: 978- 1934356920 ISBN-10: 1934356921

DATA SCIENCE

OPEN ELECTIVE

SYLLABUS

Course Objectives:

From the course the student will learn

- Knowhow and expertise to become a data scientist.
- Essential concepts of statistics and machine learning that are vital for data science;
- Significance of exploratory data analysis (EDA) in data science.
- Critically explore and analyze data visualizations presented on the dashboards
- Suitability and limitations of tools and techniques related to data science process

Course Outcomes:

At the end of the course, student will be able to

- Describe the steps involved in Data Science process and the technologies needed for a data scientist.
- Identify suitable ML techniques for data modelling and apply them for decision support.
- handle large datasets with distributed storage and processing system
- use appropriate tools for data collection, EDA and model building for specific types of data
- build a prototype application of Data Science as a case study.

Syllabus:

Introduction to Data science, benefits and uses, facets of data, data science process in brief, big data

ecosystem and data science.

Data Science process: Overview, defining goals and creating project charter, retrieving data, cleansing, integrating and transforming data, exploratory analysis, model building, presenting findings and building applications on top of them

Applications of machine learning in Data science, role of ML in DS, Python tools like sklearn, modelling process for feature engineering, model selection, validation and prediction, types of ML including semi-supervised learning

Handling large data: problems and general techniques for handling large data, programming tips for dealing large data, case studies on DS projects for predicting malicious URLs, for building recommender systems.

NoSQL movement for handling Big data: Distributing data storage and processing with Hadoop framework, case study on risk assessment for loan sanctioning, ACID principle of relational databases, CAP theorem, base principle of NoSQL databases, types of NoSQL databases, case study on disease diagnosis and profiling

Tools and Applications of Data Science: Introducing Neo4j for dealing with graph databases, graph query language Cipher, Applications graph databases, Python libraries like nltk and SQLite for handling Text mining and analytics, case study on classifying Reddit posts

Data Visualization and Prototype Application Development: Data Visualization options, Cross filter, the JavaScript Map Reduce library, Creating an interactive dashboard with dc.js, Dashboard development tools, Applying the DS process for respective engineering problem solving scenarios as a detailed case study.

Text Books:

1. Davy Cielen, Arno D.B.Meysman, and Mohamed Ali, "Introducing to Data Science using Python tools", Manning Publications Co, Dreamtech press, 2016
2. Prateek Gupta, "Data Science with Jupyter" BPB publishers, 2019 for basics

Reference Books:

1. Joel Grus, "Data Science From Scratch", OReilly, 2019
2. Doing Data Science: Straight Talk From the Frontline, 1 st Edition, Cathy O'Neil and Rachel Schutt, O'Reilly, 2013

INFORMATION RETRIEVAL

OPEN ELECTIVE

SYLLABUS

Course Objectives:

- To provide an overview of Information Retrieval.
- To introduce students about insights of the several topics of Information retrieval such as inverted files, signature files, Boolean retrieval model, Vector space model.
- To provide comprehensive details about various stemming algorithms.
- To provide comprehensive details about various search and evaluation methods.

Course Outcomes:

At the end of the course the students will

- Get the understanding of different information retrieval models.
- Get to know about the various evaluation and information retrieval models.
- Get to know the challenges associated with Information retrieval.

Syllabus

Introduction to Information storage and retrieval systems: Domain Analysis of IR systems, IR and other types of Information Systems, IR System Evaluation, Introduction to Data structures and algorithms related to Information Retrieval: Basic Concepts, Data structures, Algorithms.

Inverted Files: Introduction, Structures used in Inverted Files, Building an Inverted files using a sorted array, Modifications to the Basic Techniques.

Signature Files: Introduction, Concepts of Signature files, Compression, Vertical Partitioning, Horizontal Partitioning.

New Indices for Text: PAT Trees and PAT Arrays: Introduction, PAT Tree structure, Algorithms on the PAT Trees, Building PAT Trees as PATRICA Trees, PAT representation as Arrays.

Lexical Analysis and Stop lists: Introduction, Lexical Analysis, Stop lists.

Stemming Algorithms: Introduction, Types of Stemming algorithms, Experimental Evaluations of Stemming, Stemming to Compress Inverted Files.

Thesaurus Construction: Introduction, Features of Thesauri, Thesaurus Construction, Thesaurus construction from Texts, Merging existing Thesauri.

String Searching Algorithms: Introduction, Preliminaries, The Naive Algorithm, The Knutt-Morris-Pratt Algorithm, The Boyer-Moore Algorithm, The Shift-Or Algorithm, The Karp-Rabin Algorithm.

Text Books:

1. Introduction to Information Retrieval, Christopher D.Manning, Raghavan, Cambridge University Press
2. Modern Information Retrieval, Ricardo Baeza-Yates, Neto, PEA,2007.
3. Information Storage and Retrieval Systems: Theory and Implementation, Kowalski, Gerald, Mark Academic Press,2000.

Reference Books:

1. Information Retrieval: Algorithms and Heuristics , Grossman, OphirFrieder,2/e, Springer,2004.

2. Information Retrieval Data Structures and Algorithms ,Frakes, Ricardo Baeza-Yates, PEA

3. Information Storage and Retrieval, Robert Korfhage, John Wiley &Sons.

DATABASE & WEB APPLICATION SECURITY

OPEN ELECTIVE

SYLLABUS

Course Objectives:

- Introduce various threats and vulnerabilities in database security, Context and control based access control
- Introduce the basic principles of web application security, Authentication, Authorization
- Introduce the basics of IT security and mobile device security
- Introduce the basics of security testing and penetration testing

Course Outcomes:

At the end of the course, student will be able to:

- Explain the various threats and vulnerabilities in database security
- Understand the basic principles of web application security, Authentication, Authorization
- Explain the basics of IT security and mobile device security
- Apply security testing and penetration testing

Syllabus:

Database security – Introduction includes threats, vulnerabilities and breaches, Basics of database design, DB security – concepts, approaches and challenges, types of access controls, Oracle VPD,

Discretionary and Mandatory Access Control – Principles, applications and poly-instantiation, Database inference problem, types of inference attacks, distributed database, security levels, SQL-injection: types and advanced concepts.

Security in relational data model, concurrency controls and locking, SQL extensions to security (oracle as an example), System R concepts, Context and control based access control, Hippocratic databases, Database watermarking, Database intrusion, Secure data outsourcing,

Web Application security, Basic principles and concepts, Authentication, Authorization, Browser security principles; XSS and CSRF, same origin policies, File security principles, Secure development and deployment methodologies, Web DB principles, OWASP – Top 10 – Detailed treatment,

IoT security – OWASP Top 10 – Detailed treatment, Mobile device security – Introduction, attack vector and models, hardware centric security aspects, SMS / MMS vulnerabilities, software centric security aspects, mobile web browser security,

Application security – Concepts, CIA Triad, Hexad, types of cyber attacks, Introduction to software development vulnerabilities, code analyzers – Static and dynamic analyzers,

Security testing/Penetration testing – Principles and concepts, PT work flows and examples, blind tests, ethical hacking techniques, synthetic transactions, interface testing and fuzzing, SDLC phases and security mandates.

Text Books:

1. Michael Gertz and Sushil Jajodia, “Handbook of Database Security— Applications and Trends”, Springer, 2008.

2. Bryan and Vincent, “Web Application Security, A Beginners Guide ”,McGraw-Hill, 2011

3. Bhavani Thuraisingham, “Database and Applications Security”, Integrating Information Security and Data Management, Auerbach Publications, 2005.

4. Alfred Basta, Melissa Zgola, “Database Security”, Course Technology, 2012 - Delmar Cengage Learning

BUSINESS ANALYTICS

OPEN ELECTIVE

SYLLABUS

Course Objectives:

- To introduce students to problem solving with Business Analytics and the use of spreadsheets for descriptive analytics, data queries and visualization
- To introduce students to statistical sampling, sampling distributions, confidence intervals and statistical inference
- To learn the basic arithmetic functions used in MS Excel
- To familiarize students with various types of regression including simple linear regression and multiple linear regression

Course Outcomes:

After completion of the course the student should be able to:

- Describe data and models used for Business Analytics and apply various descriptive analytic techniques to analyze data
- Estimating population parameters, interval estimates, construct confidence intervals and perform hypothesis testing
- Estimate and interpret the parameters of simple linear regression and multiple linear regressions

SYLLABUS:

Foundations of Business Analytics: Evolution of Business Analytics, Scope, data and models for Business Analytics, problem solving with Business Analytics, Analytics on spreadsheets, Excel functions for Database queries, Add-ons for Business Analytics. Descriptive Analytics: Data visualization, creating charts in MS Excel, Data Queries, Tables, sorting and filtering, Data summarization with statistics, Data exploration using Pivot tables

Statistical Sampling: methods, estimating population parameters, sampling error, sampling distributions, interval estimates, confidence intervals, using confidence intervals for decision making, prediction intervals Statistical Inference: Hypothesis testing, one-sample Hypothesis testing, two-tailed test of Hypothesis for mean, two-sample Hypothesis testing, Analysis of variance, chi-square test for independence

Trendliness and Regression: Modelling Relationships and trends in data, Simple linear regression, least squares regression, regression on analysis of variance, testing hypothesis for regression coefficients, Confidence intervals for regression coefficients, Residual analysis and regression assumptions, Multiple linear regression, building regression models, regression with categorical independent variables with two or more levels, regression with nonlinear terms, advanced techniques for regression modelling

Forecasting Techniques: Qualitative and judgmental forecasting, statistical forecasting models, forecasting models for stationary time series, forecasting models for time series with linear trend, forecasting models for time series with seasonality, selecting appropriate time-series-based forecasting models, regression forecasting with casual variables, practice of forecasting

Spreadsheet modeling and Analysis: Strategies for predictive decision modelling, Implementing models on spreadsheet, spreadsheet applications in Business analytics, Model assumptions, complexity and realism, developing user-friendly applications, analyzing uncertainty and model assumptions, model analysis using analytics solver platform

Linear Optimization & Applications: Building Linear Optimization Models on spreadsheets, solving Linear Optimization models, Graphical interpretation of linear optimization, Using optimization models of prediction and insight, Types of constraints in optimization models, process selection models, Blending Models, Portfolio Investment models

Text Book:

1."Business Analytics: Methods, Models, and Decisions" James R. Evans, Pearson Publications,Second edition

Reference Book:

1."Business Analytics: The Science of Data-Driven Decision Making", U.Dinesh Kumar, Wiley Publications

HUMAN COMPUTER INTERACTION

OPEN ELECTIVE

SYLLABUS

Course Objectives:

- To gain an overview of Human-Computer Interaction, with an understanding of user interface design in general, and alternatives to traditional "keyboard and mouse" computing
- Be able to predict user performance in various human-computer interaction tasks
- Appreciate the importance of a design that maintains a focus on the user; be familiar with a variety of both conventional and non-traditional user interface paradigms

Course Outcomes:

By the end of the course, the student should be able to:

- Apply HCI and principles for interaction and design.
- Appreciate importance of user documentation and information search

Syllabus:

Introduction: Usability of Interactive Systems- introduction, usability goals and measures, usability motivations, universal usability, goals for our profession Managing Design Processes: Introduction, Organizational design to support usability, Four pillars of design, development methodologies, Ethnographic observation, Participatory design, Scenario Development, Social impact statement for early design review, legal issues, Usability Testing and Laboratories

Menu Selection, Form Fill-In and Dialog Boxes: Introduction, Task- Related Menu Organization, Single menus, Combinations of Multiple Menus, Content Organization, Fast Movement Through Menus, Data entry with Menus: Form Fill-in, dialog Boxes, and alternatives, Audio Menus and menus for Small Displays

Command and Natural Languages: Introduction, Command organization Functionality, Strategies and Structure, Naming and Abbreviations, Natural Language in Computing Interaction Devices: Introduction, Keyboards and Keypads, Pointing Devices, Speech and Auditory Interfaces, Displays- Small and large

Quality of Service: Introduction, Models of Response-Time impacts, Expectations and attitudes, User Productivity, Variability in Response Time, Frustrating Experiences Balancing Function and Fashion: Introduction, Error Messages, Nonanthropomorphic Design, Display Design, Web Page Design, Window Design, Color

User Documentation and Online Help: Introduction, Online Vs Paper Documentation, reading from paper Vs from Displays, Shaping the content of the Documentation, Accessing the Documentation, Online tutorials and animated documentation, Online communities for User Assistance, The Development Process

Information Search: Introduction, searching in Textual Documents and Database Querying, Multimedia Document Searches, Advanced Filtering and Searching Interfaces

Information Visualization: Introduction, Data Type by Task Taxonomy, Challenges for Information Visualization.

Text Books:

1. Designing the User Interface, Strategies for Effective Human Computer Interaction, 5ed, Ben Shneiderman, Catherine Plaisant, Maxine Cohen, Steven M Jacobs, Pearson
2. The Essential guide to user interface design,2/e, Wilbert O Galitz, Wiley DreamaTech.

Reference Books:

1. Human Computer, Interaction Dan R.Olsan, Cengage ,2010.
2. Designing the user interface. 4/e, Ben Shneidermann , PEA.

BIO INFORMATICS

OPEN ELECTIVE

SYLLABUS

Course Objectives:

- To import fundamental concepts in the area of Bioinformatics.
- To understand the concept of DNA Sequence analysis and Protein Information Resources.
- To learn Pairwise alignment techniques and Secondary database searching.
- To gain competence in Analysis packages.

Course Outcomes:

At the end of the course, students will be able to

- Get introduced to the basic concepts of Bioinformatics and its significance in biological data analysis
- Overview about types and biological data and database search tools
- Explain about the methods to characterize and manage the different types of biological data.
- Classify different types of Biological Databases
- Implement the algorithms for single and multiple sequence alignments

SYLLABUS:

Introduction: Definition, History and Application areas of Bioinformatics. Major Information Resources: NCBI, EBI, ExPasy, TIGR, JGI, DDBJ Biological Databases: Primary & Secondary; Structure Databases, Specialized Databases, Chemical Databases.File Formats in Bioinformatics-Genbank, EMBL, Swissprot/Uniprot, PDB, Clustal, FASTA etc.

Sequence Similarity Searching: Basics of sequence alignment, Local and Global Sequence Alignment, similarity, Identity, homology, Sensitivity/Selectivity, Scoring System & Substitution Matrices: Distance and Similarity matrices, Identity Matrices, PAM & BLOSUM matrices & their Derivation DNA sequence databases, specialized genomic resources

Similarity Searching Tools: BLAST and FASTA, Theory and Algorithms, variants of BLAST and FASTA, PSI & PHI Blast, Statistical Significance. Sequence Pattern and Profiles: Concepts of motif, pattern and profile. Profile construction and its application in Bioinformatics. Gene Identity and identification tools

Tools for DNA & Protein Sequence Analysis: EMBOSS, PHYLIP, Mega2 Tools at NCBI, EBI, DDBJ, Microarray data analysis tools

Markov models: Hidden Markov models – The evaluation, decoding and estimation problem and the algorithms. Application in sequence analysis.

Molecular phylogeny: maximum Parsimony, distance Matrix and maximum likelihood methods. Concepts of adaptive evolution.

Application of graph theory in Biology: Biochemical Pathway, Protein-protein interaction network, Regulatory network and their analysis.

Text Books:

1. T.K Attwood & D.J Parry-Smith. Delhi. “Introduction to Bioinformatics”. Pearson Education (Singapore) Pte.Ltd., 2001.
2. Bioinformatics: David Mount

Reference Books:

1. Biological Sequence Analysis: Probabilistic Models of Proteins and Nucleic acids, R.
2. Durbin, S.R. Eddy, A. Krogh and G. Mitchison**.**

INDUSTRY 4.0

OPEN ELECTIVE

SYLLABUS

Course Objectives:

- This course provides students with an introduction to Industry 4.0, its building blocks, its applications and advantages compared to conventional production techniques.
- Learners get a deep insight into components and technologies of industry 4.0 can be used to build up the production of the future.
- It is also important that the theory is deepened by means of roadmap technologies with
- phase wise developments.
- To impart knowledge of smart manufacturing, IIot for industry 4.0.
- To expand Robotic technology with Augmented reality for Industry 4.0 and obstacle
- with framework conditions for Industry 4.0

Course Outcomes:

- Students will be able to:
- Describe Industry 4.0 and scope for Indian Industry
- Demonstrate conceptual framework and road map of Industry 4.0
- Describe IIoT, cloud computing and big data, smart factories role in Industry 4.0
- Describe Robotic technology and Augmented reality for Industry 4.0
- Demonstrate obstacle and framework conditions for Industry 4.0

Syllabus:

Introduction to Industry 4.0

Introduction, Idea of Industry 4.0, Various Industrial Revolutions, Origin concept of Industry 4.0, Industry 4.0 Production system, How is India preparing for Industry 4.0, Comparison of Industry Factory and Today's Factory.

Trends in Industry 4.0

Introduction, Main Concepts and Components of Industry 4.0, State of Art Technologies, Proposed Framework for Industry 4.0, Trends of Industrial Big Data and Smart Business Transformation.

Roadmap for Industry 4.0

Introduction, Proposed Framework for Technology Roadmap: Strategy Phase, Development Phase, Smart Manufacturing, Types of Smart Devices, Smart Logistics, Smart Cities, Predictive Analytics.

Advances in the Era of Industry 4.0

Introduction, Recent Technological Components of Robots- Advanced Sensor Technologies, Internet of Things, Industrial Robotic Applications- Manufacturing, Maintenance and Assembly, IIoT- Industrial IoT.

The Role of Industry 4.0 and Future Aspects

Introduction, Challenges & Future of Works and Skills for Workers in the Industry 4.0 Era, Strategies for competing in an Industry 4.0 world.

Text Books:

1. Alp Ustundag and Emre Cevikcan,"Industry 4.0: Managing the Digital Transformation".
2. Bartodziej, Christoph Jan,"The Concept Industry 4.0".
3. Klaus Schwab,"The Fourth Industrial Revolution".
4. Christian Schröder, "The Challenges of Industry 4.0 for Small and Medium-sized Enterprises".

References:

List of Open Source Software/learning website:

1. www.nptel.ac.in/

(Material Is Readily Available On Internet)

HSS ELECTIVES

1. OPERATIONS RESEARCH
2. ORGANIZATIONAL BEHAVIOUR
3. INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP
4. FINANCIAL MANAGEMENT FOR ENGINEERS

OPERATIONS RESEARCH

HSS ELECTIVE

SYLLABUS

Course Objectives:

Upon completion of this course, you will be able to:

- Formulate a real-world problem as a mathematical programming model
- Understand the theoretical workings of the simplex method for linear programming and perform iterations of it by hand
- Understand the relationship between a linear program and its dual, including strong duality and complementary slackness
- Solve specialized linear programming problems like the transportation and assignment problems
- Solve network models like the shortest path, minimum spanning tree, and maximum flow problems

Course Outcomes:

After learning the course, the students should be able to:

- Students will be able to describe characteristics and scope of OR.
- Students will be able to define and formulate mathematical problems.
- Students will be able to select optimal problems solving techniques for a given problem using LP.
- Students will be able to formulate and solve transportation, travelling sales man and transshipment problems.
- Students will be able to formulate and solve optimization problems related to job/ work assignments.
- Students will be able to demonstrate and solve simple models of Game theory.
- Students will be able to evaluate optimum solution using dynamic programming for different applications.

SYLLABUS:

Overview of Operations Research: Types of OR Models, Phases of Operations Research–OR Techniques, Introduction to Linear Programming, Formulation of Linear Programming Problem, Graphical Solution; Graphical Sensitivity Analysis.

Standard Form of LPP: Basic Feasible Solutions, Unrestricted Variables, Simplex Algorithm, Artificial Variables, Big M Method, Two Phase Simplex Method, Degeneracy,

Alternative Optimal, Unbounded Solutions, Infeasible Solutions, Primal and Dual Problems and Their Relations, Dual Simplex Method

Transportation Problem: LPP, Initial Solutions, North West Corner Rule, Lowest Cost Method, Vogel's Approximation Method, Optimum Solutions of TPP, Degeneracy in Transportation, Transportation Algorithms

Assignment Problem: Assignment Problem as LPP, Hungarian Method, Travelling Salesman Problem, Solutions of TSP, Sequencing Problems, N-Jobs Two Machine Problems, N Jobs K Machines Problems, Two-Jobs M- Machine Problems, Crew Scheduling Problems

Network Representation of a Project: CPM and PERT, Critical Path Calculations, Time – Cost Optimizations, PERT Analysis and Probability Considerations, Resource Analysis in Network Scheduling.

Replacement Problems: Individual and Group Replacement Policy, Reliability & System Failure Problems, Inventory-Factors Effecting Inventory-EOQ, Inventory Problems with and Without Shortages, Inventory Problems with Price Breakups, Multi Item Deterministic Problems. Probabilistic Inventory Problems

Game Theory: Two Person Zero Sum Games, Mixed Strategy Games and Their Algorithms.

Text Books:

1. Operations Research, KantiSwaroop, P.K. Gupta, ManMohan, Sulthan Chand & Sons Education
2. Operations Research–An Introduction, HandyATaha–Pearson Education

Reference Books:

1. Taha.H.A, Operations Research : An Introduction, McMilan publishing Co., 1982. 7 th ed.
2. Ravindran A, Philips D.T & Solberg.J.J, Operations Research: Principles and practice, John Wiley & Sons, New York, 1987.
3. Frank S. Budnick, Dennis Mcleavey and Richard Mojena, Principles of Operations Research for Management. All India Traveler Book seller, Delhi.
4. Gillet.B.E., Introduction to Operations Research - A Computer oriented algorithmic approach, McGraw Hill, 1987.
5. Joseph.G.Ecker& Michael Kupper Schimd, Introduction to Operations Research, John Wiley & Sons, 1988.
6. Hillier.F.S & Liberman.G.J, Operations Research, Second Edition, Holden Day Inc, 1974.
7. Kanti Swarup, Gupta.P.K. & Man Mohan, Operations Research, S.Chand& Sons

ORGANIZATIONAL BEHAVIOUR
HSS ELECTIVE
SYLLABUS

Course Objectives:

- To understand the basic concepts of organizational behaviour, its foundations and importance.
- To enable students to have a basic perspective of Motivation and Motivation theories.
- To acquaint the students about group behaviour in organizations, including communication, leadership conflicts and organizational change and how these are linked to and impact organizational performance.

Course Outcomes:

- Identifying fundamental aspects of organizational dynamics.
- Evaluate main theories of motivation and formulating suitable motivational strategies.
- Analyse the behaviour of individuals and groups in organizations.
- Understanding of Leadership theories and Leadership behaviour.
- Apply relevant theories, concepts to address important Organizational Behaviour questions.

Syllabus:

Organizational Behaviour : Concept of Organisation - Concept of Organizational Behaviour - Nature of Organizational Behaviour - Role of Organizational behaviour - Disciplines contributing to Organizational Behaviour.

Motivation: Definition - Nature of Motivation - Role of Motivation - Theories of Motivation: Maslow's Need Hierarchy Theory, Herzberg's Motivation Hygiene Theory and Mc Gregor's Theory X and Theory Y.

Group Dynamics: Meaning - Concept of Group - Types of groups -Formal and Informal groups - Group development - Group cohesiveness and factors affecting group cohesiveness.

Leadership: Concept of Leadership - Difference between Leadership and Management - Importance of Leadership - Leadership styles: Autocratic leadership, Participative leadership and Free Rein leadership.

Communication: Meaning - Communication Process - Forms of communication: Oral, Written and Non- Verbal communication - Direction of communication: Downward, Upward and Horizontal communication.

Organizational conflits: Concept of conflict - Reasons for conflict - Types of Conflict: Intrapersonal conflict, Interpersonal conflict, Intragroup conflict, Intergroup conflict, Interorganisational conflict - Conflict management.

Organizational Change: Nature - Factors in Organizational change -Planned change: Process of planned change - Resistance to change: Factors in resistance to change - Overcoming resistance to change.

Text Books:

1. .L.M.Prasad: Organizational Beaviour, Sultan Chand & Sons, New Delhi -110002
2. K. Aswathappa: Organizational Behaviour, Himalaya Publishing House, New Delhi

Reference Books:

1. Stephen Robbins: Organizational Behaviour, Pearsons Education, New Delhi.

INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP

HSS ELECTIVE

SYLLABUS

Course Objectives:

- To familiarize the students with the concepts of Management.
- To relate the concepts of Management with industrial organizations.
- To explain the factors affecting productivity and how productivity can be increased in an Industrial undertaking.
- To set forth a basic framework for understanding Entrepreneurship.

Course Outcomes:

On completion of the course, the students will be able to:

- Understand the roles, skills and functions of management.
- Distinguish the different types of business organizations.
- Identify the factors involved in Production Operations Management.
- Diagnose organizational problems and take suitable decisions.
- Establish good Human Resource Management practices.
- Acquire necessary knowledge and skills required for organizing and carrying out

Syllabus:

Basic Concepts of Management: Definition, Nature and Importance; Functions of the Management; Levels of Management; F.W Taylor's Scientific Management; Henry Fayol's Principles of Management;

Forms of Business Organizations: Introduction, Types of Business organizations: Private Sector- Individual Ownership, Partnership, Joint stock companies and Co-Operative organizations**;** Public sector- Departmental Organizations, Public Corporations and Government Companies; The Joint Sector Management.

Production and operations Management: Plant location- Factors to be considered in the selection of Plant location; Break - even analysis- Significance and managerial applications; Importance of Production Planning and Control and its Functions; Human Resource Management and Functions of Human Resource Manager (in brief); Functions of Marketing; Methods of Raising Finance.

Entrepreneurship: Definition, Characteristics and Skills, Types of Entrepreneurs, Entrepreneur vs. Professional Managers, , Growth of Entrepreneurs, Nature and Importance of Entrepreneurs, Women Entrepreneurs, Problems of Entrepreneurship.

Entrepreneurial Development and Project Management: Institutions in aid of Entrepreneurship Development, Idea generation: Sources and Techniques; Stages in Project formulation ; Steps for starting a small enterprise - Incentives for Small Scale Industries by Government.

Text Books:

1. Sharma,S.C, and Banga, T.R., Industrial Organization & Engineering Economics, Khanna Publishers, Delhi, 2000.
2. Vasant Desai , (The Dynamics of Entrepreneurial Development and Management (Planning for future Sustainable growth),HImalayan Publishing House, 2018.

Reference Books:

1. Aryasri , A.R., Management Science, McGraw HIll Education (India Private Limited , New Delhi 2014.
2. Sheela, P. , and Jagadeswara Rao**,** K., Entrepreneurship, Shree Publishing House, Guntur, Andhra Pradesh, 2017.

FINANCIAL MANAGEMENT FOR ENGINEERS
HSS ELECTIVE
SYLLABUS

Course Objectives:

- To provide awareness and understanding of the ways finance helps in reaching business objectives.
- To familiarise with the form, content and analysis of financial statements and the accounting principles and techniques.
- To Identify signals pointing to deterioration in financial condition and analyse the reasons for variances between the actual and budgeted results
- To facilitate in the improvement of organizations' performance by pointing out the importance of cost control, breakeven and variance analysis.
- To equip with the ability to communicate comfortably with Financial Executives and discuss the financial performance of the organization effectively.

Course Outcomes:

- Ability to Analyse financial statements
- Understanding costs and methods to reduce them
- Taking decisions regarding the price of the products services, or both
- Skill to practice different Budgeting Systems in organisations.

Syllabus:

Accounting concepts and systems - Elements of Financial Statements - Trading, Profit & Loss Statement- Cash Flow Statements - Notes to Accounts - Profits vs. Cash Flows

Analysis of Financial Statements - Financial Analysis - Financial Ratios and their Interpretations covering: Profitability Ratios; Liquidity Ratios; Return on Capital Ratios; - Management of Working Capital: Capital and Its Components - Working Capital Cycle - Working Capital Financing.

Management Decision Making: Cost concepts and its application in Decision Making - Types of cost – Direct & Indirect, Fixed & Variable - Cost Sheet - Cost Volume Profit Analysis - Understanding Cost behaviour – Cost concepts and its application in Decision Making - Relevance of Activity Based Costing- Marginal Costing - Make or Buy - Shut down or continue - Sell or process further - Domestic vs. Export Sales

Budgets and Budgetary Control: Different types of Budgets (Departmental, Function based, Cash, Master) - Budgeting systems (ABC / ZBB / Rolling/ Incremental / Planning) - Variance Analysis - Capital Budgeting and Investment Appraisals - Meaning of Capital Budgeting - Relevance of

Capital Budgeting - Techniques of Capital Budgeting - Payback Period - Accounting Rate of Return - Net Present Value - Internal Rate of Return - Discounted Payback Period

Means of Finance: Financial Instruments - Shares, Debentures, Derivatives - Share Capital Vs. Term Loans - Leasing - Financial Markets - Capital Markets - Stock Exchanges.

Text Books:

1. Finance for Non-Finance People by Sandeep Goal (2017), Publisher: Taylor and Francis.
2. Finance for Non-Finance Managers by B.K. Chatterjee (1988), Jaico Publishing House, Sold by Amazon
3. Finance for Nonfinancial Managers: Finance for Small Business, Basic Finance Concepts (Accounts and Finance) by Murugesan Ramaswamy (2021), Repro Books-On-Demand.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE STRUCTURE AND SYLLABUS

For UG –R20

B. TECH - COMPUTER SCIENCE & ENGINEERING

(Applicable for batches admitted from 2020-2021)

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE STRUCTURE

I Year – I SEMESTER						
S. No	**Course Code**	**Courses**	**L**	**T**	**P**	**Credits**
1	HS	Communicative English	3	0	0	3
2	BS	Mathematics - I (Calculus And Differential Equations)	3	0	0	3
3	BS	Applied Physics	3	0	0	3
4	ES	Programming for Problem Solving using C	3	0	0	3
5	ES	Computer Engineering Workshop	1	0	4	3
6	HS	English Communication Skills Laboratory	0	0	3	1.5
7	BS	Applied Physics Lab	0	0	3	1.5
8	ES	Programming for Problem Solving using C Lab	0	0	3	1.5
Total Credits			**19.5**			

I Year – II SEMESTER						
S. No	**Course Code**	**Courses**	**L**	**T**	**P**	**Credits**
1	BS	Mathematics – II (Linear Algebra And Numerical Methods)	3	0	0	3
2	BS	Applied Chemistry	3	0	0	3
3	ES	Computer Organization	3	0	0	3
4	ES	Python Programming	3	0	0	3
5	ES	Data Structures	3	0	0	3
6	BS	Applied Chemistry Lab	0	0	3	1.5
7	ES	Python Programming Lab	0	0	3	1.5
8	ES	Data Structures Lab	0	0	3	1.5
9	MC	Environment Science	2	0	0	0
Total Credits			**19.5**			

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II Year – I SEMESTER						
S. No	**Course Code**	**Courses**	**L**	**T**	**P**	**Credits**
1	BS	Mathematics III	3	0	0	3
2	CS	Object Oriented Programming through C++	3	0	0	3
3	CS	Operating Systems	3	0	0	3
4	CS	Software Engineering	3	0	0	3
5	CS	Mathematical Foundations of Computer Science	3	0	0	3
6	CS	Object Oriented Programming through C++ Lab	0	0	3	1.5
7	CS	Operating Systems Lab	0	0	3	1.5
8	CS	Software Engineering Lab	0	0	3	1.5
9	SO	**Skill oriented Course - I** Applications of Python-NumPy **OR** 2) Web Application Development Using Full Stack -Frontend Development – Module-I	0	0	4	2
10	MC	Constitution of India	2	0	0	0
Total Credits			**21.5**			

II Year – II SEMESTER						
S. No	**Course Code**	**Courses**	**L**	**T**	**P**	**Credits**
1	BS	Probability and Statistics	3	0	0	3
2	CS	Database Management Systems	3	0	0	3
3	CS	Formal Languages and Automata Theory	3	0	0	3
4	ES	Java Programming	3	0	0	3
5	HS	Managerial Economics and Financial Accountancy	3	0	0	3
6	CS	Database Management Systems Lab	0	0	2	1
7	CS	R Programming Lab	0	1	2	2
8	ES	Java Programming Lab	0	0	3	1.5
9	SO	**Skill Oriented Course - II** Applications of Python-Pandas **OR** 2) Web Application Development Using Full Stack -Frontend Development –Module-II	0	0	4	2
Total Credits			**21.5**			
10	Minor	Operating Systems[$]	3	0	2	3+1
11	Honors	Any course from the Pool, as per the opted track	4	0	0	4

$- Integrated Course

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III B. Tech – I Semester						
S.No	**Course Code**	**Courses**	**Hours per week**			**Credits**
			L	**T**	**P**	**C**
1	PC	Computer Networks	**3**	**0**	**0**	**3**
2	PC	Design and Analysis of Algorithms	**3**	**0**	**0**	**3**
3	PC	Data Warehousing and Data Mining	**3**	**0**	**0**	**3**
4	Open Elective / Job Oriented	**Open Elective-I** Open Electives offered by other departments/ Optimization in Operations Research (Job oriented course)	**3**	**0**	**0**	**3**
5	PE	**Professional Elective-I** Artificial Intelligence Software Project Management Distributed Systems Advanced Unix Programming	**3**	**0**	**0**	**3**
6	PC	Data Warehousing and Data Mining Lab	**0**	**0**	**3**	**1.5**
7	PC	Computer Networks Lab	**0**	**0**	**3**	**1.5**
8	SO	**Skill Oriented Course – III** 1. Animation course: Animation Design **OR** 2.Continuous Integration and Continuous Delivery using DevOps	**0**	**0**	**4**	**2**
9	MC	Employability Skills-I	**2**	**0**	**0**	**0**
10	PR	**Summer Internship 2 Months (Mandatory) after second year (to be evaluated during V semester**	**0**	**0**	**0**	**1.5**
Total credits						**21.5**
11	Minor	Database Management Systems[$]	3	0	2	3+1
12	Honors	Any course from the Pool, as per the opted track	4	0	0	4

$- Integrated Course

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III B. Tech – II Semester						
S.No	**Course Code**	**Courses**	**Hours per week**			**Credits**
			L	**T**	**P**	**C**
1	PC	Machine Learning	**3**	**0**	**0**	**3**
2	PC	Compiler Design	**3**	**0**	**0**	**3**
3	PC	Cryptography and Network Security	**3**	**0**	**0**	**3**
4	PE	**Professional Elective-II** 1.Mobile Computing 2.Big Data Analytics 3.Object Oriented Analysis and Design 4.Network Programming	**3**	**0**	**0**	**3**
5	Open Elective /Job Oriented	**Open Elective-II** Open Electives offered by other departments/ MEAN Stack Development *(Job Oriented)*	**3**	**0**	**0**	**3**
6	PC	Machine Learning using Python Lab	**0**	**0**	**3**	**1.5**
7	PC	Compiler Design Lab	**0**	**0**	**3**	**1.5**
8	PC	Cryptography and Network Security Lab	**0**	**0**	**3**	**1.5**
9	SO	**Skill Oriented Course - IV** 1.Big Data**:**Spark **OR** 2.MEAN Stack Technologies-Module I (HTML 5, JavaScript, Node.js, Express.js and TypeScript)	**0**	**0**	**4**	**2**
10	MC	Employability skills-II	**2**	**0**	**0**	**0**
Total credits						**21.5**
Industrial/Research Internship(Mandatory) 2 Months during summer vacation						
11	Minor	Data Structures and Algorithms[$]	3	0	2	3+1
12	Honors	Any course from the Pool, as per the opted track	4	0	0	4
Minor course through SWAYAM			**-**	**-**	**-**	**2**

$- Integrated Course

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IV B. Tech –I Semester						
S.No	**Course Code**	**Course Title**	**Hoursperweek**			**Credits**
			L	**T**	**P**	**C**
1	PE	**Professional Elective-III** 1.Cloud Computing 2.Neural Networks and Soft Computing 3.Ad-hoc and Sensor Networks 4.Cyber Security & Forensics	**3**	**0**	**0**	**3**
2	PE	**Professional Elective-IV** 1. Deep Learning Techniques 2. Social Networks & Semantic Web 3. Computer Vision 4.MOOCS-NPTEL/SWAYAM[%]	**3**	**0**	**0**	**3**
3	PE	**Professional Elective-V** 1.Block-Chain Technologies 2.Wireless Network Security 3.Ethical Hacking 4.MOOCS-NPTEL/SWAYAM[%]	**3**	**0**	**0**	**3**
4	Open Elective /Job Oriented	**Open Elective-III** Open Electives offered by other departments/ API and Microservices (Job Oriented Course)	**3**	**0**	**0**	**3**
5	Open Elective /Job Oriented	**Open Elective-IV** Open Electives offered by other departments/ Secure Coding Techniques (Job Oriented Course)	**3**	**0**	**0**	**3**
6	HS	Universal Human Values 2: Understanding Harmony	**3**	**0**	**0**	**3**
7	SO	1.PYTHON: Deep Learning **OR** 2.MEAN Stack Technologies-Module II-Angular JS and MongoDB **OR** 3.APSSDC offered Courses	**0**	**0**	**4**	**2**
8	PR	**Industrial/Research Internship 2 months (Mandatory) after third year (to be evaluated during VII semester**	**0**	**0**	**0**	**3**
Total credits						**23**
11	Minor	Software Engineering[$] / any other from PART-B (For Minor)	3	0	2	3+1
12	Honors	Any course from the Pool, as per the opted track	4	0	0	4
Minor course through SWAYAM			**-**	**-**	**-**	**2**

$- Integrated Course
% - MOOC Course

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IV B. Tech –II Semester						
S.No	**Course Code**	**Course Title**	**Hours per week**			**Credits**
			L	**T**	**P**	**C**
1	Project	Major Project Work, Seminar Internship	**-**	**-**	**-**	**12**
Total credits						**12**

Note:

1. ***For integrated courses***: Theory and laboratory exams will be conducted separately, and the student concern will get credits if successfully completes both theory and laboratory. Only external exam will be conducted for Laboratory component. Credit based weightage shall be considered while awarding the grade.
2. ***For MOOC courses***: Based on the students interest, student can register and complete a 12 week course one year in advance, by prior information to the concern.

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SUGGESTED COURSES FOR HONORS PROGRAM

POOL1- AI & ML 1. Mathematics for Machine Learning 2. Text Mining and Time Series Analysis 3. Natural Language Processing 4. Reinforcement Learning	**POOL2- Systems Engineering** 1. Internet of Things 2. Data Communications and Information Coding Theory 3. Service Oriented Architectures 4. Design of Secure Protocols 5. Network Coding
POOL3- Information Security 1. Principles of Cyber Security 2. Computational Number Theory 3. Cryptanalysis 4. Elliptic Curve Cryptography 5. Introduction to Quantum Computing and Quantum Cryptography 6. Public Key Infrastructure and Trust Management 7. Information Security Analysis and Audit 6. Cloud and IoT Security 7. Web Security 8. Block Chain Architecture Design and Use Cases	**POOL4 – Data Science** 1. Data Visualization 2. Statistical Foundations for Data Science 3. Mining Massive Data Sets 4. Medical Image Data Processing

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SUGGESTED COURSES MINOR ENGINEERING IN CSE

Note:

1. Any THREE courses need to be studied from PART-A.
2. Any ONE course need to be studied from PART-B.
3. TWO, NPTEL courses of EIGHT week duration covering a total of 4 credits (offered by CSE Department only), Student can register at any time after the completion of II B.Tech. I Sem.
4. Students can pursue suggested MOOC Courses via NPTEL from II B.Tech II Sem and onwards, by prior information to the concern.

Eligibility for Minor in CSE:

PART A					
S.No	**Subject**	**L-T-P**	**Credits**	**Course available in NPTEL**	**NPTEL Link**
1	Operating Systems	3-0-2	4	Operating Systems	https://onlinecourses.swayam2.ac.in/cec21_cs20/preview
2	Data Structures and Algorithms	3-0-2	4	Data Structures Programming, Data Structures and Algorithms using Python	https://onlinecourses.swayam2.ac.in/cec22_cs10/preview https://onlinecourses.nptel.ac.in/noc22_cs26/preview
3	Software Engineering	3-0-2	4	Software Engineering	https://onlinecourses.swayam2.ac.in/cec21_cs21/preview
4	Computer Networks	3-0-2	4	Computer Networks	https://onlinecourses.swayam2.ac.in/cec22_cs05/preview
5	Database Management Systems	3-0-2	4	Data Base Management System (noc22-cs51)	https://onlinecourses.nptel.ac.in/noc22_cs51/preview

PART B					
S.No	**Subject**	**L-T-P**	**Credits**	**Course available in NPTEL**	**NPTEL Link**
1	Computational Thinking	4-0-0	4	Physics through Computational Thinking	https://onlinecourses.nptel.ac.in/noc22_ph12/preview
2	Object Oriented Programming through JAVA	3-0-2	4		
3	Data Analytics using Python	3-0-2	4	Data Analytics with Python	https://onlinecourses.nptel.ac.in/noc22_cs8/ preview
4	Artificial Intelligence	4-0-0	4	Artificial Intelligence: Knowledge Representation And Reasoning	1. https://onlinecourses.nptel.ac.in/noc22_cs56/preview 2. https://onlinecour

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				(noc22-cs02), An Introduction to Artificial Intelligence (noc22-cs56), AI: Constraint Satisfaction (noc22-cs06)	ses.swayam2.ac.in/cec21_cs08/preview
5	Unix and Shell Programming	3-0-2	4		
6	Cloud Computing	4-0-0	4	Cloud Computing and Distributed Systems (noc22-cs18), Cloud computing(noc22-cs20)	1. https://onlinecourses.nptel.ac.in/noc22_cs18/preview 2. https://onlinecourses.nptel.ac.in/noc22_cs20/preview

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Open Electives to be offered by CSE for other Branches:

Open Elective-I: 1. Data Structures 2. Object Oriented Programming through JAVA 3. Data Base Management Systems 4. Computer Graphics 5. Advanced UNIX Programming 6. Computer Organization and Architecture 7. Operating Systems	**Open Elective-II:** 1. Python Programming 2. Web Technologies 3. Soft Computing 4. Distributed Computing 5. AI and ML for Robotics 6. Computer Networks 7. Big Data Analytics 8. Computational Tools
Open Elective-III: 1. AI Tools & Techniques 2. Image Processing 3. Information Security 4. Mobile Application Development 5. Data Science 6. Cyber Security 7. Introduction to Internet of Things	**Open Elective-IV:** 1. MEAN Stack Technologies 2. Deep Learning Techniques 3. Cloud computing with AWS 4. Block Chain Technologies 5. Cryptography & Network Security 6. Introduction to Machine Learning 7. Machine Learning with Python

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I Year - I Semester		L	T	P	C
		3	0	0	3
COMMUNICATIVE ENGLISH					

Introduction
The course is designed to train students in receptive (listening and reading) as well as productive and interactive (speaking and writing) skills by incorporating a comprehensive, coherent and integrated approach that improves the learners' ability to effectively use English language in academic/ workplace contexts. The shift is from *learning about the language* to *using the language*. On successful completion of the compulsory English language course/s in B.Tech., learners would be confident of appearing for international language qualification/proficiency tests such as IELTS, TOEFL, or BEC, besides being able to express themselves clearly in speech and competently handle the writing tasks and verbal ability component of campus placement tests. Activity based teaching-learning methods would be adopted to ensure that learners would engage in actual use of language both in the classroom and laboratory sessions.

Course Objectives:
- Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Course Outcomes:
At the end of the module, the learners will be able to
- understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information
- ask and answer general questions on familiar topics and introduce oneself/others
- employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information
- recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs
- form sentences using proper grammatical structures and correct word forms

Unit 1:
Lesson-1: A Drawer full of happiness from "**Infotech English**", Maruthi Publications
Lesson-2: Deliverance by Premchand from "**The Individual Society",**Pearson Publications. (Non-detailed)
Listening: Listening to short audio texts and identifying the topic. Listening to prose, prose and conversation.
Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests. Self introductions and introducing others.
Reading: Skimming text to get the main idea. Scanning to look for specific pieces of information.

Reading for Writing: Paragraph writing (specific topics) using suitable cohesive devices; linkers, sign posts and transition signals; mechanics of writing - punctuation, capital letters.
Vocabulary: Technical vocabulary from across technical branches (20) GRE Vocabulary (20) (Antonyms and Synonyms, Word applications) Verbal reasoning and sequencing of words.
Grammar: Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countables and uncountables; singular and plural basic sentence structures; simple question form - wh-questions; word order in sentences.
Pronunciation: Vowels, Consonants, Plural markers and their realizations

Unit 2:
Lesson-1: Nehru's letter to his daughter Indira on her birthday from "**Infotech English**", Maruthi Publications
Lesson-2: Bosom Friend by Hira Bansode from "**The Individual Society",** Pearson Publications.(Non-detailed)
Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts, both in speaking and writing.
Speaking: Discussion in pairs/ small groups on specific topics followed by short structured talks. Functional English: Greetings and leave takings.**Reading**: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.
Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions.
Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary Analogies (20 words) (Antonyms and Synonyms, Word applications)
Grammar: Use of articles and zero article; prepositions.
Pronunciation: Past tense markers, word stress-di-syllabic words

Unit 3:
Lesson-1: Stephen Hawking-Positivity 'Benchmark' from "**Infotech English**", Maruthi Publications
Lesson-2: Shakespeare's Sister by Virginia Woolf from "**The Individual Society",** Pearson Publications.(Non-detailed**)**
Listening: Listening for global comprehension and summarizing what is listened to, both in speaking and writing.
Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed. Functional English: Complaining and Apologizing.
Reading: Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension.Critical reading.
Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. Letter writing-types, format and principles of letter writing.E-mail etiquette, Writing CV's.
Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Association, sequencing of words
Grammar: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.
Pronunciation: word stress-poly-syllabic words.

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Unit 4:

Lesson-1: Liking a Tree, Unbowed: Wangari Maathai-biography from "**Infotech English**", Maruthi Publications

Lesson-2: Telephone Conversation-Wole Soyinka from "**The Individual Society",** Pearson Publications**.**(Non-detailed)

Listening: Making predictions while listening to conversations/ transactional dialogues without video (only audio); listening to audio-visual texts.

Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.Functional English: Permissions, Requesting, Inviting.

Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicative process or display complicated data.

Reading for Writing: Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables.Writing SOP, writing for media.

Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Cloze Encounters.

Grammar: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms

Pronunciation: Contrastive Stress

Unit 5:

Lesson-1: Stay Hungry-Stay foolish from "**Infotech English**", Maruthi Publications

Lesson-2: Still I Rise by Maya Angelou from "**The Individual Society",** Pearson Publications.(Non-detailed)

Listening: Identifying key terms, understanding concepts and interpreting the concepts both in speaking and writing.

Speaking: Formal oral presentations on topics from academic contexts - without the use of PPT slides. Functional English: Suggesting/Opinion giving.

Reading: Reading for comprehension. RAP StrategyIntensive reading and Extensive reading techniques.

Reading for Writing: Writing academic proposals- writing research articles: format and style.

Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Coherence, matching emotions.

Grammar: Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)

Pronunciation: Stress in compound words

Text Books:

1. "**Infotech English**", Maruthi Publications. (Detailed)
2. "**The Individual Society",** Pearson Publications.(Non-detailed)

Prescribed text book for Laboratory for Semesters-I & II:

1. "**Infotech English**", Maruthi Publications. (with Compact Disc)

Reference Books

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.

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I Year - I Semester		L	T	P	C
		3	0	0	3
MATHEMATICS-I (Calculus And Differential Equations)					

Course Objectives:

- To familiarize a variety of well-known sequences and series, with a developing intuition about the behaviour of new ones.
- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

Course Outcomes: At the end of the course, the student will be able to

- utilize mean value theorems to real life problems (L3)
- solve the differential equations related to various engineering fields (L3)
- familiarize with functions of several variables which is useful in optimization (L3)
- apply double integration techniques in evaluating areas bounded by region (L3)
- students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional and 3-dimensional coordinate systems(L5)

UNIT – I: Sequences, Series and Mean value theorems: (10hrs)

Sequences and Series: Convergences and divergence – Ratio test – Comparison tests – Integral test – Cauchy's root test – Alternate series– Leibnitz's rule.

Mean Value Theorems (without proofs): Rolle's Theorem – Lagrange's mean value theorem – Cauchy's mean value theorem – Taylor's and Maclaurin's theorems with remainders, Problems and applications on the above theorem.

UNIT – II: Differential equations of first order and first degree: (10hrs)

Linear differential equations– Bernoulli's equations –Exact equations and equations reducible to exact form.

Applications: Newton's Law of cooling– Law of natural growth and decay– Orthogonal trajectories– Electrical circuits.

UNIT – III: Linear differential equations of higher order: (10hrs)

Homogeneous and Non-homogeneousdifferential equations of higher order with constant coefficients – with non-homogeneous term of the type e^{ax}, sin ax, cos ax, polynomials in x^n, $e^{ax}V(x)$ and $x^nV(x)$ – Method of Variation of parameters, Cauchy and Legendre's linear equations.

Applications: LCR circuit, Simple Harmonic motion.

UNIT – IV: Partial differentiation: (10hrs)

Introduction – Homogeneous function – Euler's theorem– Total derivative– Chain rule– Jacobian – Functional dependence –Taylor's and MacLaurin's series expansion of functions of two variables.

Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method.

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UNIT – V: Multiple integrals: **(8 hrs)**

Double and Triple integrals – Change of order of integration in double integrals – Change of variables to polar, cylindrical and spherical coordinates.
Applications: Finding Areas and Volumes.

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers.
2. B. V. Ramana,Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:

1. Erwin Kreyszig,Advanced Engineering Mathematics, 10th Edition, Wiley-India.
2. Joel Hass, Christopher Heil and Maurice D. Weir, Thomas calculus, 14thEdition, Pearson.
3. Lawrence Turyn,Advanced Engineering Mathematics, CRC Press, 2013.
4. Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford University Press.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester		L	T	P	C
		3	0	0	3
APPLIED PHYSICS (For All Circuital Branches like ECE, EEE, CSE etc)					

Course Objectives:

1. Bridging the gap between the physics in school at 10+2 level and UG level engineering courses.
2. To identify the importance of the optical phenomenon i.e. interference, diffraction and polarization related to its Engineering applications
3. Understand the mechanism of emission of light, utilization of lasers as coherent light sources for low and high energy applications, study of propagation of light through optical fibers and their implications in optical communications.
4. Enlightenment of the concepts of Quantum Mechanics and to provide fundamentals of deBroglie matter waves, quantum mechanical wave equation and its application, the importance of free electron theory for metals and band theory for crystalline solids. Metals-Semiconductors-Insulators concepts utilization of transport phenomenon of charge carriers in semiconductors.
5. To explain the significant concepts of dielectric and magnetic materials that leads to potential applications in the emerging micro devices.
6. To Understand the physics of Semiconductors and their working mechanism. To give an impetus on the subtle mechanism of superconductors using the concept of BCS theory and their fascinating applications.

Course Outcomes:

1. Explain the need of coherent sources and the conditions for sustained interference (L2). Identify the applications of interference in engineering (L3). Analyze the differences between interference and diffraction with applications (L4). Illustrate the concept of polarization of light and its applications (L2). Classify ordinary refracted light and extraordinary refracted rays by their states of polarization (L2)
2. Explain various types of emission of radiation (L2). Identify the role of laser in engineering applications (L3). Describe the construction and working principles of various types of lasers (L1). Explain the working principle of optical fibers (L2). Classify optical fibers based on refractive index profile and mode of propagation (L2). Identify the applications of optical fibers in medical, communication and other fields (L2). Apply the fiber optic concepts in various fields (L3).
3. Describe the dual nature of matter (L1). Explain the significance of wave function (L2). Identify the role of Schrodinger's time independent wave equation in studying particle in one-dimensional infinite potential well (L3). Identify the role of classical and quantum free electron theory in the study of electrical conductivity (L3). Classify the energy bands of solids (L2).

4. Explain the concept of dielectric constant and polarization in dielectric materials (L2). Summarize various types of polarization of dielectrics (L2). Interpret Lorentz field and Claussius-Mosotti relation in dielectrics (L2). Classify the magnetic materials based on susceptibility and their temperature dependence (L2). Explain the applications of dielectric and magnetic materials (L2). Apply the concept of magnetism to magnetic devices (L3)
5. Outline the properties of charge carriers in semiconductors (L2). Identify the type of semiconductor using Hall effect (L2). Identify applications of semiconductors in electronic devices (L2). Classify superconductors based on Meissner's effect (L2). Explain Meissner's effect, BCS theory & Josephson effect in superconductors (L2).

Unit-I: Wave Optics **12hrs**

Interference: Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Colors in thin films- Newton's Rings- Determination of wavelength and refractive index.

Diffraction: Introduction - Fresnel and Fraunhofer diffraction - Fraunhofer diffraction due to single slit, double slit - N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating(Qualitative).

Polarization: Introduction-Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol's Prism -Half wave and Quarter wave plates.

Unit Outcomes:

The students will be able to

- **Explain** the need of coherent sources and the conditions for sustained interference (L2)
- **Identify** engineering applications of interference (L3)
- **Analyze** the differences between interference and diffraction with applications (L4)
- **Illustrate** the concept of polarization of light and its applications (L2)
- **Classify** ordinary polarized light and extraordinary polarized light (L2)

Unit-II: Lasers and Fiber optics **8hrs**

Lasers: Introduction – Characteristics of laser – Spontaneous and Stimulated emissions of radiation – Einstein's coefficients – Population inversion – Lasing action - Pumping mechanisms – Ruby laser – He-Ne laser - Applications of lasers.

Fiber optics: Introduction –Principle of optical fiber- Acceptance Angle - Numerical Aperture - Classification of optical fibers based on refractive index profile and modes – Propagation of electromagnetic wave through optical fibers - Applications.

Unit Outcomes:

The students will be able to

- **Understand** the basic concepts of LASER light Sources (L2)
- **Apply** the concepts to learn the types of lasers (L3)
- **Identifies** the Engineering applications of lasers (L2)
- **Explain** the working principle of optical fibers (L2)
- **Classify** optical fibers based on refractive index profile and mode of propagation (L2)

- **Identify** the applications of optical fibers in various fields (L2)

Unit III: Quantum Mechanics, Free Electron Theory and Band theory 10hrs

Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory– Equation for electrical conductivity based on quantum free electron theory- Fermi-Dirac distribution- Density of states (3D) - Fermi energy.

Band theory of Solids: Bloch's Theorem (Qualitative) - Kronig - Penney model (Qualitative)- E vs K diagram - v vs K diagram - effective mass of electron – Classification of crystalline solids– concept of hole.

Unit Outcomes:

The students will be able to

- **Explain** the concept of dual nature of matter (L2)
- **Understand** the significance of wave function (L2)
- **Interpret** the concepts of classical and quantum free electron theories (L2)
- **Explain** the importance of K-P model
- **Classify** the materials based on band theory (L2)
- **Apply** the concept of effective mass of electron (L3)

Unit-IV: Dielectric and Magnetic Materials 8hrs

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility and Dielectric constant - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field- Clausius-Mossotti equation- Piezoelectricity.

Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability - Origin of permanent magnetic moment - Classification of magnetic materials: Dia, para, Ferro, antiferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials- Eddy currents- Engineering applications.

Unit Outcomes: ***The students will be able to***

- **Explain** the concept of dielectric constant and polarization in dielectric materials (L2)
- **Summarize** various types of polarization of dielectrics (L2)
- **Interpret** Lorentz field and Claussius- Mosotti relation in dielectrics(L2)
- **Classify** the magnetic materials based on susceptibility and their temperature dependence (L2)
- **Explain** the applications of dielectric and magnetic materials (L2)
- **Apply** the concept of magnetism to magnetic data storage devices (L3)

Unit – V: Semiconductors and Superconductors 10hrs

Semiconductors: Introduction- Intrinsic semiconductors – Density of charge carriers – Electrical conductivity – Fermi level – extrinsic semiconductors – density of charge carriers – dependence of Fermi energy on carrier concentration and temperature - Drift and diffusion currents – Einstein's equation- Hall effect – Hall coefficient –Applications of Hall effect.

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Superconductors: Introduction – Properties of superconductors – Meissner effect – Type I and Type II superconductors – BCS theory (Qualitative) – Josephson effects (AC and DC) – SQUIDs – High T_c superconductors – Applications of superconductors.

Unit Outcomes:

The students will be able to

- **Classify** the energy bands of semiconductors (L2)
- **Interpret** the direct and indirect band gap semiconductors (L2)
- **Identify** the type of semiconductor using Hall effect (L2)
- **Identify** applications of semiconductors in electronic devices (L2)
- **Classify** superconductors based on Meissner's effect (L2)
- **Explain** Meissner's effect, BCS theory & Josephson effect in superconductors (L2)

Text books:

1. M. N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy" A Text book of Engineering Physics"- S.Chand Publications, 11th Edition 2019.
2. Engineering Physics" by D.K.Bhattacharya and Poonam Tandon, Oxford press (2015).
3. Applied Physics by P.K.Palanisamy SciTech publications.

Reference Books:

1. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons
2. Engineering Physics by M.R.Srinivasan, New Age international publishers (2009).
3. Shatendra Sharma, Jyotsna Sharma, " Engineering Physics", Pearson Education, 2018
4. Engineering Physics - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press
5. Semiconductor physics and devices- Basic principle – Donald A, Neamen, Mc Graw Hill
6. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester		L	T	P	C
		3	0	0	3
PROGRAMMING FOR PROBLEM SOLVING USING C					

Course Objectives:
The objectives of Programming for Problem Solving Using C are

- To learn about the computer systems, computing environments, developing of a computer program and Structure of a C Program
- To gain knowledge of the operators, selection, control statements and repetition in C
- To learn about the design concepts of arrays, strings, enumerated structure and union types and their usage.
- To assimilate about pointers, dynamic memory allocation and know the significance of Preprocessor.
- To assimilate about File I/O and significance of functions

Course Outcomes:
Upon the completion of the course the student will learn

- To write algorithms and to draw flowcharts for solving problems
- To convert flowcharts/algorithms to C Programs, compile and debug programs
- To use different operators, data types and write programs that use two-way/ multi-way selection
- To select the best loop construct for a given problem
- To design and implement programs to analyze the different pointer applications
- To decompose a problem into functions and to develop modular reusable code
- To apply File I/O operations

UNIT I
Introduction to Computers: Creating and running Programs, Computer Numbering System, Storing Integers, Storing Real Numbers
Introduction to the C Language: Background, C Programs, Identifiers, Types, Variable, Constants, Input/output, Programming Examples, Scope, Storage Classes and Type Qualifiers.
Structure of a C Program: Expressions Precedence and Associativity, Side Effects, Evaluating Expressions, Type Conversion Statements, Simple Programs, Command Line Arguments.

UNIT II
Bitwise Operators: Exact Size Integer Types, Logical Bitwise Operators, Shift Operators.
Selection & Making Decisions: Logical Data and Operators, Two Way Selection, Multiway Selection, More Standard Functions.
Repetition: Concept of Loop, Pretest and Post-test Loops, Initialization and Updating, Event and Counter Controlled Loops, Loops in C, Other Statements Related to Looping, Looping Applications, Programming Examples.

UNIT III
Arrays: Concepts, Using Array in C, Array Application, Two Dimensional Arrays, Multidimensional Arrays, Programming Example – Calculate Averages
Strings: String Concepts, C String, String Input / Output Functions, Arrays of Strings, String Manipulation Functions String/ Data Conversion, A Programming Example – Morse Code
Enumerated, Structure, and Union: The Type Definition (Type def), Enumerated Types, Structure, Unions, and Programming Application.



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UNIT IV

Pointers: Introduction, Pointers to pointers, Compatibility, L value and R value
Pointer Applications: Arrays, and Pointers, Pointer Arithmetic and Arrays, Memory Allocation Function, Array of Pointers, Programming Application.
Processor Commands: Processor Commands.

UNIT V

Functions: Designing, Structured Programs, Function in C, User Defined Functions, Inter-Function Communication, Standard Functions, Passing Array to Functions, Passing Pointers to Functions, Recursion
Text Input / Output: Files, Streams, Standard Library Input / Output Functions, Formatting Input / Output Functions, Character Input / Output Functions
Binary Input / Output: Text versus Binary Streams, Standard Library, Functions for Files, Converting File Type.

Text Books:

1) Programming for Problem Solving, Behrouz A. Forouzan, Richard F.Gilberg, CENGAGE.
2) The C Programming Language, Brian W.Kernighan, Dennis M. Ritchie, 2e, Pearson.

Reference Books:

1) Computer Fundamentals and Programming, Sumithabha Das, Mc Graw Hill.
2) Programming in C, Ashok N. Kamthane, Amit Kamthane, Pearson.
3) Computer Fundamentals and Programming in C, Pradip Dey, Manas Ghosh, OXFORD.

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester		L	T	P	C
		1	0	4	3
COMPUTER ENGINEERING WORKSHOP					

Course Objectives:
The objective of this course is to

- Explain the internal parts of a computer, peripherals, I/O ports, connecting cables
- Demonstrate basic command line interface commands on Linux
- Teach the usage of Internet for productivity and self paced lifelong learning
- Describe about Compression, Multimedia and Antivirus tools
- Demonstrate Office Tools such as Word processors, Spreadsheets and Presentation tools

Course Outcomes:
Students should be able to:

- Assemble and disassemble components of a PC
- Construct a fully functional virtual machine, Summarize various Linux operating system commands,
- Recognize characters & extract text from scanned images, Create audio files and podcasts

Computer Hardware:
Experiment 1: Identification of peripherals of a PC, Laptop, Server and Smart Phones: Prepare a report containing the block diagram along with the configuration of each component and its functionality, Input/ Output devices, I/O ports and interfaces, main memory, cache memory and secondary storage technologies, digital storage basics, networking components and speeds.

Operating Systems:

Experiment 2: Virtual Machine setup:

- Setting up and configuring a new Virtual Machine
- Setting up and configuring an existing Virtual Machine
- Exporting and packaging an existing Virtual Machine into a portable format

Experiment 2: Operating System installation:

- Installing an Operating System such as Linux on Computer hardware.

Experiment 3: Linux Operating System commands:

- General command syntax
- Basic *help* commands
- Basic File system commands
- Date and Time
- Basic Filters and Text processing
- Basic File compression commands
- Miscellaneous: apt-get, vi editor

Networking and Internet:

Experiment 4: Networking Commands:

- ping, ssh, ifconfig, scp, netstat, ipstat, nslookup, traceroute, telnet, host, ftp, arp, wget,route

Experiment 5: Internet Services:

- Web Browser usage and advanced settings like LAN, proxy, content, privacy, security, cookies, extensions/ plugins

- Antivirus installation, configuring a firewall, blocking pop-ups
- Email creation and usage, Creating a Digital Profile on LinkedIn

Productivity Tools:

Experiment 6: Basic HTML tags, Introduction to HTML5 and its tags, Introduction to CSS3 and its properties. Preparation of a simple website/ homepage,

Assignment: Develop your home page using HTML Consisting of your photo, name, address and education details as a table and your skill set as a list.

Features to be covered:- Layouts, Inserting text objects, Editing text objects, Inserting Tables, Working with menu objects, Inserting pages, Hyper linking, Renaming, deleting, modifying pages, etc.,

Internet of Things (IoT): IoT fundamentals, applications, protocols, communication models, architecture, IoT devices

Office Tools:

Experiment 7: Demonstration and Practice on Text Editors like Notepad++, Sublime Text, Atom, Brackets, Visual code, etc

Experiment 8: Demonstration and practice on Microsoft Word, Power Point, Microsoft Excel

Experiment 10: Demonstration and practice on LaTeX and produce professional pdf documents.

Text Books:

1) Computer Fundamentals, Anita Goel, Pearson Education, 2017
2) PC Hardware Trouble Shooting Made Easy, TMH

References Books:

1) Essential Computer and IT Fundamentals for Engineering and Science Students, Dr.N.B.Vekateswarlu, S.Chand

e-Resources:

1) https://explorersposts.grc.nasa.gov/post631/2006-2007/computer_basics/ComputerPorts.doc

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester		L	T	P	C
		0	0	3	1.5
ENGLISH COMMUNICATION SKILLS LABORATORY					

UNIT I:
Vowels, Consonants, Pronunciation, Phonetic Transcription, Common Errors in Pronunciation,

UNIT II:
Word stress-di-syllabic words, poly-syllabic words, weak and strong forms, contrastive stress (Homographs)

UNIT III: Stress in compound words,rhythm, intonation,accent neutralisation.

UNIT IV: Listening to short audio texts and identifying the context and specific pieces of information toanswer a series of questions in speaking.

UNIT V: Newspapers reading; Understanding and identifying key terms and structures useful for writing reports.

Text Book:
1.“Infotech English”, Maruthi Publications.

Reference Books:
1. Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL.
2. English Pronunciation in use- Mark Hancock, Cambridge University Press.
3. English Phonetics and Phonology-Peter Roach, Cambridge University Press.
4. English Pronunciation in use- Mark Hewings, Cambridge University Press.
5. English Pronunciation Dictionary- Daniel Jones, Cambridge University Press.
6. English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications.

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester		L	T	P	C
		0	0	3	1.5
APPLIED PHYSICS LAB					

(For All Circuital Branches like CSE, ECE, EEE etc.)
(Any 10 of the following listed experiments)

List of Applied Physics Experiments

1. Determination of thickness of thin object by wedge method.
2. Determination of radius of curvature of a given plano convex lens by Newton's rings.
3. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
4. Determination of dispersive power of the prism.
5. Determination of dielectric constant using charging and discharging method.
6. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
7. Determination of numerical aperture and acceptance angle of an optical fiber.
8. Determination of wavelength of Laser light using diffraction grating.
9. Estimation of Planck's constant using photoelectric effect.
10. Determination of the resistivity of semiconductor by four probe method.
11. To determine the energy gap of a semiconductor using p-n junction diode.
12. Magnetic field along the axis of a current carrying circular coil by Stewart & Gee's Method
13. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall Effect .
14. Measurement of resistance of a semiconductor with varying temperature.
15. Resistivity of a Superconductor using four probe method & Meissner effect.

References:

1. S. Balasubramanian, M.N. Srinivasan "A Text Book of Practical Physics"- S Chand Publishers, 2017.

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester		L	T	P	C
		0	0	3	1.5
PROGRAMMING FOR PROBLEM SOLVING USING C LAB					

Course Objectives:

- Apply the principles of C language in problem solving.
- To design flowcharts, algorithms and knowing how to debug programs.
- To design & develop of C programs using arrays, strings pointers & functions.
- To review the file operations, preprocessor commands.

Course Outcomes:

By the end of the Lab, the student

- Gains Knowledge on various concepts of a C language.
- Able to draw flowcharts and write algorithms.
- Able design and development of C problem solving skills.
- Able to design and develop modular programming skills.
- Able to trace and debug a program

Exercise 1:

1. Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five and four characters.
2. Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5 inches.
3. Write a C program to display multiple variables.

Exercise 2:

1. Write a C program to calculate the distance between the two points.
2. Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".

Exercise 3:

1. Write a C program to convert a string to a long integer.
2. Write a program in C which is a Menu-Driven Program to compute the area of the various geometrical shape.
3. Write a C program to calculate the factorial of a given number.

Exercise 4:

1. Write a program in C to display the n terms of even natural number and their sum.
2. Write a program in C to display the n terms of harmonic series and their sum. 1 + 1/2 + 1/3 + 1/4 + 1/5 ... 1/n terms.
3. Write a C program to check whether a given number is an Armstrong number or not.

Exercise 5:

1. Write a program in C to print all unique elements in an array.
2. Write a program in C to separate odd and even integers in separate arrays.
3. Write a program in C to sort elements of array in ascending order.



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Exercise 6:
1. Write a program in C for multiplication of two square Matrices.
2. Write a program in C to find transpose of a given matrix.

Exercise 7:
1. Write a program in C to search an element in a row wise and column wise sorted matrix.
2. Write a program in C to print individual characters of string in reverse order.

Exercise 8:
1. Write a program in C to compare two strings without using string library functions.
2. Write a program in C to copy one string to another string.

Exercise 9:
1. Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
2. Write a program in C to demonstrate how to handle the pointers in the program.

Exercise 10:
1. Write a program in C to demonstrate the use of & (address of) and *(value at address) operator.
2. Write a program in C to add two numbers using pointers.

Exercise 11:
1. Write a program in C to add numbers using call by reference.
2. Write a program in C to find the largest element using Dynamic Memory Allocation.

Exercise 12:
1. Write a program in C to swap elements using call by reference.
2. Write a program in C to count the number of vowels and consonants in a string using a pointer.

Exercise 13:
1. Write a program in C to show how a function returning pointer.
2. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc( ) function.

Exercise 14:
1. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc( ) function. Understand the difference between the above two programs
2. Write a program in C to convert decimal number to binary number using the function.

Exercise 15:
1. Write a program in C to check whether a number is a prime number or not using the function.
2. Write a program in C to get the largest element of an array using the function.

Exercise 16:
1. Write a program in C to append multiple lines at the end of a text file.
2. Write a program in C to copy a file in another name.
3. Write a program in C to remove a file from the disk.

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - II Semester		L	T	P	C
		3	0	0	3
MATHEMATICS-II (Linear Algebra And Numerical Methods)					

Course Objectives:

- To instruct the concept of Matrices in solving linear algebraic equations
- To elucidate the different numerical methods to solve nonlinear algebraic equations
- To disseminate the use of different numerical techniques for carrying out numerical integration.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

Course Outcomes: At the end of the course, the student will be able to

- develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6)
- solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel (L3)
- evaluate the approximate roots of polynomial and transcendental equations by different algorithms (L5)
- apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals (L3)
- apply numerical integral techniques to different Engineering problems (L3)
- apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations (L3)

UNIT – I: Solving systems of linear equations, Eigen values and Eigen vectors: (10hrs)
Rank of a matrix by echelon form and normal form – Solving system of homogeneous and non-homogeneous linear equations – Gauss Eliminationmethod – Eigenvalues and Eigen vectors and properties (article-2.14 in text book-1).

Unit – II: Cayley–Hamilton theorem and Quadratic forms: (10hrs)
Cayley-Hamilton theorem (without proof) – Applications – Finding the inverse and power of a matrix by Cayley-Hamilton theorem – Reduction to Diagonal form – Quadratic forms and nature of the quadratic forms – Reduction of quadratic form to canonical forms by orthogonal transformation. Singular values of a matrix, singular value decomposition (text book-3).

UNIT – III: Iterative methods: (8 hrs)
Introduction– Bisection method–Secant method – Method of false position– Iteration method – Newton-Raphson method (One variable and simultaneous Equations) – Jacobi and Gauss-Seidel methods for solving system of equations numerically.

UNIT – IV: Interpolation: (10 hrs)
Introduction– Errors in polynomial interpolation – Finite differences– Forward differences– Backward differences –Central differences – Relations between operators – Newton's forward and backward formulae for interpolation – Interpolation with unequal intervals – Lagrange's interpolation formula– Newton's divide difference formula.



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UNIT – V: Numerical differentiation and integration, Solution of ordinary differential equations with initial conditions: (10 hrs)

Numerical differentiation using interpolating polynomial – Trapezoidal rule– Simpson's $1/3^{rd}$ and $3/8^{th}$ rule– Solution of initial value problems by Taylor's series– Picard's method of successive approximations– Euler's method –Runge-Kutta method (second and fourth order).

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 44^{th} Edition, Khanna Publishers.
2. B. V. Ramana,Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.
3. David Poole, Linear Algebra- A modern introduction, 4^{th} Edition, Cengage.

Reference Books:

1. Steven C. Chapra, Applied Numerical Methods with MATLAB for Engineering and Science,Tata Mc. Graw Hill Education.
2. M. K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publications.
3. Lawrence Turyn,Advanced Engineering Mathematics, CRC Press.

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - II Semester		L	T	P	C
		3	0	0	3
APPLIED CHEMISTRY					

Course Objectives

- Importance of usage of plastics in household appliances and composites (FRP) in aerospace and automotive industries.
- Outline the basics for the construction of electrochemical cells, batteries and fuel cells. Understand the mechanism of corrosion and how it can be prevented.
- Explain the preparation of semiconductors and nanomaterials, engineering applications of nanomaterials, superconductors and liquid crystals.
- Recall the increase in demand for power and hence alternative sources of power are studied due to depleting sources of fossil fuels. Advanced instrumental techniques are introduced.
- Outline the basics of computational chemistry and molecular switches

UNIT I: POLYMER TECHNOLOGY **8 hrs**

Polymerisation:- Introduction, methods of polymerization (emulsion and suspension), mechanical properties.

Plastics: Compounding, fabrication (compression, injection, blown film and extrusion), preparation, properties and applications (PVC, polycarbonates and Bakelite), mention some examples of plastic materials used in electronic gadgets, recycling of e-plastic waste (waste to wealth).

Elastomers:- Introduction, preparation, properties and applications (Buna S, thiokol and polyurethanes).

Composite materials: Fiber reinforced plastics, conducting polymers, biodegradable polymers, biopolymers, biomedical polymers.

Course Outcomes: At the end of this unit, the students will be able to

- Analyze the different types of composite plastic materials and interpret the mechanism of conduction in conducting polymers.

UNIT II: ELECTROCHEMICAL CELLS AND CORROSION **10 hrs**

Single electrode potential, electrochemical series and uses of series, standard hydrogen electrode, calomel electrode, construction of glass electrode, batteries (Dry cell, Li ion battery and zinc air cells), fuel cells (H_2-O_2, CH_3OH-O_2, phosphoric acid and molten carbonate).

Corrosion:-Definition, theories of corrosion (chemical and electrochemical), galvanic corrosion, differential aeration corrosion, stress corrosion, galvanic series, factors influencing rate of corrosion, corrosion control (proper designing and cathodic protection), Protective coatings (surface preparation, cathodic coatings, anodic coatings, electroplating and electroless plating [nickel]), Paints (constituents, functions and special paints).

Course Outcomes: At the end of this unit, the students will be able to

- Utilize the theory of construction of electrodes, batteries and fuel cells in redesigning new engineering products and categorize the reasons for corrosion and study methods to control corrosion.

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UNIT III: MATERIAL CHEMISTRY **10 hrs**

Part I : Non-elemental semiconducting materials:- Stoichiometric, controlled valency & chalcogen photo/semiconductors-preparation of semiconductors (distillation, zone refining, Czochralski crystal pulling, epitaxy, diffusion, ion implantation) - Semiconductor devices (p-n junction diode as rectifier, junction transistor).

Insulators & magnetic materials: electrical insulators-ferro and ferri magnetism-Hall effect and its applications.

Part II: Nano materials:- Introduction, sol-gel method, characterization by (Brunauer Emmet Teller [BET]), (scanning electron microscopy [SEM]) and (transmission electron microscopy [TEM]), applications of graphene and fullerenes, carbon nanotubes (types, preparation and applications)

Liquid crystals:- Introduction-types-applications.

Super conductors:-Type –I, Type II-characteristics and applications

Course Outcomes: At the end of this unit, the students will be able to

- Synthesize nanomaterials for modern advances of engineering technology.
- Summarize the preparation of semiconductors; analyze the applications of liquid crystals and superconductors.

UNIT IV: SPECTROSCOPIC TECHNIQUES & NON-CONVENTIONAL ENERGY SOURCES 10 hrs

Part A: **SPECTROSCOPIC TECHNIQUES**

Electromagnetic spectrum-UV (laws of absorption, instrumentation, theory of electronic spectroscopy, Frank-condon principle, chromophores and auxochromes, intensity shifts, applications), FT-IR [instrumentation and differentiation of sp, sp^2, sp^3 and IR stretching of functional groups (alcohols, carbonyls, amines) applications], magnetic resonance imaging and CT scan (procedure & applications).

Part B*:* NON-CONVENTIONAL ENERGY SOURCES

Design, working, schematic diagram, advantages and disadvantages of photovoltaic cell, hydropower, geothermal power, tidal and wave power, ocean thermal energy conversion.

Course Outcomes: At the end of this unit, the students will be able to

- Analyze the principles of different analytical instruments and their applications.
- Design models for energy by different natural sources.

UNIT V: ADVANCED CONCEPTS/TOPICS IN CHEMISTRY **8 hrs**

Computational chemistry: Introduction to computational chemistry, molecular modelling and docking studies

Molecular switches: characteristics of molecular motors and machines, Rotaxanes and Catenanes as artificial molecular machines, prototypes – linear motions in rotaxanes, an acid-base controlled molecular shuttle, a molecular elevator, an autonomous light-powered molecular motor

Course Outcomes: At the end of this unit, the students will be able to

- Obtain the knowledge of computational chemistry and molecular machines

Text Books:

1. P.C. Jain and M. Jain “Engineering Chemistry”, 15/e, Dhanpat Rai & Sons, Delhi, (Latest edition).
2. Shikha Agarwal, “Engineering Chemistry”, Cambridge University Press, New Delhi, (2019).
3. S.S. Dara, “A Textbook of Engineering Chemistry”, S.Chand & Co, (2010).
4. Shashi Chawla, “Engineering Chemistry”, Dhanpat Rai Publicating Co. (Latest edition).



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Reference Books:

1. K. Sesha Maheshwaramma and Mridula Chugh, "Engineering Chemistry", Pearson India Edn.
2. O.G. Palana, "Engineering Chemistry", Tata McGraw Hill Education Private Limited, (2009).
3. CNR Rao and JM Honig (Eds) "Preparation and characterization of materials" Academic press, New York (latest edition)
4. B. S. Murthy, P. Shankar and others, "Textbook of Nanoscience and Nanotechnology", University press (latest edition)

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - II Semester		L	T	P	C
		3	0	0	3
COMPUTER ORGANIZATION					

Course Objectives:
The purpose of the course is to introduce principles of computer organization and the basic architectural concepts. It provides an in depth understanding of basic organization, design, programming of a simple digital computer, computer arithmetic, instruction set design, microprogrammed control unit, pipelining and vector processing, memory organization and I/O systems.

Course Outcomes:
By the end of the course the student will be able to

- Demonstrate and understanding of the design of the functional units of a digital computer system.
- Relate Postulates of Boolean algebra and minimize combinational functions
- Recognize and manipulate representations of numbers stored in digital computers
- Build the logic families and realization of logic gates.
- Design and analyze combinational and sequential circuits
- Recall the internal organization of computers, CPU, memory unit and Input/Outputs and the relations between its main components
- Solve elementary problems by assembly language programming

UNIT I:
Digital Computers and Data Representation: Introduction ,Numbering Systems, Decimal to Binary Conversion, Binary Coded Decimal Numbers, Weighted Codes, Self-Complementing Codes, Cyclic Codes, Error Detecting Codes, Error Correcting Codes, Hamming Code for Error Correction, Alphanumeric Codes, ASCI Code
Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation.
Boolean Algebra and Logical gates:
Boolean Algebra :Theorems and properties, Boolean functions, canonical and standard forms , minimization of Boolean functions using algebraic identities; Karnaugh map representation and minimization using two and three variable Maps ;Logical gates ,universal gates and Two-level realizations using gates : AND-OR, OR-AND, NAND-NAND and NOR-NOR structures

UNIT II:
Digital logic circuits: Combinatorial Circuits: Introduction, Combinatorial Circuit Design Procedure, Implementation using universal gates, Multi-bit adder, Multiplexers, De-multiplexers, Decoders
Sequential Switching Circuits: Latches and Flip-Flops, Ripple counters using T flip-flops; Synchronous counters: Shift Registers; Ring counters

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UNIT III:

Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Booth multiplication algorithm, Division Algorithms, Floating – point Arithmetic operations.

Register Transfer language and microinstructions : Bus memory transfer, arithmetic and logical micro-operations, shift and rotate micro-operations

Basic Computer Organization and Design: Stored program concept, computer Registers, common bus system**,** Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input–Output configuration and program Interrupt.

UNIT IV:

Microprogrammed Control: Control memory, Address sequencing, microprogram example, design of control unit.

Central Processing Unit: General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control: conditional Flags and Branching

UNIT V:

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.

Input-Output Organization: Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access.

Text Books:

1. Digital Logic and Computer Design,Moriss Mano,11thEdition,PearsonEducation.
2. Computer System Architecture,3rded., M.MorrisMano, PHI

Reference Books:

1. Digital Logic and Computer Organization, Rajaraman,Radhakrishnan,PHI,2006
2. Computer Organization, 5thed.,Hamacher, VranesicandZaky,TMH,2002
3. Computer Organization & Architecture :Designing for Performance, 7thed., William Stallings, PHI, 2006

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year – II Semester		L	T	P	C
		3	0	0	3
PYTHON PROGRAMMING					

Course Objectives:
The Objectives of Python Programming are

- To learn about Python programming language syntax, semantics, and the runtime environment
- To be familiarized with universal computer programming concepts like data types, containers
- To be familiarized with general computer programming concepts like conditional execution, loops & functions
- To be familiarized with general coding techniques and object-oriented programming

Course Outcomes:

- Develop essential programming skills in computer programming concepts like data types, containers
- Apply the basics of programming in the Python language
- Solve coding tasks related conditional execution, loops
- Solve coding tasks related to the fundamental notions and techniques used in object-oriented programming

UNIT I
Introduction: Introduction to Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, Operators. Type conversions, Expressions, More about Data Output.
Data Types, and Expression: Strings Assignment, and Comment, Numeric Data Types and Character Sets, Using functions and Modules.
Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables. Repetition Structures: Introduction, while loop, for loop, Calculating a Running Total, Input Validation Loops, Nested Loops.

UNIT II
Control Statement: Definite iteration for Loop Formatting Text for output, Selection if and if else Statement Conditional Iteration The While Loop
Strings and Text Files: Accessing Character and Substring in Strings, Data Encryption, Strings and Number Systems, String Methods Text Files.

UNIT III
List and Dictionaries: Lists, Defining Simple Functions, Dictionaries
Design with Function**:** Functions as Abstraction Mechanisms, Problem Solving with Top Down Design, Design with Recursive Functions, Case Study Gathering Information from a File System, Managing a Program's Namespace, Higher Order Function.
Modules: Modules, Standard Modules, Packages.

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UNIT IV

File Operations: Reading config files in python, Writing log files in python, Understanding read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines(), Manipulating file pointer using seek, Programming using file operations

Object Oriented Programming**:** Concept of class, object and instances, Constructor, class attributes and destructors, Real time use of class in live projects, Inheritance , overlapping and overloading operators, Adding and retrieving dynamic attributes of classes, Programming using Oops support

Design with Classes: Objects and Classes, Data modeling Examples, Case Study An ATM, Structuring Classes with Inheritance and Polymorphism

UNIT V

Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defined Exceptions, Defining Clean-up Actions, Redefined Clean-up Actions.

Graphical User Interfaces: The Behavior of Terminal Based Programs and GUI -Based, Programs, Coding Simple GUI-Based Programs, Other Useful GUI Resources.

Programming**:** Introduction to Programming Concepts with Scratch.

Text Books

1) Fundamentals of Python First Programs, Kenneth. A. Lambert, Cengage.
2) Python Programming: A Modern Approach, Vamsi Kurama, Pearson.

Reference Books:

1) Introduction to Python Programming, Gowrishankar.S, Veena A, CRC Press.
2) Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

e-Resources:

https://www.tutorialspoint.com/python3/python_tutorial.pdf

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I Year – II Semester		L	T	P	C
		3	0	0	3
DATA STRUCTURES					

Course Objectives:
The objective of the course is to
- Introduce the fundamental concept of data structures and abstract data types
- Emphasize the importance of data structures in developing and implementing efficient algorithms
- Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms

Course Outcomes:
After completing this course a student will be able to:
- Summarize the properties, interfaces, and behaviors of basic abstract data types
- Discuss the computational efficiency of the principal algorithms for sorting & searching
- Use arrays, records, linked structures, stacks, queues, trees, and Graphs in writing programs
- Demonstrate different methods for traversing trees

UNIT I
Data Structures - Definition, Classification of Data Structures, Operations on Data Structures, Abstract Data Type (ADT), Preliminaries of algorithms. Time and Space complexity.
Searching - Linear search, Binary search, Fibonacci search.
Sorting- Insertion sort, Selection sort, Exchange (Bubble sort, quick sort), distribution (radix sort), merging (Merge sort) algorithms.

UNIT II
Linked List: Introduction, Single linked list, Representation of Linked list in memory, Operations on Single Linked list-Insertion, Deletion, Search and Traversal ,Reversing Single Linked list, Applications on Single Linked list- Polynomial Expression Representation ,Addition and Multiplication, Sparse Matrix Representation using Linked List, Advantages and Disadvantages of Single Linked list, Double Linked list-Insertion, Deletion, Circular Linked list-Insertion, Deletion.

UNIT III
Queues: Introduction to Queues, Representation of Queues-using Arrays and using Linked list, Implementation of Queues-using Arrays and using Linked list, Application of Queues-Circular Queues, Deques, Priority Queues, Multiple Queues.
Stacks: Introduction to Stacks, Array Representation of Stacks, Operations on Stacks, Linked list Representation of Stacks, Operations on Linked Stack, Applications-Reversing list, Factorial Calculation, Infix to Postfix Conversion, Evaluating Postfix Expressions.

UNIT IV
Trees: Basic Terminology in Trees, Binary Trees-Properties, Representation of Binary Trees using Arrays and Linked lists. Binary Search Trees- Basic Concepts, BST Operations: Insertion, Deletion, Tree Traversals, Applications-Expression Trees, Heap Sort, Balanced Binary Trees- AVL Trees, Insertion, Deletion and Rotations.

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UNIT V

Graphs: Basic Concepts, Representations of Graphs-Adjacency Matrix and using Linked list, Graph Traversals (BFT & DFT), Applications- Minimum Spanning Tree Using Prims & Kruskals Algorithm, Dijkstra's shortest path, Transitive closure, Warshall's Algorithm.

Text Books:

1) Data Structures Using C. 2nd Edition.Reema Thareja, Oxford.
2) Data Structures and algorithm analysis in C, 2nded, Mark Allen Weiss.

Reference Books:

1) Fundamentals of Data Structures in C, 2nd Edition, Horowitz, Sahni, Universities Press.
2) Data Structures: A PseudoCode Approach, 2/e, Richard F.Gilberg, Behrouz A. Forouzon, Cengage.
3) Data Structures with C, Seymour Lipschutz TMH

e-Resources:

1) http://algs4.cs.princeton.edu/home/
2) https://faculty.washington.edu/jstraub/dsa/Master_2_7a.pdf

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I Year - II Semester		L	T	P	C
		0	0	3	1.5
APPLIED CHEMISTRY LAB					

Introduction to Chemistry laboratory – Molarity, normality, primary, secondary standard solutions, volumetric titrations, quantitative analysis

1. Determination of HCl using standard Na_2CO_3 solution.
2. Determination of alkalinity of a sample containing Na_2CO_3 and NaOH.
3. Determination of Mn^{+2} using standard oxalic acid solution.
4. Determination of ferrous iron using standard $K_2Cr_2O_7$ solution.
5. Determination of Cu^{+2} using standard hypo solution.
6. Determination of temporary and permanent hardness of water using standard EDTA solution.
7. Determination of Fe^{+3} by a colorimetric method.
8. Determination of the concentration of acetic acid using sodium hydroxide (pH-metry method).
9. Determination of iso-electric point of amino acids using pH-metry method/conductometric method.
10. Determination of the concentration of strong acid vs strong base (by conductometric method).
11. Determination of strong acid vs strong base (by potentiometric method).
12. Determination of Mg^{+2} present in an antacid.
13. Determination of $CaCO_3$ present in an egg shell.
14. Estimation of Vitamin C.
15. Determination of phosphoric content in soft drinks.
16. Adsorption of acetic acid by charcoal.
17. Preparation of nylon-6, 6 and Bakelite (demonstration only).

Of the above experiments at-least 10 assessment experiments should be completed in a semester.

Outcomes: The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

Reference Books

1. A Textbook of Quantitative Analysis, Arthur J. Vogel.

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I Year - II Semester		L	T	P	C
		0	0	3	1.5
PYTHON PROGRAMMING LAB					

Course Objectives:
The Objectives of Python Programming are

- *To learn about Python programming language syntax, semantics, and the runtime environment*
- *To be familiarized with universal computer programming concepts like data types, containers*
- *To be familiarized with general computer programming concepts like conditional execution, loops & functions*
- *To be familiarized with general coding techniques and object-oriented programming*

Course Outcomes:

- Develop essential programming skills in computer programming concepts like data types, containers
- Apply the basics of programming in the Python language
- Solve coding tasks related conditional execution, loops
- Solve coding tasks related to the fundamental notions and techniques used in object-oriented programming

List of Experiments:

1) Write a program that asks the user for a weight in kilograms and converts it to pounds. There are 2.2 pounds in a kilogram.
2) Write a program that asks the user to enter three numbers (use three separate input statements). Create variables called total and average that hold the sum and average of the three numbers and print out the values of total and average.
3) Write a program that uses a *for* loop to print the numbers 8, 11, 14, 17, 20, . . . , 83, 86, 89.
4) Write a program that asks the user for their name and how many times to print it. The program should print out the user's name the specified number of times.
5) Use a *for* loop to print a triangle like the one below. Allow the user to specify how high the triangle should be.

```
*
**
***
****
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6) Generate a random number between 1 and 10. Ask the user to guess the number and print a message based on whether they get it right or not.
7) Write a program that asks the user for two numbers and prints *Close* if the numbers are within .001 of each other and Not close otherwise.
8) Write a program that asks the user to enter a word and prints out whether that word contains any vowels.
9) Write a program that asks the user to enter two strings of the same length. The program should then check to see if the strings are of the same length. If they are not, the program should print an appropriate message and exit. If they are of the same



length, the program should alternate the characters of the two strings. For example, if the user enters *abcde* and *ABCDE* the program should print out *AaBbCcDdEe*.

10) Write a program that asks the user for a large integer and inserts commas into it according to the standard American convention for commas in large numbers. For instance, if the user enters 1000000, the output should be 1,000,000.
11) In algebraic expressions, the symbol for multiplication is often left out, as in 3x+4y or 3(x+5). Computers prefer those expressions to include the multiplication symbol, like 3*x+4*y or 3*(x+5). Write a program that asks the user for an algebraic expression and then inserts multiplication symbols where appropriate.
12) Write a program that generates a list of 20 random numbers between 1 and 100.
    (a) Print the list.
    (b) Print the average of the elements in the list.
    (c) Print the largest and smallest values in the list.
    (d) Print the second largest and second smallest entries in the list
    (e) Print how many even numbers are in the list.
13) Write a program that asks the user for an integer and creates a list that consists of the factors of that integer.
14) Write a program that generates 100 random integers that are either 0 or 1. Then find the longest run of zeros, the largest number of zeros in a row. For instance, the longest run of zeros in [1,0,1,1,0,0,0,0,1,0,0] is 4.
15) Write a program that removes any repeated items from a list so that each item appears at most once. For instance, the list [1,1,2,3,4,3,0,0] would become [1,2,3,4,0].
16) Write a program that asks the user to enter a length in feet. The program should then give the user the option to convert from feet into inches, yards, miles, millimeters, centimeters, meters, or kilometers. Say if the user enters a 1, then the program converts to inches, if they enter a 2, then the program converts to yards, etc. While this can be done with if statements,it is much shorter with lists and it is also easier to add new conversions if you use lists.
17) Write a function called *sum_digits* that is given an integer num and returns the sum of the digits of num.
18) Write a function called *first_diff* that is given two strings and returns the first location in which the strings differ. If the strings are identical, it should return -1.
19) Write a function called *number_of_factors* that takes an integer and returns how many factors the number has.
20) Write a function called *is_sorted* that is given a list and returns True if the list is sorted and False otherwise.
21) Write a function called root that is given a number x and an integer n and returns $x^{1/n}$. In the function definition, set the default value of n to 2.
22) Write a function called primes that is given a number n and returns a list of the first n primes. Let the default value of n be 100.
23) Write a function called merge that takes two already sorted lists of possibly different lengths, and merges them into a single sorted list.
    (a) Do this using the sort method. (b) Do this without using the sort method.
24) Write a program that asks the user for a word and finds all the smaller words that can be made from the letters of that word. The number of occurrences of a letter in a smaller word can't exceed the number of occurrences of the letter in the user's word.
25) Write a program that reads a file consisting of email addresses, each on its own line. Your program should print out a string consisting of those email addresses separated by semicolons.

26) Write a program that reads a list of temperatures from a file called *temps.txt*, converts those temperatures to Fahrenheit, and writes the results to a file called ftemps.txt.
27) Write a class called Product. The class should have fields called name, amount, and price, holding the product's name, the number of items of that product in stock, and the regular price of the product. There should be a method *get_price* that receives the number of items to be bought and returns a the cost of buying that many items, where the regular price is charged for orders of less than 10 items, a 10% discount is applied for orders of between 10 and 99 items, and a 20% discount is applied for orders of 100 or more items. There should also be a method called *make_purchase* that receives the number of items to be bought and decreases amount by that much.
28) Write a class called Time whose only field is a time in seconds. It should have a method called *convert_to_minutes* that returns a string of minutes and seconds formatted as in the following example: if seconds is 230, the method should return '5:50'. It should also have a method called *convert_to_hours* that returns a string of hours, minutes, and seconds formatted analogously to the previous method.
29) Write a class called Converter. The user will pass a length and a unit when declaring an object from the class—for example, c = Converter(9,'inches'). The possible units are inches, feet, yards, miles, kilometers, meters, centimeters, and millimeters. For each of these units there should be a method that returns the length converted into those units. For example, using the Converter object created above, the user could call c.feet() and should get 0.75 as the result.
30) Write a Python class to implement pow(x, n).
31) Write a Python class to reverse a string word by word.
32) Write a program that opens a file dialog that allows you to select a text file. The program then displays the contents of the file in a textbox.
33) Write a program to demonstrate Try/except/else.
34) Write a program to demonstrate try/finally and with/as.



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I Year – II Semester		L	T	P	C
		0	0	3	1.5
DATA STRUCTURES LAB					

Course Objectives:
The objective of this lab is to
- Demonstrate the different data structures implementation.

Course Outcomes:
By the end of this lab the student is able to
- Use basic data structures such as arrays and linked list.
- Programs to demonstrate fundamental algorithmic problems including Tree Traversals, Graph traversals, and shortest paths.
- Use various searching and sorting algorithms.

List of Experiments:

Exercise -1 (Searching)
a)Write C program that use both recursive and non recursive functions to perform Linear search for a Key value in a given list.
b) Write C program that use both recursive and non recursive functions to perform Binary search for a Key value in a given list.

Exercise -2 (Sorting-I)
a) Write C program that implement Bubble sort, to sort a given list of integers in ascending order
b) Write C program that implement Quick sort, to sort a given list of integers in ascending order
c) Write C program that implement Insertion sort, to sort a given list of integers in ascending order

Exercise -3(Sorting-II)
a) Write C program that implement radix sort, to sort a given list of integers in ascending order
b) Write C program that implement merge sort, to sort a given list of integers in ascending order

Exercise -4(Singly Linked List)
a) Write a C program that uses functions to create a singly linked list
b) Write a C program that uses functions to perform insertion operation on a singly linked list
c) Write a C program that uses functions to perform deletion operation on a singly linked list
d) Write a C program to reverse elements of a single linked list.

Exercise -5(Queue)
a) Write C program that implement Queue (its operations) using arrays.
b) Write C program that implement Queue (its operations) using linked lists



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Exercise -6(Stack)

a) Write C program that implement stack (its operations) using arrays
b) Write C program that implement stack (its operations) using Linked list
c) Write a C program that uses Stack operations to evaluate postfix expression

Exercise -7(Binary Tree)

d) Write a recursive C program for traversing a binary tree in preorder, inorder and postorder.

Exercise -8(Binary Search Tree)

a) Write a C program to Create a BST
b) Write a C program to insert a node into a BST.
c) Write a C program to delete a node from a BST.

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year – II Semester		L	T	P	C
		2	0	0	0
ENVIRONMENT SCIENCE					

Course Objectives:
The objectives of the course are to impart:

- Overall understanding of the natural resources.
- Basic understanding of the ecosystem and its diversity.
- Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.
- An understanding of the environmental impact of developmental activities.
- Awareness on the social issues, environmental legislation and global treaties.

UNIT I
Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance – Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects. Role of information technology in environment and human health.
Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem; Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

UNIT II
Natural Resources: Natural resources and associated problems.
Forest resources: Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people.
Water resources: Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems.
Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.
Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.
Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.
Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification; Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.

UNIT III
Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity-classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-sports of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts. - Endangered and endemic species of India – Conservation of biodiversity: conservation of biodiversity.

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UNIT IV

Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his well being.

Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.

UNIT V

Social Issues and the Environment: Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act - Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Public awareness.

Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Green business and Green politics.

The student should Visit an Industry / Ecosystem and submit a report individually on any **issues related to Environmental Studies course and make a power point presentation.**

Text Books:

1) Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada
2) Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.
3) Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

Reference Books:

1) Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
2) A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi
3) Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi
4) Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2014

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year I Semester		L	T	P	C
		3	0	0	3
MATHEMATICS - III					

Course Objectives:

- To familiarize the techniques in partial differential equations
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.

Course Outcomes:

At the end of the course, the student will be able to

- Interpret the physical meaning of different operators such as gradient, curl and divergence (L5)
- Estimate the work done against a field, circulation and flux using vector calculus (L5)
- Apply the Laplace transform for solving differential equations (L3)
- Find or compute the Fourier series of periodic signals (L3)
- Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms (L3)
- Identify solution methods for partial differential equations that model physical processes (L3)

UNIT I: Vector calculus: (10 hrs)

Vector Differentiation: Gradient – Directional derivative – Divergence – Curl – Scalar Potential.

Vector Integration: Line integral – Work done – Area – Surface and volume integrals – Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof).

UNIT II: Laplace Transforms: (10 hrs)

Laplace transforms of standard functions – Shifting theorems – Transforms of derivatives and integrals – Unit step function – Dirac's delta function – Inverse Laplace transforms – Convolution theorem (without proof).

Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.

UNIT III: Fourier series and Fourier Transforms: (10 hrs)

Fourier Series: Introduction – Periodic functions – Fourier series of periodic function – Dirichlet's conditions – Even and odd functions – Change of interval – Half-range sine and cosine series.

Fourier Transforms: Fourier integral theorem (without proof) – Fourier sine and cosine integrals – Sine and cosine transforms – Properties – inverse transforms – Finite Fourier transforms.

UNIT IV: PDE of first order: (8 hrs

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.

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UNIT V: Second order PDE and Applications: (10 hrs)
Second order PDE: Solutions of linear partial differential equations with constant coefficients – RHS term of the type e^{ax+by}, $\sin(ax+by)$, $\cos(ax+by)$, $x^m y^n$.
Applications of PDE: Method of separation of Variables – Solution of One dimensional Wave, Heat and two-dimensional Laplace equation.

Text Books:

1) B. S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2) B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:

1) Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India.
2) Dean. G. Duffy, Advanced Engineering Mathematics with MATLAB, 3rd Edition, CRC Press.
3) Peter O' Neil, Advanced Engineering Mathematics, Cengage.
4) Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford University Press.

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – I Semester		L	T	P	C
		3	0	0	3
OBJECT ORIENTED PROGRAMMING THROUGH C++					

Course Objectives:

- Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects
- Understand dynamic memory management techniques using pointers, constructors, destructors
- Describe the concept of function overloading, operator overloading, virtual functions and polymorphism
- Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming
- Demonstrate the use of various OOPs concepts with the help of programs

Course Outcomes:

By the end of the course, the student

- Classify object oriented programming and procedural programming
- Apply C++ features such as composition of objects, operator overloads, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling
- Build C++ classes using appropriate encapsulation and design principles
- Apply object oriented or non-object oriented techniques to solve bigger computing problems

UNIT I

Introduction to C++: Difference between C and C++, Evolution of C++, The Object Oriented Technology, Disadvantage of Conventional Programming, Key Concepts of Object Oriented Programming, Advantage of OOP, Object Oriented Language.

UNIT II

Classes and Objects &Constructors and Destructor: Classes in C++, Declaring Objects, Access Specifiers and their Scope, Defining Member Function, Overloading Member Function, Nested class, Constructors and Destructors, Introduction, Constructors and Destructor, Characteristics of Constructor and Destructor, Application with Constructor, Constructor with Arguments parameterized Constructor, Destructors, Anonymous Objects.

UNIT III

Operator Overloading and Type Conversion & Inheritance: The Keyword Operator, Overloading Unary Operator, Operator Return Type, Overloading Assignment Operator (=), Rules for Overloading Operators, Inheritance, Reusability, Types of Inheritance, Virtual Base Classes- Object as a Class Member, Abstract Classes, Advantages of Inheritance, Disadvantages of Inheritance.

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UNIT IV

Pointers & Binding Polymorphisms and Virtual Functions: Pointer, Features of Pointers, Pointer Declaration, Pointer to Class, Pointer Object, The this Pointer, Pointer to Derived Classes and Base Class, Binding Polymorphisms and Virtual Functions, Introduction, Binding in C++, Virtual Functions, Rules for Virtual Function, Virtual Destructor.

UNIT V

Generic Programming with Templates & Exception Handling: Definition of class Templates, Normal Function Templates, Over Loading of Template Function, Bubble Sort Using Function Templates, Difference between Templates and Macros, Linked Lists with Templates, Exception Handling, Principles of Exception Handling, The Keywords try throw and catch, Multiple Catch Statements, Specifying Exceptions.

Overview of Standard Template Library, STL Programming Model, Containers, Sequence Containers, Associative Containers, Algorithms, Iterators, Vectors, Lists, Maps.

Text Books:

1) A First Book of C++, Gary Bronson, Cengage Learning.
2) The Complete Reference C++, Herbert Schildt, TMH.

Reference Books:

1) Object Oriented Programming C++, Joyce Farrell, Cengage.
2) C++ Programming: from problem analysis to program design, DS Malik, Cengage Learning
3) Programming in C++, Ashok N Kamthane, Pearson 2nd Edition

e- Resources:

1) https://nptel.ac.in/courses/106/105/106105151/
2) https://github.com/topics/object-oriented-programming

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – I Semester		L	T	P	C
		3	0	0	3
OPERATING SYSTEMS					

Course Objectives:
The objectives of this course is to

- Introduce to the internal operation of modern operating systems
- Define, explain, processes and threads, mutual exclusion, CPU scheduling, deadlock, memory management, and file systems
- Understand File Systems in Operating System like UNIX/Linux and Windows
- Understand Input Output Management and use of Device Driver and Secondary Storage (Disk) Mechanism
- Analyze Security and Protection Mechanism in Operating System

Course Outcomes:
After learning, the course the students should be able to:

- Describe various generations of Operating System and functions of Operating System
- Describe the concept of program, process and thread and analyze various CPU Scheduling Algorithms and compare their performance
- Solve Inter Process Communication problems using Mathematical Equations by various methods
- Compare various Memory Management Schemes especially paging and Segmentation in Operating System and apply various Page Replacement Techniques
- Outline File Systems in Operating System like UNIX/Linux and Windows

UNIT I
Operating Systems Overview: Operating system functions, Operating system structure, Operating systems operations, Computing environments, Open-Source Operating Systems.
System Structures: Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs, operating system structure, operating system debugging, System Boot.

UNIT II
Process Concept: Process scheduling, Operations on processes, Inter-process communication, Communication in client server systems.
Multithreaded Programming: Multithreading models, Thread libraries, Threading issues.
Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling, Thread scheduling.
Inter-process Communication: Race conditions, Critical Regions, Mutual exclusion with busy waiting, Sleep and wakeup, Semaphores, Mutexes, Monitors, Message passing, Barriers, Classical IPC Problems - Dining philosophers problem, Readers and writers problem.

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UNIT III

Memory-Management Strategies: Introduction, Swapping, Contiguous memory allocation, Paging, Segmentation.

Virtual Memory Management: Introduction, Demand paging, Copy on-write, Page replacement, Frame allocation, Thrashing, Memory-mapped files, Kernel memory allocation.

UNIT IV

Deadlocks: Resources, Conditions for resource deadlocks, Ostrich algorithm, Deadlock detection and recovery, Deadlock avoidance, Deadlock prevention.

File Systems: Files, Directories, File system implementation, management and optimization.

Secondary-Storage Structure: Overview of disk structure, and attachment, Disk scheduling, RAID structure, Stable storage implementation.

UNIT V

System Protection: Goals of protection, Principles and domain of protection, Access matrix, Access control, Revocation of access rights.

System Security: Introduction, Program threats, System and network threats, Cryptography for security, User authentication, Implementing security defenses, Firewalling to protect systems and networks, Computer security classification.

Case Studies: Linux, Microsoft Windows.

Text Books:

1) Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2013.
2) Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008. (for Interprocess Communication and File systems.)

Reference Books:

1) Dhamdhere D M, Operating Systems A Concept Based Approach, 3rd edition, Tata McGraw-Hill, 2012.
2) Stallings W, Operating Systems -Internals and Design Principles, 6th edition, Pearson Education, 2009
3) Nutt G, Operating Systems, 3rd edition, Pearson Education, 2004.

e-Resources:

1) https://nptel.ac.in/courses/106/105/106105214/

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – I Semester		L	T	P	C
		3	0	0	3
SOFTWARE ENGINEERING					

Course Objectives:
This course is designed to:

- Give exposure to phases of Software Development, common process models including Waterfall, and the Unified Process, and hands-on experience with elements of the agile process
- Give exposure to a variety of Software Engineering practices such as requirements analysis and specification, code analysis, code debugging, testing, traceability, and version control
- Give exposure to Software Design techniques

Course Outcomes:
Students taking this subject will gain software engineering skills in the following areas:

- Ability to transform an Object-Oriented Design into high quality, executable code
- Skills to design, implement, and execute test cases at the Unit and Integration level
- Compare conventional and agile software methods

UNIT I
The Nature of Software, The Unique Nature of WebApps, Software Engineering, The Software Process, Software Engineering Practice, Software Myths. A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Technology.

UNIT II
Agility, Agility and the Cost of Change, Agile Process, Extreme Programming (XP), Other Agile Process Models, A Tool Set for the Agile Process, Software Engineering Knowledge, Core Principles, Principles That Guide Each Framework Activity, Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Requirements Model, Negotiating Requirements, Validating Requirements.

UNIT III
Requirements Analysis, Scenario-Based Modeling, UML Models That Supplement the Use Case, Data Modeling Concepts, Class-Based Modeling, Requirements Modeling Strategies, Flow-Oriented Modeling, Creating a Behavioral Model, Patterns for Requirements Modelling, Requirements Modeling for WebApps.

UNIT IV
Design within the Context of Software Engineering, The Design Process, Design Concepts, The Design Model, Software Architecture, Architectural Genres, Architectural Styles,

Assessing Alternative Architectural Designs, Architectural Mapping Using Data Flow, Components, Designing Class-Based Components, Conducting Component-Level Design, Component-Level Design for WebApps, Designing Traditional Components, Component-Based Development.

UNIT V

The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, WebApp Interface Design, Design Evaluation, Elements of Software Qualtiy Assurance, SQA Tasks, Goals & Metrics, Statistical SQA, Software Reliability, A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object-Oriented Software, Test Strategies for WebApps, Validation Testing, System Testing, The Art of Debugging, Software Testing Fundamentals, Internal and External Views of Testing, White-Box Testing, Basis Path Testing.

Text Books:

1) Software Engineering a practitioner's approach, Roger S. Pressman, Seventh Edition, McGraw Hill Higher Education.
2) Software Engineering, Ian Sommerville, Ninth Edition, Pearson.

Reference Books:

1) Software Engineering, A Precise Approach, PankajJalote, Wiley India, 2010.
2) Software Engineering, Ugrasen Suman, Cengage.

e-Resources:

1) https://nptel.ac.in/courses/106/105/106105182/

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – I Semester		L	T	P	C
		3	0	0	3
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE					

Course Objectives:
This course is designed to:

- To introduce the students to the topics and techniques of discrete methods and combinatorial reasoning
- To introduce a wide variety of applications. The algorithmic approach to the solution of problems is fundamental in discrete mathematics, and this approach reinforces the close ties between this discipline and the area of computer science

Course Outcomes:
At the end of the course student will be able to

- Demonstrate skills in solving mathematical problems
- Comprehend mathematical principles and logic
- Demonstrate knowledge of mathematical modeling and proficiency in using mathematical software
- Manipulate and analyze data numerically and/or graphically using appropriate Software
- Communicate effectively mathematical ideas/results verbally or in writing

UNIT I
Mathematical Logic: Propositional Calculus: Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Normal Forms, Theory of Inference for Statement Calculus, Consistency of Premises, Indirect Method of Proof, Predicate Calculus: Predicates, Predicative Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus.

UNIT II
Set Theory: Sets: Operations on Sets, Principle of Inclusion-Exclusion, Relations: Properties, Operations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering, Hasse Diagrams, Functions: Bijective, Composition, Inverse, Permutation, and Recursive Functions, Lattice and its Properties, Algebraic Structures: Algebraic Systems, Properties, Semi Groups and Monoids, Group, Subgroup and Abelian Group, Homomorphism, Isomorphism.

UNIT III
Combinatorics: Basis of Counting, Permutations, Permutations with Repetitions, Circular and Restricted Permutations, Combinations, Restricted Combinations, Binomial and Multinomial Coefficients and Theorems, Number Theory: Properties of Integers, Division Theorem,

Greatest Common Divisor, Euclidean Algorithm, Least Common Multiple, Testing for Prime Numbers, The Fundamental Theorem of Arithmetic, Modular Arithmetic, Fermat's and Euler's Theorems

UNIT IV

Recurrence Relations: Generating Functions, Function of Sequences, Partial Fractions, Calculating Coefficient of Generating Functions, Recurrence Relations, Formulation as Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations

UNIT V

Graph Theory: Basic Concepts, Graph Theory and its Applications, Sub graphs, Graph Representations: Adjacency and Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Bipartite and Planar Graphs, Euler's Theorem, Graph Colouring and Covering, Chromatic Number, Spanning Trees, Prim's and Kruskal's Algorithms, BFS and DFS Spanning Trees.

Text Books:

1) Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill.
2) Elements of Discrete Mathematics-A Computer Oriented Approach, C. L. Liu and D. P. Mohapatra, 3rd Edition, Tata McGraw Hill.

Reference Books:

1) Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel and T. P. Baker, 2nd Edition, Prentice Hall of India.
2) Discrete Mathematical Structures, Bernand Kolman, Robert C. Busby and Sharon Cutler Ross, PHI.
3) Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7th Edition, Tata McGraw Hill.

e-Resources:

1) https://nptel.ac.in/courses/106/106/106106094/



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – I Semester		L	T	P	C
		0	0	3	1.5
OBJECT ORIENTED PROGRAMMING THROUGH C++ LAB					

Course Objectives:
The objective of this lab is to

- Demonstrate procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects.
- Understand dynamic memory management techniques using pointers, constructors, destructors, etc
- Demonstrate the concept of function overloading, operator overloading, virtual functions and polymorphism, inheritance.

Course Outcomes:
By the end of this lab the student is able to

- Apply the various OOPs concepts with the help of programs.

Exercise -1 (Classes Objects)

Create a Distance class with:

•feet and inches as data members

•member function to input distance

•member function to output distance

•member function to add two distance objects

1. Write a main function to create objects of DISTANCE class. Input two distances and output the sum.
2. Write a C++ Program to illustrate the use of Constructors and Destructors (use the above program.)
3. Write a program for illustrating function overloading in adding the distance between objects (use the above problem)

Exercise – 2 (Access)
Write a program for illustrating Access Specifiers public, private, protected

1. Write a program implementing Friend Function
2. Write a program to illustrate this pointer
3. Write a Program to illustrate pointer to a class



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Exercise -3 (Operator Overloading)

1. Write a program to Overload Unary, and Binary Operators as Member Function, and Non Member Function.
    1. Unary operator as member function
    2. Binary operator as non member function
2. Write a c ++ program to implement the overloading assignment = operator

Exercise -4 (Inheritance)

1. Write C++ Programs and incorporating various forms of Inheritance
    i) Single Inheritance
    ii) Hierarchical Inheritance
    iii) Multiple Inheritances
    iv) Multi-level inheritance
    v) Hybrid inheritance
2. Also illustrate the order of execution of constructors and destructors in inheritance

Exercise -5(Templates, Exception Handling)

1. a)Write a C++ Program to illustrate template class
2. b)Write a Program to illustrate member function templates
3. c) Write a Program for Exception Handling Divide by zero
4. d)Write a Program to rethrow an Exception

Exercise -6

1. Write a C++ program illustrating user defined string processing functions using pointers (string length, string copy, string concatenation)
2. Write a C++ program illustrating Virtual classes & virtual functions.
3. Write C++ program that implement Bubble sort, to sort a given list of integers in ascending order

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – I Semester		L	T	P	C
		0	0	3	1.5
OPERATING SYSTEM LAB					

Course Objectives:

- To understand the design aspects of operating system
- To study the process management concepts & Techniques
- To study the storage management concepts
- To familiarize students with the Linux environment
- To learn the fundamentals of shell scripting/programming

Course Outcomes:

- To use Unix utilities and perform basic shell control of the utilities
- To use the Unix file system and file access control
- To use of an operating system to develop software
- Students will be able to use Linux environment efficiently
- Solve problems using bash for shell scripting

1) a) Study of Unix/Linux general purpose utility command list: man,who,cat, cd, cp, ps, ls, mv, rm, mkdir, rmdir, echo, more, date, time, kill, history, chmod, chown, finger, pwd, cal, logout, shutdown.
   b) Study of vi editor
   c) Study of Bash shell, Bourne shell and C shell in Unix/Linux operating system
   d) Study of Unix/Linux file system (tree structure)
   e) Study of .bashrc, /etc/bashrc and Environment variables.
2) Write a C program that makes a copy of a file using standard I/O, and system calls
3) Write a C program to emulate the UNIX ls –l command.
4) Write a C program that illustrates how to execute two commands concurrently with a command pipe. Ex: - ls –l | sort
5) Simulate the following CPU scheduling algorithms: (a) Round Robin (b) SJF (c) FCFS (d) Priority
6) Multiprogramming-Memory management-Implementation of fork (), wait (), exec() and exit (), System calls
7) Simulate the following:
   a) Multiprogramming with a fixed number of tasks (MFT)
   b) Multiprogramming with a variable number of tasks (MVT)
8) Simulate Bankers Algorithm for Dead Lock Avoidance
9) Simulate Bankers Algorithm for Dead Lock Prevention.



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

10) Simulate the following page replacement algorithms:
    a) FIFO b) LRU c) LFU
11) Simulate the following File allocation strategies
    (a) Sequenced (b) Indexed (c) Linked

12) Write a C program that illustrates two processes communicating using shared memory

13) Write a C program to simulate producer and consumer problem usingsemaphores

14) Write C program to create a thread using pthreads library and let it run its function.

15) Write a C program to illustrate concurrent execution of threads using pthreads library.

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II Year – I Semester		L	T	P	C
		0	0	3	1.5
SOFTWARE ENGINEERING LAB					

Course Objectives:
The objective of this lab is to acquire the generic software development skill through various stages of software life cycle and also to ensure the quality of software through software development with various protocol based environment

Course Outcomes:

- By the end of this lab the student is able to elicit, analyze and specify software requirements through a productive working relationship with various stakeholders of the project
- prepare SRS document, design document, test cases and software configuration management and risk management related document.
- develop function oriented and object oriented software design using tools like rational rose.
- use modern engineering tools necessary for software project management, estimations, time management and software reuse
- generate test cases for software testing

1) Perform the following, for the following experiments:

i. Do the Requirement Analysis and Prepare SRS
ii. Draw E-R diagrams, DFD, CFD and structured charts for the project.

1) Course Registration System

2) Students Marks Analyzing System

3) Online Ticket Reservation System

4) Stock Maintenance

5) Consider any application, using COCOMO model, estimate the effort.
6) Consider any application, Calculate effort using FP oriented estimation model.
7) Draw the UML Diagrams for the problem 1,2, 3, 4.

8) Design the test cases for e-Commerce application (Flipcart, Amazon)

9) Design the test cases for a Mobile Application (Consider any example from Appstore)

10) Design and Implement ATM system through UML Diagrams.

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II Year - I Semester	Skill Oriented Course- I	L	T	P	C
		0	0	4	2
APPLICATIONS OF PYTHON-NumPy					

Course Objectives:

The objective of this lab is to acquire programming skills in Python package NumPy and perform mathematical and statistical operations.

Course Outcomes:

By the end of this lab the student is able to

- Explain how data is collected, managed and stored for processing
- Understand the workings of various numerical techniques, different descriptive measures of Statistics, correlation and regression to solve the engineering problems
- Understand how to apply some linear algebra operations to n-dimensional arrays
- Use NumPy perform common data wrangling and computational tasks in Python.

Perform the following:

1) NumPy Installation using different scientific python distributions(Anaconda, Python(x,y), WinPython, Pyzo)
2) NumPy Basics (np.array, np.arrange, np.linespace, np.zeros, np.ones, np.random.random, np.empty)
3) Arrays (array.shape, len(array), array.ndim, array.dtype, array.astype(type), type(array))
4) Array Manipulation (np.append, np.insert, np.resize, np.delete, np.concatenate, np.vstack, np.hstack)
5) Mathematical Operations(np.add, np.substract, np.divide, np.multiply, np.sqrt, np.sin, np.cos, np.log, np.dot, np.roots) , Statistical Operations(np.mean, np.median, np.std, array.corrcoef( ))
6) NumPy data types
7) NumPy ndarray
8) NumPy String Operations
9) NumPy Financial functions
10) NumPy Functional Programming

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II Year - I Semester	Skill Oriented Course- I	L	T	P	C
		0	0	4	2

WEB APPLICATION DEVELOPMENT USING FULL STACK
Frontend Development – Module -I

Course Objectives:
The objective of this lab is to provide understanding about the core concepts of frontend programming for web application

Course Outcomes:
By the end of this lab the student is able to

- Analyze a web page and identify its elements and attributes.
- Demonstrate the important HTML tags for designing static pages and separate design from content using Cascading Style sheet
- Implement MVC and responsive design to scale well across PC, tablet and Mobile Phone
- Create web pages using HTML and Cascading Style Sheets.

Perform experiments related to the following concepts:

A) HTML

1) Introduction to HTML
2) Browsers and HTML
3) Editor's Offline and Online
4) Tags, Attribute and Elements
5) Doctype Element
6) Comments
7) Headings, Paragraphs, and Formatting Text
8) Lists and Links
9) Images and Tables

B) CSS

1) Introduction CSS
2) Applying CSS to HTML
3) Selectors, Properties and Values
4) CSS Colors and Backgrounds
5) CSS Box Model
6) CSS Margins, Padding, and Borders
7) CSS Text and Font Properties
8) CSS General Topics

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year - I Semester		L	T	P	C
		2	0	0	0
CONSTITUTION OF INDIA					

Course Objectives:

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
- To understand the central and state relation financial and administrative

Course Outcomes:

At the end of the course, the student will be able to have a clear knowledge on the following:

- Understand historical background of the constitution making and its importance for building a democratic India.
- Understand the functioning of three wings of the government ie., executive, legislative and judiciary.
- Understand the value of the fundamental rights and duties for becoming good citizen of India.
- Analyze the decentralization of power between central, state and local self-government.
- Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.
    1. Know the sources, features and principles of Indian Constitution.
    2. Learn about Union Government, State government and its administration.
    3. Get acquainted with Local administration and Pachayati Raj.
    4. Be aware of basic concepts and developments of Human Rights.
    5. Gain knowledge on roles and functioning of Election Commission

UNIT I

Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

Learning outcomes:After completion of this unit student will

- Understand the concept of Indian constitution
- Apply the knowledge on directive principle of state policy
- Analyze the History, features of Indian constitution
- Evaluate Preamble Fundamental Rights and Duties

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UNIT II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre-State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, LokSabha, RajyaSabha, The Supreme Court and High Court: Powers and Functions;

Learning outcomes: After completion of this unit student will

- Understand the structure of Indian government
- Differentiate between the state and central government
- Explain the role of President and Prime Minister
- Know the Structure of supreme court and High court

UNIT III

State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

Learning outcomes: After completion of this unit student will

- Understand the structure of state government
- Analyze the role Governor and Chief Minister
- Explain the role of state Secretariat
- Differentiate between structure and functions of state secretariat

UNIT IV

A.Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation PachayatiRaj: Functions PRI: ZilaPanchayat, Elected officials and their roles, CEO ZilaPanchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy

Learning outcomes:-After completion of this unit student will

- Understand the local Administration
- Compare and contrast district administration role and importance
- Analyze the role of Myer and elected representatives of Municipalities
- Evaluate Zillapanchayat block level organisation

UNIT V

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women

Learning outcomes: After completion of this unit student will

- Know the role of Election Commission apply knowledge
- Contrast and compare the role of Chief Election commissioner and Commissiononerate
- Analyze role of state election commission
- Evaluate various commissions of viz SC/ST/OBC and women

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References:

1) Durga Das Basu, Introduction to the Constitution of India, Prentice Hall of India Pvt. Ltd.
2) SubashKashyap, Indian Constitution, National Book Trust
3) J.A. Siwach, Dynamics of Indian Government & Politics
4) D.C. Gupta, Indian Government and Politics
5) H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6) J.C. Johari, Indian Government andPolitics Hans
7) J. Raj IndianGovernment and Politics
8) M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi
9) Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

e-Resources:

1) nptel.ac.in/courses/109104074/8
2) nptel.ac.in/courses/109104045/
3) nptel.ac.in/courses/101104065/
4) www.hss.iitb.ac.in/en/lecture-details
5) www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

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II Year – II Semester		L	T	P	C
		3	0	0	3
PROBABILITY AND STATISTICS					

Course Objectives:

- To familiarize the students with the foundations of probability and statistical methods
- To impart probability concepts and statistical methods in various applications Engineering

Course Outcomes:

Upon successful completion of this course, the student should be able to

- Classify the concepts of data science and its importance (L4) or (L2)
- Interpret the association of characteristics and through correlation and regression tools (L4)
- Make use of the concepts of probability and their applications (L3)
- Apply discrete and continuous probability distributions (L3)
- Design the components of a classical hypothesis test (L6)
- Infer the statistical inferential methods based on small and large sampling tests (L4)

UNIT I

Descriptive statistics and methods for data science: Data science – Statistics Introduction – Population vs Sample – Collection of data – primary and secondary data – Type of variable: dependent and independent Categorical and Continuous variables – Data visualization – Measures of Central tendency – Measures of Variability (spread or variance) – Skewness Kurtosis.

UNIT II

Correlation and Curve fitting: Correlation – correlation coefficient – rank correlation – regression coefficients and properties – regression lines – Method of least squares – Straight line – parabola – Exponential – Power curves.

UNIT III

Probability and Distributions: Probability – Conditional probability and Baye's theorem – Random variables – Discrete and Continuous random variables – Distribution function – Mathematical Expectation and Variance – Binomial, Poisson, Uniform and Normal distributions.

UNIT IV

Sampling Theory:Introduction – Population and samples – Sampling distribution of Means and Variance (definition only) – Central limit theorem (without proof) – Introduction to t, χ^2 and F-distributions – Point and Interval estimations – Maximum error of estimate.



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UNIT V

Tests of Hypothesis: Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors – Level of significance – One tail and two-tail tests – Tests concerning one mean and two means (Large and Small samples) – Tests on proportions.

Text Books:

1) Miller and Freund's, Probability and Statistics for Engineers,7/e, Pearson, 2008.
2) S. C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.

Reference Books:

1) Shron L. Myers, Keying Ye, Ronald E Walpole, Probability and Statistics Engineers and the Scientists,8th Edition, Pearson 2007.
2) Jay l. Devore, Probability and Statistics for Engineering and the Sciences, 8th Edition, Cengage.
3) Sheldon M. Ross, Introduction to probability and statistics Engineers and the Scientists, 4th Edition, Academic Foundation, 2011.
4) Johannes Ledolter and Robert V. Hogg, Applied statistics for Engineers and Physical Scientists, 3rd Edition, Pearson, 2010.

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – II Semester		L	T	P	C
		3	0	0	3
DATABASE MANAGEMENT SYSTEMS					

Course Objectives:

- To introduce about database management systems
- To give a good formal foundation on the relational model of data and usage of Relational Algebra
- To introduce the concepts of basic SQL as a universal Database language
- To demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization
- To provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques

Course Outcomes:

By the end of the course, the student will be able to

- Describe a relational database and object-oriented database
- Create, maintain and manipulate a relational database using SQL
- Describe ER model and normalization for database design
- Examine issues in data storage and query processing and can formulate appropriate solutions
- Outline the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage

UNIT I

Introduction: Database system, Characteristics (Database Vs File System), Database Users(Actors on Scene, Workers behind the scene), Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.

UNIT II

Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance BASIC SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update), basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions(Date and Time, Numeric, String conversion).

UNIT III

Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams. SQL: Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non-updatable), relational set operations.



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UNIT IV

Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency(1NF, 2NF and 3 NF), concept of surrogate key, Boyce-codd normal form(BCNF), Lossless join and dependency preserving decomposition, Fourth normal form(4NF), Fifth Normal Form (5NF).

UNIT V

Transaction Concept: Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm.
Indexing Techniques: B+ Trees: Search, Insert, Delete algorithms, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes , Index data Structures, Hash Based Indexing: Tree base Indexing ,Comparison of File Organizations, Indexes and Performance Tuning

Text Books:

1) Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke, TMH
2) Database System Concepts,5/e, Silberschatz, Korth, TMH

Reference Books:

1) Introduction to Database Systems, 8/e C J Date, PEA.
2) Database Management System, 6/e Ramez Elmasri, Shamkant B. Navathe, PEA
3) Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

e-Resources:

1) https://nptel.ac.in/courses/106/105/106105175/
2) https://www.geeksforgeeks.org/introduction-to-nosql/

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II Year – II Semester		L	T	P	C
		3	0	0	3
FORMAL LANGUAGES AND AUTOMATA THEORY					

Course Objectives:

- To learn fundamentals of Regular and Context Free Grammars and Languages
- To understand the relation between Regular Language and Finite Automata and machines
- To learn how to design Automata's and machines as Acceptors, Verifiers and Translators
- To understand the relation between Contexts free Languages, PDA and TM
- To learn how to design PDA as acceptor and TM as Calculators

Course Outcomes:

By the end of the course students can

- Classify machines by their power to recognize languages.
- Summarize language classes & grammars relationship among them with the help of Chomsky hierarchy
- Employ finite state machines to solve problems in computing
- Illustrate deterministic and non-deterministic machines
- Quote the hierarchy of problems arising in the computer science

UNIT I

Finite Automata: Need of Automata theory, Central Concepts of Automata Theory, Automation, Finite Automation, Transition Systems, Acceptance of a String, DFA, Design of DFAs, NFA, Design of NFA, Equivalence of DFA and NFA, Conversion of NFA into DFA, Finite Automata with Є-Transitions, Minimization of Finite Automata, Finite Automata with output-Mealy and Moore Machines, Applications and Limitation of Finite Automata.

UNIT II

Regular Expressions, Regular Sets, Identity Rules, Equivalence of two RE, Manipulations of REs, Finite Automata and Regular Expressions, Inter Conversion, Equivalence between FA and RE, Pumping Lemma of Regular Sets, Closure Properties of Regular Sets, Grammars, Classification of Grammars, Chomsky Hierarchy Theorem, Right and Left Linear Regular Grammars, Equivalence between RG and FA, Inter Conversion.

UNIT III

Formal Languages, Context Free Grammar, Leftmost and Rightmost Derivations, Parse Trees, Ambiguous Grammars, Simplification of Context Free Grammars-Elimination of Useless Symbols, Є-Productions and Unit Productions, Normal Forms-Chomsky Normal Form and Greibach Normal Form, Pumping Lemma, Closure Properties, Applications of Context Free Grammars.

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UNIT IV

Pushdown Automata, Definition, Model, Graphical Notation, Instantaneous Description, Language Acceptance of Pushdown Automata, Design of Pushdown Automata, Deterministic and Non – Deterministic Pushdown Automata, Equivalence of Pushdown Automata and Context Free Grammars, Conversion, Two Stack Pushdown Automata, Application of Pushdown Automata.

UNIT V

Turning Machine: Definition, Model, Representation of TMs-Instantaneous Descriptions, Transition Tables and Transition Diagrams, Language of a TM, Design of TMs, Types of TMs, Church's Thesis, Universal and Restricted TM, Decidable and Un-decidable Problems, Halting Problem of TMs, Post's Correspondence Problem, Modified PCP, Classes of P and NP, NP-Hard and NP-Complete Problems.

Text Books:

1) Introduction to Automata Theory, Languages and Computation, J. E. Hopcroft, R. Motwani and J. D. Ullman, 3rd Edition, Pearson, 2008
2) Theory of Computer Science-Automata, Languages and Computation, K. L. P. Mishra and N. Chandrasekharan, 3rd Edition, PHI, 2007

Reference Books:

1) Elements of Theory of Computation, Lewis H.P. & Papadimition C.H., Pearson /PHI
2) Theory of Computation, V. Kulkarni, Oxford University Press, 2013
3) Theory of Automata, Languages and Computation, Rajendra Kumar, McGraw Hill, 2014

e-Resources:

1) https://nptel.ac.in/courses/106/104/106104028/

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – II Semester		L	T	P	C
		3	0	0	3
JAVA PROGRAMMING					

Course Objectives:
The learning objectives of this course are:

- To identify Java language components and how they work together in applications
- To learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
- To learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications
- To understand how to design applications with threads in Java
- To understand how to use Java APIs for program development

Course Outcomes:

By the end of the course, the student will be

- Able to realize the concept of Object Oriented Programming & Java Programming Constructs
- Able to describe the basic concepts of Java such as operators, classes, objects, inheritance, packages, Enumeration and various keywords
- Apply the concept of exception handling and Input/ Output operations
- Able to design the applications of Java & Java applet
- Able to Analyze & Design the concept of Event Handling and Abstract Window Toolkit

UNIT I
Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.

Data Types, Variables, and Operators: Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final, Introduction to Operators, Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.



Control Statements: Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator?:, Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.

UNIT II

Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this.

Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.

UNIT III

Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.

Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.

Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.

UNIT IV

Packages and Java Library: Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java.lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto-unboxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java.time.Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.

Exception Handling: Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions, try-with-resources, Catching Subclass Exception, Custom Exceptions, Nested try and catch Blocks, Rethrowing Exception, Throws Clause.

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UNIT V

String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Methods for Comparison of Strings, Methods for Modifying Strings, Methods for Searching Strings, Data Conversion and Miscellaneous Methods, Class String Buffer, Class String Builder.

Multithreaded Programming: Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread- Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter-thread Communication - Suspending, Resuming, and Stopping of Threads.

Java Database Connectivity: Introduction, JDBC Architecture, Installing MySQL and MySQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, ResultSet Interface, Creating JDBC Application, JDBC Batch Processing, JDBC Transaction Management

Text Books:

1) JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
2) The complete Reference Java, 8th edition, Herbert Schildt, TMH.

References Books:

1) Introduction to java programming, 7th edition by Y Daniel Liang, Pearson
2) Murach's Java Programming, Joel Murach

e-Resources:

1) https://nptel.ac.in/courses/106/105/106105191/
2) https://www.w3schools.com/java/java_data_types.asp

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – II Semester		L	T	P	C
		3	0	0	3
MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTANCY					

Course Objectives:

- The Learning objectives of this paper are to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting
- To familiarize about the Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles
- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation
- Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals

Course Outcomes:

- The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product
- The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs
- The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units
- The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis
- The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making

UNIT I

Introduction to Managerial Economics and demand Analysis: Definition of Managerial Economics – Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.

UNIT II

Theories of Production and Cost Analyses: Theories of Production function- Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs-Fixed costs, Variable Costs and Total costs –Cost –Volume-Profit analysis-Determination of Breakeven point(problems)-Managerial significance and limitations of Breakeven point.

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UNIT III

Introduction to Markets, Theories of the Firm & Pricing Policies: Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson's models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing, Business Cycles : Meaning and Features – Phases of a Business Cycle. Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and their forms.

UNIT IV

Introduction to Accounting & Financing Analysis: Introduction to Double Entry System, Journal, Ledger, Trail Balance and Preparation of Final Accounts with adjustments – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow and cash flow analysis (Problems)

UNIT V

Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods (pay back period, accounting rate of return) and modern methods(Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)

Text Books:

1) A R Aryasri, Managerial Economics and Financial Analysis, The McGraw – Hill companies.

Reference Books:

1) Varshney R.L, K.L Maheswari, Managerial Economics, S. Chand & Company Ltd.
2) JL Pappas and EF Brigham, Managerial Economics, Holt, R & W; New edition edition
3) N.P Srinivasn and M. SakthivelMurugan, Accounting for Management, S. Chand & Company Ltd.
4) MaheswariS.N,AnIntroduction to Accountancy, Vikas Publishing House Pvt Ltd
5) I.M Pandey, Financial Management , Vikas Publishing House Pvt Ltd
6) V. Maheswari, Managerial Economics, S. Chand & Company Ltd.

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – II Semester		L	T	P	C
		0	0	2	1
DATABASE MANAGEMENT SYSTEMS LAB					

Course Objectives:
This Course will enable students to

- Populate and query a database using SQL DDL/DML Commands
- Declare and enforce integrity constraints on a database
- Writing Queries using advanced concepts of SQL
- Programming PL/SQL including procedures, functions, cursors and triggers

Course Outcomes:
At the end of the course the student will be able to:

- Utilize SQL to execute queries for creating database and performing data manipulation operations
- Examine integrity constraints to build efficient databases
- Apply Queries using Advanced Concepts of SQL
- Build PL/SQL programs including stored procedures, functions, cursors and triggers

List of Exercises:

1. Creation, altering and droping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
2. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example:- Select the roll number and name of the student who secured fourth rank in the class.
3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
4. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date)
5. i. Create a simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found)
   ii. Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
6. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.
7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE-APPLICATION ERROR.

8. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.
9. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.
10. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
11. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers
12. Create a table and perform the search operation on table using indexing and non-indexing techniques.

Text Books/Suggested Reading:

1) Oracle: The Complete Reference by Oracle Press
2) Nilesh Shah, "Database Systems Using Oracle", PHI, 2007
3) Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007

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II Year – II Semester		L	T	P	C
		0	1	2	2
R PROGRAMMING LAB					

COURSE OBJECTIVES:

- To learn statistical programming, computation, graphics, and modeling,
- To learn Writing functions and use R in an efficient way,
- To learn about basic types of statistical models

COURSE OUTCOMES:

At the end of this course, students will be able to:

- Access online resources for R and import new function packages into the R workspace
- Import, review, manipulate and summarize data-sets in R
- Explore data-sets to create testable hypotheses and identify appropriate statistical tests
- Perform appropriate statistical tests using R
- Create and edit visualizations with R

1) Write a R program to take input from the user (name and age) and display the values. Also print the version of R installation.
2) Write a R program to get the details of the objects in memory.
3) Write a R program to create a sequence of numbers from 20 to 50 and find the mean of numbers from 20 to 60 and sum of numbers from 51 to 91.
4) Write a R program to create a simple bar plot of five subjects marks.
5) Write a R program to get the unique elements of a given string and unique numbers of vector.
6) Write a R program to create three vectors a,b,c with 3 integers. Combine the three vectors to become a 3×3 matrix where each column represents a vector. Print the content of the matrix.
7) Write a R program to create a 5 x 4 matrix , 3 x 3 matrix with labels and fill the matrix by rows and 2 × 2 matrix with labels and fill the matrix by columns.
8) Write a R program to combine three arrays so that the first row of the first array is followed by the first row of the second array and then first row of the third array.
9) Write a R program to create a two-dimensional 5x3 array of sequence of even integers greater than 50.
10) Write a R program to create an array using four given columns, three given rows, and two given tables and display the content of the array.
11) Write a R program to create an empty data frame.
12) Write a R program to create a data frame from four given vectors.
13) Write a R program to create a data frame using two given vectors and display the duplicated elements and unique rows of the said data frame.
14) Write a R program to save the information of a data frame in a file and display the information of the file.

15) Write a R program to create a matrix from a list of given vectors.
16) Write a R program to concatenate two given matrices of same column but different rows.
17) Write a R program to find row and column index of maximum and minimum value in a given matrix.
18) Write a R program to append value to a given empty vector.
19) Write a R program to multiply two vectors of integers type and length 3.
20) Write a R program to find Sum, Mean and Product of a Vector, ignore element like NA or NaN.
21) Write a R program to list containing a vector, a matrix and a list and give names to the elements in the list.
22) Write a R program to create a list containing a vector, a matrix and a list and give names to the elements in the list. Access the first and second element of the list.
23) Write a R program to create a list containing a vector, a matrix and a list and remove the second element.
24) Write a R program to select second element of a given nested list.
25) Write a R program to merge two given lists into one list.
26) Write a R program to create a list named s containing sequence of 15 capital letters, starting from ‘E’.
27) Write a R program to assign new names "a", "b" and "c" to the elements of a given list.
28) Write a R program to find the levels of factor of a given vector.
29) Write a R program to create an ordered factor from data consisting of the names of months.
30) Write a R program to concatenate two given factor in a single factor.

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II Year – II Semester		L	T	P	C
		0	0	3	1.5
JAVA PROGRAMMING LAB					

Course Objectives:
The aim of this lab is to

- Practice programming in the Java
- Gain knowledge of object-oriented paradigm in the Java programming language
- Learn use of Java in a variety of technologies and on different platforms

Course Outcomes:
By the end of the course student will be able to write java program for

- Evaluate default value of all primitive data type, Operations, Expressions, Control-flow, Strings
- Determine Class, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
- Illustrating simple inheritance, multi-level inheritance, Exception handling mechanism
- Construct Threads, Event Handling, implement packages, developing applets

Exercise - 1 (Basics)

a) Write a JAVA program to display default value of all primitive data type of JAVA

b) Write a java program that display the roots of a quadratic equation $ax^2+bx=0$. Calculate the discriminate D and basing on value of D, describe the nature of root.

c) Five Bikers Compete in a race such that they drive at a constant speed which may or may not be the same as the other. To qualify the race, the speed of a racer must be more than the average speed of all 5 racers. Take as input the speed of each racer and print back the speed of qualifying racers.

Exercise - 2 (Operations, Expressions, Control-flow, Strings)

a) Write a JAVA program to search for an element in a given list of elements using binary search mechanism.

b) Write a JAVA program to sort for an element in a given list of elements using bubble sort

c) Write a JAVA program to sort for an element in a given list of elements using merge sort.

d) Write a JAVA program using StringBuffer to delete, remove character.



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Exercise - 3 (Class, Objects)

a) Write a JAVA program to implement class mechanism. Create a class, methods and invoke them inside main method.

b) Write a JAVA program to implement constructor.

Exercise - 4 (Methods)

a) Write a JAVA program to implement constructor overloading.

b) Write a JAVA program implement method overloading.

Exercise - 5 (Inheritance)

a) Write a JAVA program to implement Single Inheritance

b) Write a JAVA program to implement multi level Inheritance

c) Write a java program for abstract class to find areas of different shapes

Exercise - 6 (Inheritance - Continued)

a) Write a JAVA program give example for "super" keyword.

b) Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?

Exercise - 7 (Exception)

a) Write a JAVA program that describes exception handling mechanism

b) Write a JAVA program Illustrating Multiple catch clauses

Exercise – 8 (Runtime Polymorphism)

a) Write a JAVA program that implements Runtime polymorphism

b) Write a Case study on run time polymorphism, inheritance that implements in above problem

Exercise – 9 (User defined Exception)

a) Write a JAVA program for creation of Illustrating throw
b) Write a JAVA program for creation of Illustrating finally
c) Write a JAVA program for creation of Java Built-in Exceptions
d) d)Write a JAVA program for creation of User Defined Exception

Exercise – 10 (Threads)

a) Write a JAVA program that creates threads by extending Thread class .First thread display "Good Morning "every 1 sec, the second thread displays "Hello "every 2 seconds and the third display "Welcome" every 3 seconds ,(Repeat the same by implementing Runnable)

b) Write a program illustrating **isAlive** and **join ()**

c) Write a Program illustrating Daemon Threads.

Exercise - 11 (Threads continuity)

a) Write a JAVA program Producer Consumer Problem

b) Write a case study on thread Synchronization after solving the above producer consumer problem

Exercise – 12 (Packages)

a) Write a JAVA program illustrate class path

b) Write a case study on including in class path in your os environment of your package.

c) Write a JAVA program that import and use the defined your package in the previous Problem

Exercise - 13 (Applet)

a) Write a JAVA program to paint like paint brush in applet.

b) Write a JAVA program to display analog clock using Applet.
c) Write a JAVA program to create different shapes and fill colors using Applet.

Exercise - 14 (Event Handling)

a) Write a JAVA program that display the x and y position of the cursor movement using Mouse.

b) Write a JAVA program that identifies key-up key-down event user entering text in a Applet.

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II Year - II Semester	Skill Oriented Course- II	L	T	P	C
		0	0	4	2
APPLICATIONS OF PYTHON-Pandas					

Course Objectives:
The objective of this lab is to understand the fundamentals of the Pandas library in Python and how it is used to handle data and also develop basic skills in data analysis and visualization

Course Outcomes:

By the end of this lab the student is able to

- Use Pandas to create and manipulate data structures like Series and DataFrames.
- Work with arrays, queries, and dataframes
- Query DataFrame structures for cleaning and processing and manipulating files
- Understand best practices for creating basic charts

Perform the following:

1) Pandas Installation

2) Creating DataFrames

Exercises:

A) Pandas DataSeries:

1) Write a Pandas program to create and display a one-dimensional array-like object containing an array of data using Pandas module.
2) Write a Pandas program to convert a Panda module Series to Python list and it's type.
3) Write a Pandas program to add, subtract, multiple and divide two Pandas Series.
4) Write a Pandas program to convert a NumPy array to a Pandas series.
   Sample Series:
   NumPy array:
   [10 20 30 40 50]
   Converted Pandas series:
   0 10
   1 20
   2 30
   3 40
   4 50
   dtype: int64

B) Pandas DataFrames:



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Consider Sample Python dictionary data and list labels:
exam_data = {'name': ['Anastasia', 'Dima', 'Katherine', 'James', 'Emily', 'Michael', 'Matthew', 'Laura', 'Kevin', 'Jonas'],
'score': [12.5, 9, 16.5, np.nan, 9, 20, 14.5, np.nan, 8, 19],
'attempts': [1, 3, 2, 3, 2, 3, 1, 1, 2, 1],
'qualify': ['yes', 'no', 'yes', 'no', 'no', 'yes', 'yes', 'no', 'no', 'yes']}
labels = ['a', 'b', 'c', 'd', 'e', 'f', 'g', 'h', 'i', 'j']

1) Write a Pandas program to create and display a DataFrame from a specified dictionary data which has the index labels.
2) Write a Pandas program to change the name 'James' to 'Suresh' in name column of the DataFrame.
3) Write a Pandas program to insert a new column in existing DataFrame.
4) Write a Pandas program to get list from DataFrame column headers.
5) Write a Pandas program to get list from DataFrame column headers.

C) Pandas Index:

1) Write a Pandas program to display the default index and set a column as an Index in a given dataframe.
2) Write a Pandas program to create an index labels by using 64-bit integers, using floating-point numbers in a given dataframe.

D) Pandas String and Regular Expressions:

1) Write a Pandas program to convert all the string values to upper, lower cases in a given pandas series. Also find the length of the string values.
2) Write a Pandas program to remove whitespaces, left sided whitespaces and right sided whitespaces of the string values of a given pandas series.
3) Write a Pandas program to count of occurrence of a specified substring in a DataFrame column.
4) Write a Pandas program to swap the cases of a specified character column in a given DataFrame.

E) Pandas Joining and merging DataFrame:

1) Write a Pandas program to join the two given dataframes along rows and assign all data.
2) Write a Pandas program to append a list of dictioneries or series to a existing DataFrame and display the combined data.
3) Write a Pandas program to join the two dataframes with matching records from both sides where available.

F) Pandas Time Series:

1) Write a Pandas program to create
   a) Datetime object for Jan 15 2012.

b) Specific date and time of 9:20 pm.

c) Local date and time.

d) A date without time.

e) Current date.

f) Time from a datetime.

g) Current local time.

2) Write a Pandas program to create a date from a given year, month, day and another date from a given string formats.
3) Write a Pandas program to create a time-series with two index labels and random values. Also print the type of the index.

G) Pandas Grouping Aggregate:

Consider dataset:

	school	class	name	date_Of_Birth	age	height	weight	address
S1	s001	V	Alberto Franco	15/05/2002	12	173	35	street1
S2	s002	V	Gino Mcneill	17/05/2002	12	192	32	street2
S3	s003	VI	Ryan Parkes	16/02/1999	13	186	33	street3
S4	s001	VI	Eesha Hinton	25/09/1998	13	167	30	street1
S5	s002	V	Gino Mcneill	11/05/2002	14	151	31	street2
S6	s004	VI	David Parkes	15/09/1997	12	159	32	street4

1) Write a Pandas program to split the following dataframe into groups based on school code. Also check the type of GroupBy object.
2) Write a Pandas program to split the following dataframe by school code and get mean, min, and max value of age for each school.

H) Pandas Styling:

1) Create a dataframe of ten rows, four columns with random values. Write a Pandas program to highlight the negative numbers red and positive numbers black.
2) Create a dataframe of ten rows, four columns with random values. Write a Pandas program to highlight the maximum value in each column.
3) Create a dataframe of ten rows, four columns with random values. Write a Pandas program to highlight dataframe's specific columns.

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I) Excel:

1) Write a Pandas program to import excel data into a Pandas dataframe.
2) Write a Pandas program to find the sum, mean, max, min value of a column of file.

J) Plotting:

1) Write a Pandas program to create a horizontal stacked bar plot of opening, closing stock prices of any stock dataset between two specific dates.
2) Write a Pandas program to create a histograms plot of opening, closing, high, low stock prices of stock dataset between two specific dates.
3) Write a Pandas program to create a stacked histograms plot of opening, closing, high, low stock prices of stock dataset between two specific dates with more bins.

K) Pandas SQL Query:

1) Write a Pandas program to display all the records of a student file.
2) Write a Pandas program to select distinct department id from employees file.

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II Year - II Semester	Skill Oriented Course- II	L	T	P	C
		0	0	4	2

WEB APPLICATION DEVELOPMENT USING FULL STACK
Frontend Development – Module -II

Course Objectives:

The objective of this lab is to build strong foundation of JavaScript which will help developer to apply JavaScript concepts for responsive web frontend development

Course Outcomes:

By the end of this lab the student is able to

- develop of the major Web application tier- Client side development
- participate in the active development of cross-browser applications through JavaScript
- Develop JavaScript applications that transition between states

Perform experiments related to the following concepts:

1) Introduction to JavaScript
2) Applying JavaScript (internal and external)
3) Understanding JS Syntax
4) Introduction to Document and Window Object
5) Variables and Operators
6) Data Types and Num Type Conversion
7) Math and String Manipulation
8) Objects and Arrays
9) Date and Time
10) Conditional Statements
11) Switch Case
12) Looping in JS
13) Functions

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III Year – I Semester		L	T	P	C
		3	0	0	3
COMPUTER NETWORKS					

Course Objectives:
- To provide insight about networks, topologies, and the key concepts.
- To gain comprehensive knowledge about the layered communication architectures (OSI and TCP/IP) and its functionalities.
- To understand the principles, key protocols, design issues, and significance of each layers in ISO and TCP/IP.
- To know the basic concepts of network services and various network applications.

Course Outcomes:
By the end of the course, the student will be able to
- Demonstrate different network models for networking links OSI, TCP/IP, B-ISDN, N-BISDN and get knowledge about various communication techniques, methods and protocol standards.
- Discuss different transmission media and different switching networks.
- Analyze data link layer services, functions and protocols like HDLC and PPP.
- Compare and Classify medium access control protocols like ALOHA, CSMA, CSMA/CD, CSMA/CA, Polling, Token passing, FDMA, TDMA, CDMA protocols
- Determine application layer services and client server protocols working with the client server paradigms like WWW, HTTP, FTP, e-mail and SNMP etc.

UNIT I:
Introduction: Network Types, LAN, MAN, WAN, Network Topologies Reference models- The OSI Reference Model- the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models, OSI Vs TCP/IP, Lack of OSI models success, Internet History.
Physical Layer –Introduction to Guided Media- Twisted-pair cable, Coaxial cable and Fiber optic cable and unguided media: Wireless-Radio waves, microwaves, infrared.

UNIT II:
Data link layer: Design issues, **Framing**: fixed size framing, variable size framing, flow control, error control, error detection and correction codes, CRC, Checksum: idea, one's complement internet checksum, services provided to Network Layer, **Elementary Data Link Layer protocols**: simplex protocol, Simplex stop and wait, Simplex protocol for Noisy Channel.
Sliding window protocol: One bit, Go back N, Selective repeat-Stop and wait protocol, Data link layer in HDLC: configuration and transfer modes, frames, control field, point to point protocol (PPP): framing transition phase, multiplexing, multi link PPP.

UNIT – III:
Media Access Control: Random Access: ALOHA, Carrier sense multiple access (CSMA), CSMA with Collision Detection, CSMA with Collision Avoidance, **Controlled Access:** Reservation, Polling, Token Passing, **Channelization:** frequency division multiple Access(FDMA), time division multiple access(TDMA), code division multiple access(CDMA).
Wired LANs: Ethernet, Ethernet Protocol, Standard Ethernet, Fast Ethernet(100 Mbps), Gigabit Ethernet, 10 Gigabit Ethernet.

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UNIT – IV:

The Network Layer Design Issues – Store and Forward Packet Switching-Services Provided to the Transport layer- Implementation of Connectionless Service-Implementation of Connection Oriented Service- Comparison of Virtual Circuit and Datagram Networks, Routing Algorithms-The Optimality principle-Shortest path, Flooding, Distance vector, Link state, Hierarchical, Congestion Control algorithms-General principles of congestion control, Congestion prevention polices, Approaches to Congestion Control-Traffic Aware Routing- Admission Control-Traffic Throttling-Load Shedding. Traffic Control Algorithm-Leaky bucket & Token bucket.

Internet Working: How networks differ- How networks can be connected- Tunnelling, internetwork routing-, Fragmentation, network layer in the internet – IP protocols-IP Version 4 protocol-IPV4 Header Format, IP addresses, Class full Addressing, CIDR, NAT-, Subnets-IP Version 6-The main IPV6 header, Transition from IPV4 to IPV6, Comparison of IPV4 & IPV6- Internet control protocols- ICMP-ARP-DHCP

UNIT –V:

The Transport Layer: Transport layer protocols: Introduction-services- port number-User data gram protocol-User datagram-UDP services-UDP applications-Transmission control protocol: TCP services-TCP features- Segment- A TCP connection- windows in TCP- flow control-Error control, Congestion control in TCP.

Application Layer –- World Wide Web: HTTP, Electronic mail-Architecture- web based mail- email security- TELENET-local versus remote Logging-Domain Name System: Name Space, DNS in Internet ,-Resolution-Caching- Resource Records- DNS messages- Registrars-security of DNS Name Servers, SNMP.

Text Books:

1. Computer Networks — Andrew S Tanenbaum, Fifth Edition. Pearson Education/PHI
2. Data Communications and Networks – Behrouz A. Forouzan, Fifth Edition TMH.

References Books:

1. Data Communications and Networks- Achut S Godbole, Atul Kahate
2. Computer Networks, Mayank Dave, CENGAGE

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I Semester		L	T	P	C
		3	0	0	3
DESIGN AND ANALYSIS OF ALGORITHMS					

Course Objectives:

Upon completion of this course, students will be able to do the following:

- Ability to understand, analyze and denote time complexities of algorithms
- To introduce the different algorithmic approaches for problem solving through numerous example problems
- Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms, and analyze them.
- To provide some theoretical grounding in terms of finding the lower bounds of algorithms and the NP-completeness

Course Outcomes: After the completion of the course, student will be able to

- Analyze the performance of a given algorithm, denote its time complexity using the asymptotic notation for recursive and non-recursive algorithms
- List and describe various algorithmic approaches and Solve problems using divide and conquer &greedy Method
- Synthesize efficient algorithms dynamic programming approaches to solve in common engineering design situations.
- Organize important algorithmic design paradigms and methods of analysis: backtracking, branch and bound algorithmic approaches
- Demonstrate NP- Completeness theory ,lower bound theory and String Matching

UNIT I:

Introduction: Algorithm Definition, Algorithm Specification, performance Analysis, Performance measurement, asymptotic notation, Randomized Algorithms.

UNIT II:

Divide and Conquer: General Method, Defective chessboard, Binary Search, finding the maximum and minimum, Merge sort, Quick sort.

The Greedy Method: The general Method, knapsack problem, minimum-cost spanning Trees, Optimal Merge Patterns, Single Source Shortest Paths.

UNIT III:

Dynamic Programming: The general method, multistage graphs, All pairs-shortest paths, optimal Binary search trees, 0/1 knapsack, The traveling salesperson problem.

UNIT IV:

Backtracking: The General Method, The 8-Queens problem, sum of subsets, Graph coloring, Hamiltonian cycles, knapsack problem.

UNIT V:

NP-Hard and NP-Complete problems: Basic concepts, non-deterministic algorithms, NP - Hard and NP-Complete classes, Cook's theorem.

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Text Books:

1. Ellis Horowitz, SartajSahni, Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", 2nd Edition, Universities Press.
2. Introduction to Algorithms Thomas H. Cormen, PHI Learning
3. Harsh Bhasin, "Algorithms Design & Analysis", Oxford University Press.

Reference Books:

1. Horowitz E. Sahani S: "Fundamentals of Computer Algorithms", 2nd Edition, Galgotia Publications, 2008.
2. S. Sridhar, "Design and Analysis of Algorithms", Oxford University Press.

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I Semester		L	T	P	C
		3	0	0	3
DATA WAREHOUSING AND DATA MINING					

Course Objectives:
The main objective of the course is to

- Introduce basic concepts and techniques of data warehousing and data mining
- Examine the types of the data to be mined and apply pre-processing methods on raw data
- Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms.

Course Outcomes:
By the end of the course student will be able to

- Illustrate the importance of Data Warehousing, Data Mining and its functionalities and Design schema for real time data warehousing applications.
- Demonstrate on various Data Preprocessing Techniques viz. data cleaning, data integration, data transformation and data reduction and Process raw data to make it suitable for various data mining algorithms.
- Choose appropriate classification technique to perform classification, model building and evaluation.
- Make use of association rule mining techniques viz. Apriori and FP Growth algorithms and analyze on frequent itemsets generation.
- Identify and apply various clustering algorithm (with open source tools), interpret, evaluate and report the result.

UNIT I:
Data Warehousing and Online Analytical Processing: Data Warehouse: Basic concepts, Data Warehouse Modelling: Data Cube and OLAP, Data Warehouse Design and Usage, Data Warehouse Implementation, Introduction: Why and What is data mining, What kinds of data need to be mined and patterns can be mined, Which technologies are used, Which kinds of applications are targeted.

UNIT II:
Data Pre-processing: An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization.

UNIT III:
Classification: Basic Concepts, General Approach to solving a classification problem, Decision Tree Induction: Attribute Selection Measures, Tree Pruning, Scalability and Decision Tree Induction, Visual Mining for Decision Tree Induction.

UNIT IV:
Association Analysis: Problem Definition, Frequent Item set Generation, Rule Generation: Confident Based Pruning, Rule Generation in Apriori Algorithm, Compact Representation of frequent item sets, FP-Growth Algorithm.

UNIT V:
Cluster Analysis: Overview, Basics and Importance of Cluster Analysis, Clustering techniques, Different Types of Clusters; K-means: The Basic K-means Algorithm, K-means Additional Issues, Bi-secting K Means,

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Text Books:

1. Data Mining concepts and Techniques, 3/e, Jiawei Han, Michel Kamber, Elsevier,2011.
2. Introduction to Data Mining: Pang-Ning Tan & Michael Steinbach, Vipin Kumar, Pearson,2012.

Reference Books:

1. Data Mining Techniques and Applications: An Introduction, Hongbo Du, Cengage Learning.
2. Data Mining: VikramPudi and P. Radha Krishna, Oxford Publisher.
3. Data Mining and Analysis - Fundamental Concepts and Algorithms; Mohammed J. Zaki, Wagner Meira, Jr, Oxford
4. Data Warehousing Data Mining & OLAP, Alex Berson, Stephen Smith, TMH.
   http://onlinecourses.nptel.ac.in/noc18_cs14/preview
5. (NPTEL course by Prof.Pabitra Mitra)
   http://onlinecourses.nptel.ac.in/noc17_mg24/preview
6. (NPTEL course by Dr. Nandan Sudarshanam& Dr. Balaraman Ravindran)
   http://www.saedsayad.com/data_mining_map.htm

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I Semester		L	T	P	C
		3	0	0	3
OPTIMIZATION IN OPERATIONS RESEARCH (Job Oriented Course)					

Course Objectives:

- To define an objective function and constraint functions in terms of design variables, and then state the optimization problem.
- To state single variable and multi variable optimization problems, without and with constraints.
- To explain linear programming technique to an optimization problem, define slack and surplus variables, by using Simplex method.
- To state transportation and assignment problem as a linear programming problem to determine Simplex method.
- To study and explain nonlinear programming techniques, unconstrained or constrained, and define exterior and interior penalty functions for optimization problems.

Course Outcomes: At the end of the course, student will be able to

- State and formulate the optimization problem, without and with constraints, by using design variables from an engineering design problem.
- Apply classical optimization techniques to minimize or maximize a multi-variable objective function, without or with constraints, and arrive at an optimal solution.
- Apply and Solve transportation and assignment problem by using Linear programming Simplex method.
- Apply gradient and non-gradient methods to nonlinear optimization problems and use interior or exterior penalty functions for the constraints to derive the optimal solutions
- Formulate and apply Dynamic programming technique to inventory control, production planning, engineering design problems etc. to reach a final optimal solution from the current optimal solution.

UNIT I:

Introduction and Classical Optimization Techniques: Statement of an Optimization problem, design vector, design constraints, constraint surface, objective function, objective function surfaces, classification of Optimization problems.

Classical Optimization Techniques: Single variable Optimization, multi variable Optimization without constraints, necessary and sufficient conditions for minimum/maximum, multivariable Optimization with equality constraints. Solution by method of Lagrange multipliers, multivariable Optimization with inequality constraints, Kuhn – Tucker conditions

UNIT II: Linear Programming : Standard form of a linear programming problem, geometry of linear programming problems, definitions and theorems, solution of a system of linear simultaneous equations, pivotal reduction of a general system of equations, motivation to the simplex method, simplex algorithm, Duality in Linear Programming, Dual Simplex method.

UNIT III: Transportation Problem: Finding initial basic feasible solution by north – west corner rule, least cost method and Vogel's approximation method, testing for optimality of balanced transportation problems, Special cases in transportation problem.

UNIT IV: Nonlinear Programming: Unconstrained cases, One – dimensional minimization methods: Classification, Fibonacci method and Quadratic interpolation method, Univariate method, Powell's method and steepest descent method.

Constrained cases– Characteristics of a constrained problem, Classification, Basic approach of Penalty

Function method; Basic approaches of Interior and Exterior penalty function methods, Introduction to convex Programming Problem.

UNIT V: Dynamic Programming: Dynamic programming multistage decision processes, types, concept of sub optimization and the principle of optimality, computational procedure in dynamic programming, examples illustrating the calculus method of solution, examples illustrating the tabular method of solution.

Text Books:

1. "Engineering optimization: Theory and practice", S. S.Rao, New Age International (P) Limited, 3rd edition, 1998.
2. "Introductory Operations Research", H.S. Kasene & K.D. Kumar, Springer (India), Pvt. LTd.

Reference Books:

1. "Optimization Methods in Operations Research and systems Analysis", by K.V. Mital and C. Mohan, New Age International (P) Limited, Publishers, 3rd edition, 1996.
2. Operations Research, Dr. S.D.Sharma, Kedarnath, Ramnath & Co

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I Semester		L	T	P	C
		3	0	0	3
ARTIFICIAL INTELLIGENCE (Professional Elective –I)					

Course Objectives: The student will be able to
- Know the methodology of Problem solving
- Implement basic AI algorithms
- Design and carry out an empirical evolution of different algorithms on a problem formalization

Course Outcomes (COs): At the end of the course, student will be able to
- Understand the fundamental concepts in Artificial Intelligence
- Analyze the applications of search strategies and problem reductions
- Apply the mathematical logic concepts.
- Develop the Knowledge representations in Artificial Intelligence.
- Explain the Fuzzy logic systems.

UNIT I:
Introduction to artificial intelligence: Introduction ,history, intelligent systems, foundations of AI, applications, tic-tac-tie game playing, development of AI languages, current trends in AI.

UNIT II:
Problem solving: state-space search and control strategies: Introduction, general problem solving, characteristics of problem
Search Strategies: exhaustive searches, heuristic search techniques, iterative-deepening A*, constraint satisfaction

UNIT III:
Logic concepts: Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, predicate logic

UNIT IV:
Knowledge representation: Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR
Advanced knowledge representation techniques: Introduction, conceptual dependency theory, script structure.

UNIT V:
Expert system and applications: Introduction phases in building expert systems, expert system versus traditional systems, rule-based expert systems blackboard systems truth maintenance systems, application of expert systems, list of shells and tools.

Text Books:
1. Artificial Intelligence, Saroj Kaushik, CENGAGE Learning,
2. Artificial intelligence, A modern Approach , 2nd ed, Stuart Russel, Peter Norvig, PEA
3. Artificial Intelligence, Rich, Kevin Knight, Shiv Shankar B Nair, 3rd ed, TMH
4. Introduction to Artificial Intelligence, Patterson, PHI

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Reference Books:

1. Artificial intelligence, structures and Strategies for Complex problem solving, -George F Lugar, 5th ed, PEA
2. Introduction to Artificial Intelligence, Ertel, Wolf Gang, Springer
3. Artificial Intelligence, A new Synthesis, Nils J Nilsson, Elsevier

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III Year – I Semester		L	T	P	C
		3	0	0	3
SOFTWARE PROJECT MANAGEMENT (Professional Elective –I)					

Course Objectives:
At the end of the course, the student shall be able to:
- To describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project
- To compare and differentiate organization structures and project structures
- To implement a project to manage project schedule, expenses and resources with the application of suitable project management tools

Course outcomes:
Upon the completion of the course students will be able to:-
- Apply the process to be followed in the software development life-cycle models
- Apply the concepts of project management & planning
- Implement the project plans through managing people, communications and change
- Conduct activities necessary to successfully complete and close the Software projects
- Implement communication, modeling, and construction & deployment practices in software development

UNIT-I:
Conventional Software Management: The waterfall model, conventional software Management performance.
Evolution of Software Economics: Software Economics, pragmatic software cost estimation.
Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.
The old way and the new: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

UNIT-II:
Life cycle phases: Engineering and production stages, inception, Elaboration, construction, transition phases.
Artifacts of the process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

UNIT- III:
Model based software architectures: A Management perspective and technical perspective.
Work Flows of the process: Software process workflows, Iteration workflows.
Checkpoints of the process: Major mile stones, Minor Milestones, Periodic status assessments.
Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

UNIT- IV:
Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.
Process Automation: Automation Building blocks, The Project Environment.
Project Control and Process instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.

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UNIT-V:

Agile Methodology, ADAPTing to Scrum, Patterns for Adopting Scrum, Iterating towards Agility.

Fundamentals of DevOps: Architecture, Deployments, Orchestration, Need, Instance of applications, DevOps delivery pipeline, DevOps eco system. DevOps adoption in projects: Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes

Text Books:

1. Software Project Management, Walker Royce, PEA, 2005.
2. Succeeding with Agile: Software Development Using Scrum, Mike Cohn, Addison Wesley.
3. The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, Gene Kim , John Willis , Patrick Debois , Jez Humb,1st Edition, O'Reilly publications, 2016.

Reference Books:

1. Software Project Management, Bob Hughes,3/e, Mike Cotterell, TMH
2. Software Project Management, Joel Henry, PEA
3. Software Project Management in practice, Pankaj Jalote, PEA, 2005,
4. Effective Software Project Management, Robert K.Wysocki, Wiley,2006
5. Project Management in IT, Kathy Schwalbe, Cengage

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III Year – I Semester		L	T	P	C
		3	0	0	3
DISTRIBUTED SYSTEMS (Professional Elective –I)					

Course Objectives:

- To understand the foundations of distributed systems.
- To learn issues related to clock Synchronization and the need for global state in distributedsystems
- To learn distributed mutual exclusion and deadlock detection algorithms
- To understand the significance of agreement, fault tolerance and recovery protocols in Distributed Systems
- To learn the characteristics of peer-to-peer and distributed shared memory systems

Course Outcomes:

At the end of the course, the students will be able to:

- Elucidate the foundations and issues of distributed systems
- Illustrate the various synchronization issues and global state for distributed systems
- Illustrate the Mutual Exclusion and Deadlock detection algorithms in distributed systems
- Describe the agreement protocols and fault tolerance mechanisms in distributed systems
- Describe the features of peer-to-peer and distributed shared memory systems

UNIT I:

Distributed Systems: Definition, Relation to computer system components, Motivation, Relation to parallel systems, Message-passing systems versus shared memory systems, Primitives for distributed communication, Synchronous versus asynchronous executions, Design issues andchallenges.
A model of distributed computations: A distributed program, A model of distributed executions, Models of communication networks, Global state, Cuts, Past and future cones of an event, Models of process communications.
Logical Time: A framework for a system of logical clocks, Scalar time, Vector time, Physical clock synchronization: NTP.

UNIT II:

Message Ordering & Snapshots: Message ordering and group communication: Message ordering paradigms, Asynchronous execution with synchronous communication, Synchronous program order on an asynchronous system, Group communication, Causal order (CO), Total order. Global state and snapshot recording algorithms: Introduction, System model and definitions, Snapshot algorithms for FIFO channels.

UNIT III:

Distributed Mutex & Deadlock: Distributed mutual exclusion algorithms: Introduction, Preliminaries, Lamport‘s algorithm, Ricart-Agrawala algorithm, Maekawa‘s algorithm, Suzuki–Kasami‘s broadcast algorithm. Deadlock detection in distributed systems: Introduction, System model, Preliminaries, Models of deadlocks, Knapp‘s classification, Algorithms forthe single resource model, the AND model and the OR model.

UNIT IV:

Recovery & Consensus: Check pointing and rollback recovery: Introduction, Background and definitions, Issues in failure recovery, Checkpoint-based recovery, Log-based rollback recovery, Coordinated check pointing algorithm, Algorithm for asynchronous check pointing and recovery. Consensus and agreement algorithms: Problem definition, Overview of results, Agreement in a failure, free system, Agreement in synchronous systems with failures.

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UNIT V:

Peer-to-peer computing and overlay graphs: Introduction, Data indexing and overlays, Chord –Content addressable networks, Tapestry.
Distributed shared memory: Abstraction and advantages, Memory consistency models, Sharedmemory Mutual Exclusion.

Text Books:

1. Distributed Systems Concepts and Design, George Coulouris, Jean Dollimore and Tim Kindberg, Fifth Edition, Pearson Education, 2012.
2. Distributed computing: Principles, algorithms, and systems, Ajay Kshemkalyani and Mukesh Singhal, Cambridge University Press, 2011.

Reference Books:

1. Distributed Operating Systems: Concepts and Design, Pradeep K Sinha, Prentice Hall ofIndia, 2007.
2. Advanced concepts in operating systems. Mukesh Singhal and Niranjan G. Shivaratri,McGraw-Hill, 1994.
3. Distributed Systems: Principles and Paradigms, Tanenbaum A.S., Van Steen M.,Pearson Education, 2007.

e-Resources:

1) https://nptel.ac.in/courses/106/106/106106168/

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I Semester		L	T	P	C
		3	0	0	3
ADVANCED UNIX PROGRAMMING (Professional Elective –I)					

Course Objectives:
Understating the shell commands, shell programming, system calls of files and processes, signals, inter-process communication concepts and programming, TCP and UDP.

Course Outcomes: After finishing this course student will be able to:

- Gain good knowledge on Unix commands and awareness of shell programming
- Know about different system calls for files and directories
- Ability to know the working of processes and signals
- Application of client server program for IPC
- Knowledge about socket programming

UNIT-I:
Introduction, Architecture of unix, Responsibilities of shell, unix file system, vi editor. **Unix commands**: Some Basic Commands, file utilities, process utilities, text processing utilities, network utilities, disk utilities, backup utilities , Security by file permissions.

UNIT-II:
Shell Programming: shell variables, The Export command, The Profile File a Script Run During starting, The First Shell Script, The read command, Positional Parameters, The $? Variable , Knowing the exit Status- More about the Set Command, The Exit command, Branching Control Structures, Loop Control Structures, The Continue and Break Statement- The Expr Command, Performing Integer Arithmetic- Real Arithmetic in Shell Programs- The here Document(<<), The Sleep Command, Debugging Scripts, The Script command, The Eval command, The Exec Command, Sample programs. **Files** - Introduction, file descriptors, open, creat, read, write, close, lseek, dup2, file status information-stat family, file and record locking- fcntl function, file permissions - chmod, fchmod, file ownership-chown, lchown, links-soft and hard links-symlink, link, unlink.

UNIT-III:
Directories-Creating, removing and changing Directories-mkdir, rmdir, chdir, obtaining current working directory-getcwd, Directory contents, Scanning Directories-opendir, readdir, closedir, rewinddir functions. **Process Control**: process identifiers, fork function, vfork function, exit function, wait and waitpid functions, exec functions, user identification. **Signals**: signal handling using signal function, kill and raise, alarm, pause, abort and sleep functions.

UNIT-IV:
IPC: introduction, pipes, FIFO's, client –server examples for pipes and FIFO's **message queues:** message queue structure in kernel, system calls of message queue, client-server example for message queue. **Semaphores:** definition, system calls of semaphores, semaphores structure in kernel, file locking using semaphores

UNIT-V:
Shared memory-system calls of shared memory, semaphore structure in kernel, client server example. **Sockets:** Introduction, overview, elementary socket system calls, TCP Echo program, UDP Echo program

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Text Books:

1. Unix the ultimate guide, 3rd edition, Sumitabha Das, TMH.
2. Advanced programming in the Unix environment by W. Richard Stevens.
3. Unix network programming by W. Richard Stevens.

Reference Books:

1. Introduction to Unix and shell programming, Venkateshmurhty
2. Unix and shell programming by B.M. Harwani, OXFORD university press.

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III Year – I Semester		L	T	P	C
		0	0	3	1.5
DATA WAREHOUSING AND DATA MINING LAB					

Course Objectives: The main objective of the course is to

- Inculcate Conceptual, Logical, and Physical design of Data Warehouses OLAP applications and OLAP deployment
- Design a data warehouse or data mart to present information needed by management in a form that is usable
- Emphasize hands-on experience working with all real data sets.
- Test real data sets using popular data mining tools such as WEKA, Python Libraries
- Develop ability to design various algorithms based on data mining tools.

Course Outcomes: By the end of the course student will be able to

- Design a data mart or data warehouse for any organization
- Extract knowledge using data mining techniques and enlist various algorithms used in information analysis of Data Mining Techniques
- Demonstrate the working of algorithms for data mining tasks such as association rule mining, classification for realistic data
- Implement and Analyze on knowledge flow application on data sets and Apply the suitable visualization techniques to output analytical results

Software Requirements: WEKA Tool/Python/R-Tool/Rapid Tool/Oracle Data mining

List of Experiments:

1. Creation of a Data Warehouse.
   - Build Data Warehouse/Data Mart (using open source tools like Pentaho Data Integration Tool, Pentaho Business Analytics; or other data warehouse tools like Microsoft-SSIS, Informatica, Business Objects,etc.,)
   - Design multi-dimensional data models namely Star, Snowflake and Fact Constellation schemas for any one enterprise (ex. Banking, Insurance, Finance, Healthcare, manufacturing, Automobiles, sales etc).
   - Write ETL scripts and implement using data warehouse tools.
   - Perform Various OLAP operations such slice, dice, roll up, drill up and pivot

2. Explore machine learning tool "WEKA"
   - Explore WEKA Data Mining/Machine Learning Toolkit.
   - Downloading and/or installation of WEKA data mining toolkit.
   - Understand the features of WEKA toolkit such as Explorer, Knowledge Flow interface, Experimenter, command-line interface.
   - Navigate the options available in the WEKA (ex. Select attributes panel, Preprocess panel, Classify panel, Cluster panel, Associate panel and Visualize panel)
   - Study the arff file format Explore the available data sets in WEKA. Load a data set (ex. Weather dataset, Iris dataset, etc.)
   - Load each dataset and observe the following:
     1. List the attribute names and they types
     2. Number of records in each dataset
     3. Identify the class attribute (if any)
     4. Plot Histogram
     5. Determine the number of records for each class.
     6. Visualize the data in various dimensions

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3. Perform data preprocessing tasks and Demonstrate performing association rule mining on data sets
   - Explore various options available in Weka for preprocessing data and apply Unsupervised filters like Discretization, Resample filter, etc. on each dataset
   - Load weather. nominal, Iris, Glass datasets into Weka and run Apriori Algorithm with different support and confidence values.
   - Study the rules generated. Apply different discretization filters on numerical attributes and run the Apriori association rule algorithm. Study the rules generated.
   - Derive interesting insights and observe the effect of discretization in the rule generation process.

4. Demonstrate performing classification on data sets
   - Load each dataset into Weka and run 1d3, J48 classification algorithm. Study the classifier output. Compute entropy values, Kappa statistic.
   - Extract if-then rules from the decision tree generated by the classifier, Observe the confusion matrix.
   - Load each dataset into Weka and perform Naïve-bayes classification and k-Nearest Neighbour classification. Interpret the results obtained.
   - Plot RoC Curves
   - Compare classification results of ID3, J48, Naïve-Bayes and k-NN classifiers for each dataset, and deduce which classifier is performing best and poor for each dataset and justify.

5. Demonstrate performing clustering of data sets
   - Load each dataset into Weka and run simple k-means clustering algorithm with different values of k (number of desired clusters).
   - Study the clusters formed. Observe the sum of squared errors and centroids, and derive insights.
   - Explore other clustering techniques available in Weka.
   - Explore visualization features of Weka to visualize the clusters. Derive interesting insights and explain.

6. Demonstrate knowledge flow application on data sets
   - Develop a knowledge flow layout for finding strong association rules by using Apriori, FP Growth algorithms
   - Set up the knowledge flow to load an ARFF (batch mode) and perform a cross validation using J48 algorithm
   - Demonstrate plotting multiple ROC curves in the same plot window by using j48 and Random forest tree
7. Demonstrate ZeroR technique on Iris dataset (by using necessary preprocessing technique(s)) and share your observations
8. Write a java program to prepare a simulated data set with unique instances.
9. Write a Python program to generate frequent item sets / association rules using Apriori algorithm
10. Write a program to calculate chi-square value using Python. Report your observation.
11. Write a program of Naive Bayesian classification using Python programming language.
12. Implement a Java program to perform Apriori algorithm
13. Write a program to cluster your choice of data using simple k-means algorithm using JDK
14. Write a program of cluster analysis using simple k-means algorithm Python programming language.
15. Write a program to compute/display dissimilarity matrix (for your own dataset containing at least four instances with two attributes) using Python
16. Visualize the datasets using matplotlib in python.(Histogram, Box plot, Bar chart, Pie chart etc.,)

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III Year – I Semester		L	T	P	C
		0	0	3	1.5
COMPUTER NETWORKS LAB					

Course Objectives:
Learn basic concepts of computer networking and acquire practical notions of protocols with the emphasis on TCP/IP. A lab provides a practical approach to Ethernet/Internet networking: networks are assembled, and experiments are made to understand the layered architecture and how do some important protocols work

Course Outcomes:
By the end of the course student will be able to

- Know how reliable data communication is achieved through data link layer.
- Suggest appropriate routing algorithm for the network.
- Provide internet connection to the system and its installation.
- Work on various network management tools

List of Experiments:

1. Study of Network devices in detail and connect the computers in Local Area Network.
2. Write a Program to implement the data link layer farming methods such as
   i) Character stuffing ii) bit stuffing.
3. Write a Program to implement data link layer farming method checksum.
4. Write a program for Hamming Code generation for error detection and correction.
5. Write a Program to implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC CCIP.
6. Write a Program to implement Sliding window protocol for Goback N.
7. Write a Program to implement Sliding window protocol for Selective repeat.
8. Write a Program to implement Stop and Wait Protocol.
9. Write a program for congestion control using leaky bucket algorithm
10. Write a Program to implement Dijkstra‘s algorithm to compute the Shortest path through a graph.
11. Write a Program to implement Distance vector routing algorithm by obtaining routing table at each node (Take an example subnet graph with weights indicating delay between nodes).
12. Write a Program to implement Broadcast tree by taking subnet of hosts.
13. Wireshark
    i. Packet Capture Using Wire shark
    ii. Starting Wire shark
    iii. Viewing Captured Traffic
    iv. Analysis and Statistics & Filters.
14. How to run Nmap scan
15. Operating System Detection using Nmap
16. Do the following using NS2 Simulator
    i. NS2 Simulator-Introduction
    ii. Simulate to Find the Number of Packets Dropped
    iii. Simulate to Find the Number of Packets Dropped by TCP/UDP
    iv. Simulate to Find the Number of Packets Dropped due to Congestion
    v. Simulate to Compare Data Rate& Throughput.

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III Year – I Semester		L	T	P	C
		0	0	4	2
ANIMATION COURSE: ANIMATION DESIGN (Skill Oriented Course)					

Course Objectives:
The main objective of this course is to understand 2-D and 3-D animation using Adobe package

Course Outcomes:
At the end of the Course, Student will be able to:

- learn various tools of digital 2-D animation
- understand production pipeline to create 2-D animation.
- apply the tools to create 2D animation for films and videos
- understand different styles and treatment of content in 3D model creation
- apply tools to create effective 3D modelling texturing and lighting

List of Experiments:
1. Adobe Photoshop:
   a. Create your visiting card
   b. Create Title for any forthcoming film
2. Draw Cartoon Animation using reference
3. Creating Frame by Frame animation
4. Create a scene by using Mask layers animation
5. Adobe Illustrator:
   Packet Design(Toothpaste packet, Soap cover, any Food product)
6. Create any model of the male or female character
7. Create any Model of Cars or Bike
8. Create any Model of any animal.
9. Create any Model of any birds, fishes, and worms.
10. Create and Convert 2D objects into 3D objects
11. Create an animated 3D titling with sound
12. Create any Model some objects such as chairs, tables, fruits, utensils

List of Augmented Experiments: (Weeks 13 – Week 16)
(Any two of the following experiments can be performed)

1. Animate day and night scene of a street with the help of lighting
2. Create a human character using Character studio and animate the same
3. Create a natural outdoor or indoor scene.
4. Apply texture on various objects and characters

Reference Books:
1. Flash MX 2004, Thyagharajan Anbumani, TMH.
2. Brian Underdahl, The Complete Reference – Macromedia Flash Mx2004, 2nd edition – TMH.

Web Links:
1. https://onlinecourses.swayam2.ac.in/cec21_cs07/preview
2. https://onlinecourses.swayam2.ac.in/ugc19_cs09/preview
3. https://onlinecourses.swayam2.ac.in/ntr20_ed15/preview
4. https://youtube.com/playlist?list=PLfFk8y2fd3FjeE_CrFASNvDLBp3yF1Hwi

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III Year – I Semester		L	T	P	C
		0	0	4	2
CONTINUOUS INTEGRATION AND CONTINUOUS DELIVERY USING DevOps (Skill Oriented Course)					

Course Outcomes:
At the end of the Course, Student will be able to:

- Understand the why, what and how of DevOps adoption
- Attain literacy on Devops
- Align capabilities required in the team
- Create an automated CICD pipeline using a stack of tools

List of Exercises:

Note: There are online courses indicated in the reference links section. Learners need to go through the contents in order to perform the given exercises

Exercise 1:

Reference course name :Software engineering and Agile software development
Get an understanding of the stages in software development lifecycle, the process models, values and principles of agility and the need for agile software development. This will enable you to work in projects following an agile approach to software development.
Solve the questions given in the reference course name to gauge your understanding of the topic

Exercise 2:

Reference course name: Development & Testing with Agile: Extreme Programming
Get a working knowledge of using extreme automation through XP programming practices of test first development, refactoring and automating test case writing.
Solve the questions in the "Take test" module given in the reference course name to gauge your understanding of the topic

Exercise 3:

Module name : DevOps adoption in projects
It is important to comprehend the need to automate the software development lifecycle stages through DevOps. Gain an understanding of the capabilities required to implement DevOps, continuous integration and continuous delivery practices.
Solve the questions given in Quiz1, Quiz2, Quiz 3

Exercise 4:

Module name :Implementation of CICD with Java and open source stack
Configure the web application and Version control using Git using Git commands and version control operations.

Exercise 5:

Module Name: Implementation of CICD with Java and open source stack
Configure a static code analyzer which will perform static analysis of the web application code and identify the coding practices that are not appropriate. Configure the profiles and dashboard of the static code analysis tool.

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Exercise 6:

Module Name: Implementation of CICD with Java and open source stack
Write a build script to build the application using a build automation tool like Maven. Create a folder structure that will run the build script and invoke the various software development build stages. This script should invoke the static analysis tool and unit test cases and deploy the application to a web application server like Tomcat.

Exercise 7:

Module Name: Implementation of CICD with Java and open source stack
Configure the Jenkins tool with the required paths, path variables, users and pipeline views.

Exercise 8:

Module name: Implementation of CICD with Java and open source stack
Configure the Jenkins pipeline to call the build script jobs and configure to run it whenever there is a change made to an application in the version control system. Make a change to the background color of the landing page of the web application and check if the configured pipeline runs.

Exercise 9:

Module name: Implementation of CICD with Java and open source stack
Create a pipeline view of the Jenkins pipeline used in Exercise 8. Configure it with user defined messages.

Exercise 10 :

Module name: Implementation of CICD with Java and open source stack
In the configured Jenkins pipeline created in Exercise 8 and 9, implement quality gates for static analysis of code.

Exercise 11:

Module name :Implementation of CICD with Java and open source stack
In the configured Jenkins pipeline created in Exercise 8 and 9, implement quality gates for static unit testing.

Exercise 12:

Module name :Course end assessment
In the configured Jenkins pipeline created in Exercise 8 and 9, implement quality gates for code coverage.

Reference Books:

1. Learning Continuous Integration with Jenkins: A beginner's guide to implementing Continuous Integration and Continuous Delivery using Jenkins - Nikhil Pathania ,Packt publication [https://www.amazon.in/Learning-Continuous-Integration-Jenkins-Pathania/dp/1785284835]
2. Jenkins 2 – Up and Running: Evolve Your Deployment Pipeline for Next Generation Automation - Brent Laster, O'Reilly publication [https://www.amazon.in/Jenkins-2-Running-Brent-Laster/dp/1491979593]

Hardware and software configuration:

1. Git [GitHub or Gitlab]
2. Sonarqube
3. Jenkins
4. JUnit
5. Eclipse

6. Tomcat server
7. Maven
8. Cobertura or JaCoCo
9. Java SDK
10. All necessary drivers and jar files for connecting the software
11. Windows machine with 16GB RAM

Web Links: (Courses mapped to Infosys Springboard platform)

1. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_01338269041100390473 5_shared/overview [Software Engineering and Agile software development]

2. https://infyspringboard.onwingspan.com/en/viewer/html/lex_auth_013501578194976768 10467 [Development & Testing with Agile: Extreme Programming]
3. https://infyspringboard.onwingspan.com/en/viewer/html/lex_auth_013538989171924992 26_shared [DevOps CICD]

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I Semester		L	T	P	C
		2	0	0	0
EMPLOYABILITY SKILLS-I					

Course Objectives:
The main objective of this course is to assist students in developing employability skills and personal qualities related to gaining and sustaining employment.

Course Outcomes: The end of the course student will be able to
- Understand the corporate etiquette.
- Make presentations effectively with appropriate body language
- Be composed with positive attitude
- Understand the core competencies to succeed in professional and personal life

UNIT I:
Analytical Thinking & Listening Skills: Self-Introduction, Shaping Young Minds - A Talk by Azim Premji (Listening Activity), Self – Analysis, Developing Positive Attitude, Perception.
Communication Skills: Verbal Communication; Non Verbal Communication (Body Language)

UNIT II:
Self-Management Skills: Anger Management, Stress Management, Time Management, Six Thinking Hats, Team Building, Leadership Qualities
Etiquette: Social Etiquette, Business Etiquette, Telephone Etiquette, Dining Etiquette

UNIT III:
Standard Operation Methods: Note Making, Note Taking, Minutes Preparation, Email & Letter Writing
Verbal Ability: Synonyms, Antonyms, One Word Substitutes-Correction of Sentences-Analogies, Spotting Errors, Sentence Completion, Course of Action -Sentences Assumptions, Sentence Arguments, Reading Comprehension, Practice work

UNIT IV:
Job-Oriented Skills –I: Group Discussion, Mock Group Discussions

UNIT V:
Job-Oriented Skills –II: Resume Preparation, Interview Skills, Mock Interviews

Text Books and Reference Books:

1. Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011.
2. S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010.
3. R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand & Company Ltd., 2018.
4. Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.

e-resources:
1. www. Indiabix.com
2. www.freshersworld.com



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I Semester	Minor Course	L	T	P	C
		3	0	2	4
DATABASE MANAGEMENT SYSTEMS					

Course Objectives:
This Course will enable students to
- introduce about database management systems
- give a good formal foundation on the relational model of data and usage of Relational Algebra
- Populate and query a database using SQL DDL/DML Commands
- Declare and enforce integrity constraints on a database
- Writing Queries using advanced concepts of SQL
- Programming PL/SQL including procedures, functions, cursors and triggers
- introduce the concepts of basic SQL as a universal Database language
- demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization

Course Outcomes:
By the end of the course, the student will be able to
- Describe a relational database and object-oriented database
- Create, maintain and manipulate a relational database using SQL
- Describe ER model and normalization for database design
- Examine issues in data storage and query processing and can formulate appropriate solutions
- Outline the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage
- Examine integrity constraints to build efficient databases
- Apply Queries using Advanced Concepts of SQL
- Build PL/SQL programs including stored procedures, functions, cursors and triggers

UNIT I
Introduction: Database system, Characteristics (Database Vs File System), Database Users(Actors on Scene, Workers behind the scene), Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.

UNIT II
Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance BASIC SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update), basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions(Date and Time, Numeric, String conversion).

UNIT III
Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams. operations.



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UNIT IV

SQL: Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non-updatable), relational set

UNIT V

Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency(1NF, 2NF and 3 NF), concept of surrogate key, Boyce-codd normal form(BCNF), Lossless join and dependency preserving decomposition, Fourth normal form(4NF), Fifth Normal Form (5NF).

List of Exercises:

1. Creation, altering and droping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
2. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example:- Select the roll number and name of the student who secured fourth rank in the class.
3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
4. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date)
5.
   i. Create a simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found)
   ii. Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
6. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.
7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE- APPLICATION ERROR.
8. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.
9. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.
10. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
11. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers

Text Books:

1) Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke, TMH
2) Database System Concepts,5/e, Silberschatz, Korth, TMH
3) Oracle: The Complete Reference by Oracle Press
4) Nilesh Shah, "Database Systems Using Oracle", PHI, 2007
5) Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007

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Reference Books:

1) Introduction to Database Systems, 8/e C J Date, PEA.
2) Database Management System, 6/e Ramez Elmasri, Shamkant B. Navathe, PEA
3) Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

e-Resources:

1) https://nptel.ac.in/courses/106/105/106105175/
2) https://www.geeksforgeeks.org/introduction-to-nosql/

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III Year – II Semester		L	T	P	C
		3	0	0	3
MACHINE LEARNING					

Course Objectives:
- Identify problems that are amenable to solution by ANN methods, and which ML methods may be suited to solving a given problem.
- Formalize a given problem in the language/framework of different ANN methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, as a Markov decision process, etc).

Course Outcomes: After the completion of the course, student will be able to
- Explain the fundamental usage of the concept Machine Learning system
- Demonstrate on various regression Technique
- Analyze the Ensemble Learning Methods
- Illustrate the Clustering Techniques and Dimensionality Reduction Models in Machine Learning.
- Discuss the Neural Network Models and Fundamentals concepts of Deep Learning

Unit I:
Introduction- Artificial Intelligence, Machine Learning, Deep learning, Types of Machine Learning Systems, Main Challenges of Machine Learning.
Statistical Learning: Introduction, Supervised and Unsupervised Learning, Training and Test Loss, Tradeoffs in Statistical Learning, Estimating Risk Statistics, Sampling distribution of an estimator, Empirical Risk Minimization.

Unit II:
Supervised Learning(Regression/Classification):Basic Methods: Distance based Methods, Nearest Neighbours, Decision Trees, Naive Bayes, **Linear Models:** Linear Regression, Logistic Regression, Generalized Linear Models, Support Vector Machines, **Binary Classification:** Multiclass/Structured outputs, MNIST, Ranking.

Unit III:
Ensemble Learning and Random Forests: Introduction, Voting Classifiers, Bagging and Pasting, Random Forests, Boosting, Stacking.
Support Vector Machine: Linear SVM Classification, Nonlinear SVM Classification SVM Regression, Naïve Bayes Classifiers.

Unit IV:
Unsupervised Learning Techniques: Clustering, K-Means, Limits of K-Means, Using Clustering for Image Segmentation, Using Clustering for Preprocessing, Using Clustering for Semi-Supervised Learning, DBSCAN, Gaussian Mixtures.
Dimensionality Reduction: The Curse of Dimensionality, Main Approaches for Dimensionality Reduction, PCA, Using Scikit-Learn, Randomized PCA, Kernel PCA.

Unit V:
Neural Networks and Deep Learning: Introduction to Artificial Neural Networks with Keras, Implementing MLPs with Keras, Installing TensorFlow 2, Loading and Preprocessing Data with TensorFlow.

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Text Books:

1. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 2nd Edition, O'Reilly Publications, 2019
2. Data Science and Machine Learning Mathematical and Statistical Methods,Dirk P. Kroese, Zdravko I. Botev, Thomas Taimre, Radislav Vaisman,25th November 2020

Reference Books:

1. Machine Learning Probabilistic Approach, Kevin P. Murphy, MIT Press, 2012.

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III Year – II Semester		L	T	P	C
		3	0	0	3
COMPILER DESIGN					

Course Objectives:
Understand the basic concept of compiler design, and its different phases which will be helpful to construct new tools like LEX, YACC, etc.

Course Outcomes: At the end of the course, student will be able to

- Demonstrate phases in the design of compiler
- Organize Syntax Analysis, Top Down and LL(1) grammars
- Design Bottom Up Parsing and Construction of LR parsers
- Analyze synthesized, inherited attributes and syntax directed translation schemes
- Determine algorithms to generate code for a target machine

UNIT I: Lexical Analysis: Language Processors, Structure of a Compiler, Lexical Analysis, The Role of the Lexical Analyzer, Bootstrapping, Input Buffering, Specification of Tokens, Recognition of Tokens, Lexical Analyzer Generator-LEX, Finite Automata, Regular Expressions and Finite Automata, Design of a Lexical Analyzer Generator.

UNIT II: Syntax Analysis: The Role of the Parser, Context-Free Grammars, Derivations, Parse Trees, Ambiguity, Left Recursion, Left Factoring, **Top Down Parsing:** Pre Processing Steps of Top Down Parsing, Backtracking, Recursive Descent Parsing, LL (1) Grammars, Non-recursive Predictive Parsing, Error Recovery in Predictive Parsing.

UNIT III: Bottom Up Parsing: Introduction, Difference between LR and LL Parsers, Types of LR Parsers, Shift Reduce Parsing, SLR Parsers, Construction of SLR Parsing Tables, More Powerful LR Parses, Construction of CLR (1) and LALR Parsing Tables, Dangling Else Ambiguity, Error Recovery in LR Parsing, Handling Ambiguity Grammar with LR Parsers.

UNIT III: Syntax Directed Translation: Syntax-Directed Definitions, Evaluation Orders for SDD's, Applications of Syntax Directed Translation, Syntax-Directed Translation Schemes, Implementing L-Attributed SDD's. **Intermediate Code Generation:** Variants of Syntax Trees, Three Address Code, Types and Declarations, Translation of Expressions, Type Checking, Control Flow, Backpatching, Intermediate Code for Procedures.

UNIT IV: Run Time Environments: Storage Organization, Run Time Storage Allocation, Activation Records, Procedure Calls, Displays, **Code Optimization:** The Principle Sources of Optimization, Basic Blocks, Optimization of Basic Blocks, Structure Preserving Transformations, Flow Graphs, Loop Optimization, Data-Flow Analysis, Peephole Optimization

UNIT V: Code Generation: Issues in the Design of a Code Generator, Object Code Forms, Code Generation Algorithm, Register Allocation and Assignment.

Text Books:

1. Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman, Pearson Publishers, 2007.

Reference Books:

1. Compiler Construction, Principles and Practice, Kenneth C Louden, Cengage Learning, 2006
2. Modern compiler implementation in C, Andrew W Appel, Revised edition, Cambridge University Press.
3. Optimizing Compilers for Modern Architectures, Randy Allen, Ken Kennedy, Morgan Kauffmann, 2001.
4. Levine, J.R., T. Mason and D. Brown, Lex and Yacc, edition, O'Reilly & Associates, 1990

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III Year – II Semester		L	T	P	C
		3	0	0	3
CRYPTOGRAPHY AND NETWORK SECURITY					

Course Objectives:
The main objectives of this course are to explore the working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, public key algorithms, design issues and working principles of various authentication protocols and various secure communication standards including Kerberos, IPsec, and SSL/TLS.

Course Outcomes : At the end of the course, student will be able to
- Explain different security threats and countermeasures and foundation course of cryptography mathematics.
- Classify the basic principles of symmetric key algorithms and operations of some symmetric key algorithms and asymmetric key cryptography
- Revise the basic principles of Public key algorithms and Working operations of some Asymmetric key algorithms such as RSA, ECC and some more
- Design applications of hash algorithms, digital signatures and key management techniques
- Determine the knowledge of Application layer, Transport layer and Network layer security Protocols such as PGP, S/MIME, SSL,TSL, and IPsec .

UNIT I:
Basic Principles : Security Goals, Cryptographic Attacks, Services and Mechanisms, Mathematics of Cryptography.

UNIT II:
Symmetric Encryption: Mathematics of Symmetric Key Cryptography, Introduction to Modern Symmetric Key Ciphers, Data Encryption Standard, Advanced Encryption Standard.

UNIT III:
Asymmetric Encryption: Mathematics of Asymmetric Key Cryptography, Asymmetric Key Cryptography

UNIT IV:
Data Integrity, Digital Signature Schemes & Key Management : Message Integrity and Message Authentication, Cryptographic Hash Functions, Digital Signature, Key Management.

UNIT V:
Network Security-I: Security at application layer: PGP and S/MIME, Security at the Transport Layer: SSL and TLS, **Network Security-II :** Security at the Network Layer: IPSec, System Security

Text Books:
1. Cryptography and Network Security, 3rd Edition Behrouz A Forouzan, Deb deep Mukhopadhyay, McGraw Hill,2015
2. Cryptography and Network Security,4th Edition, William Stallings, (6e) Pearson,2006
3. Everyday Cryptography, 1st Edition, Keith M.Martin, Oxford,2016

Reference Books:
1. Network Security and Cryptography, 1st Edition, Bernard Meneges, Cengage Learning,2018

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III Year – II Semester		L	T	P	C
		3	0	0	3
MOBILE COMPUTING (Professional Elective-II)					

Course Objectives:

- To understand the fundamentals of mobile communication
- To understand the architecture of various Wireless Communication Networks
- To understand the significance of different layers in mobile system Course Contents

Course Outcomes: Upon completion of the course, the students will be able to:

- Develop a strong grounding in the fundamentals of mobile Networks
- Apply knowledge in MAC, Network, and Transport Layer protocols of Wireless Network
- Comprehend, design, and develop a lightweight network stack
- Analyze the Mobile Network Layer system working
- Explain about the WAP Model

UNIT I: Introduction to Wireless Networks: Applications, History, Simplified Reference Model, Wireless transmission, Frequencies, Signals, Antennas, Signal propagation, Multiplexing, Modulation, Spread spectrum, Cellular Systems: Frequency Management and Channel Assignment, types of hand-off and their characteristics.

UNIT II: MAC – Motivation, SDMA, FDMA, TDMA, CDMA, Telecommunication Systems, GSM: Architecture Location tracking and call setup, Mobility management, Handover, Security, GSM, SMS, International roaming for GSM, call recording functions, subscriber and service data management, DECT, TETRA, UMTS, IMT-2000.

UNIT III: Wireless LAN: Infrared vs. Radio transmission, Infrastructure, Adhoc Network, IEEE 802.11WLAN Standards, Architecture, Services, HIPERLAN, Bluetooth Architecture & protocols.

UNIT IV: Mobile Network Layer: Mobile IP, Dynamic Host Configuration Protocol, Mobile Transport Layer, Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/Fast recovery, Transmission/Time-out freezing, Selective retransmission, Transaction Oriented TCP.

UNIT V: Support for Mobility: Wireless Application Protocol: Architecture, Wireless Datagram Protocol, Wireless Transport Layer Security, Wireless Transaction Protocol, Wireless Session Protocol, Wireless Application Environment, Wireless Markup Language, WML Scripts, Wireless Telephone Application.

Text Books:

1. Jochen Schiller, “Mobile Communication”, Second Edition, Pearson Education, 2008.

Reference Books:

1. William Stallings, “Wireless Communications and Networks”, Second Edition, Pearson Education, 2004.
2. C. Siva Ram Murthy, B. S. Manoj, “Adhoc Wireless Networks: Architectures and Protocols”, Second Edition, Pearson Education, 2008.

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III Year – II Semester		L	T	P	C
		3	0	0	3
BIG DATA ANALYTICS (Professional Elective II)					

Course Objectives:

- To optimize business decisions and create competitive advantage with Big Data analytics
- To learn to analyze the big data using intelligent techniques
- To introduce programming tools PIG & HIVE in Hadoop echo system

Course Outcomes:

At the end of the course, the students will be able to

- Illustrate big data challenges in different domains including social media, transportation, finance and medicine
- Use various techniques for mining data stream
- Design and develop Hadoop
- Identify the characteristics of datasets and compare the trivial data and big data for various applications
- Explore the various search methods and visualization techniques

UNIT I

Introduction: Introduction to big data: Introduction to Big Data Platform, Challenges of Conventional Systems, Intelligent data analysis, Nature of Data, Analytic Processes and Tools, Analysis vs Reporting.

UNIT II

Stream Processing: Mining data streams: Introduction to Streams Concepts, Stream Data Model and Architecture, Stream Computing, Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream, Estimating Moments, Counting Oneness in a Window, Decaying Window, Real time Analytics Platform (RTAP) Applications, Case Studies - Real Time Sentiment Analysis - Stock Market Predictions.

UNIT III

Introduction to Hadoop: Hadoop: History of Hadoop, the Hadoop Distributed File System, Components of Hadoop Analysing the Data with Hadoop, Scaling Out, Hadoop Streaming, Design of HDFS, Java interfaces to HDFS Basics, Developing a Map Reduce Application, How Map Reduce Works, Anatomy of a Map Reduce Job run, Failures, Job Scheduling, Shuffle and Sort, Task execution, Map Reduce Types and Formats, Map Reduce Features Hadoop environment.

UNIT IV

Frameworks and Applications: Frameworks: Applications on Big Data Using Pig and Hive, Data processing operators in Pig, Hive services, HiveQL, Querying Data in Hive, fundamentals of HBase and ZooKeeper.

UNIT V

Predictive Analytics and Visualizations: Predictive Analytics, Simple linear regression, Multiple linear regression, Interpretation of regression coefficients, Visualizations, Visual data analysis techniques, interaction techniques, Systems and application

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Text Books:

1. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'reilly Media, Fourth Edition, 2015.
2. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGrawHill Publishing, 2012.
3. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", CUP, 2012

Reference Books:

1. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley& sons, 2012.
2. Paul Zikopoulos, DirkdeRoos, Krishnan Parasuraman, Thomas Deutsch, James Giles, David Corrigan, "Harness the Power of Big Data:The IBM Big Data Platform", Tata McGraw Hill Publications, 2012.
3. Arshdeep Bahga and Vijay Madisetti, "Big Data Science & Analytics: A Hands On Approach ", VPT, 2016.
4. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications (WILEY Big Data Series)", John Wiley & Sons, 2014.

Software Links:

1. Hadoop:http://hadoop.apache.org/
2. Hive: https://cwiki.apache.org/confluence/display/Hive/Home
3. Piglatin: http://pig.apache.org/docs/r0.7.0/tutorial.html

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III Year – II Semester		L	T	P	C
		3	0	0	3
OBJECT ORIENTED ANALYSIS AND DESIGN (Professional Elective II)					

Course Objectives: The main objective is the students to

- Become familiar with all phases of OOAD.
- Master the main features of the UML.
- Master the main concepts of Object Technologies and how to apply them at work and develop the ability to analyze and solve challenging problem in various domains.
- Learn the Object design Principles and understand how to apply them towards Implementation.

Course Outcomes: After finishing this course student will be able to:

- Analyze the nature of complex system and its solutions.
- Illustrate & relate the conceptual model of the UML, identify & design the classes and relationships
- Analyze &Design Class and Object Diagrams that represent Static Aspects of a Software System and apply basic and Advanced Structural Modeling Concepts for designing real time applications.
- Analyze & Design behavioral aspects of a Software System using Use Case, Interaction and Activity Diagrams.
- Analyze & Apply techniques of State Chart Diagrams and Implementation Diagrams to model behavioral aspects and Runtime environment of Software Systems.

UNIT I:
Introduction: The Structure of Complex systems, The Inherent Complexity of Software, Attributes of Complex System, Organized and Disorganized Complexity, Bringing Order to Chaos, Designing Complex Systems. **Case Study:** System Architecture: Satellite-Based Navigation

UNIT II:
Introduction to UML: Importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture, and Software Development Life Cycle. **Basic Structural Modeling:** Classes, Relationships, common Mechanisms, and diagrams. **Case Study:** Control System: Traffic Management.

UNIT III:
Class & Object Diagrams: Terms, concepts, modeling techniques for Class & Object Diagrams. **Advanced Structural Modeling:** Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages. **Case Study:** AI: Cryptanalysis.

UNIT IV:
Basic Behavioral Modeling-I: Interactions, Interaction diagrams Use cases, Use case Diagrams, Activity Diagrams. **Case Study:** Web Application: Vacation Tracking System

UNIT V:
Advanced Behavioral Modeling: Events and signals, state machines, processes and Threads, time and space, state chart diagrams. **Architectural Modeling:** Component, Deployment, Component diagrams and Deployment diagrams
Case Study: Weather Forecasting

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Text Books:

1. Grady BOOCH, Robert A. Maksimchuk, Michael W. ENGLE, Bobbi J. Young, Jim Conallen, Kellia Houston , "Object- Oriented Analysis and Design with Applications", 3rd edition, 2013, PEARSON.
2. Grady Booch, James Rumbaugh, Ivar Jacobson: The Unified Modeling Language User Guide, Pearson Education.

Reference Books:

1. Meilir Page-Jones: Fundamentals of Object Oriented Design in UML, Pearson Education.
2. Pascal Roques: Modeling Software Systems Using UML2, WILEY- Dreamtech India Pvt. Ltd.
3. Atul Kahate: Object Oriented Analysis & Design, The McGraw-Hill Companies.
4. Appling UML and Patterns: An introduction to Object – Oriented Analysis and Design and Unified Process, Craig Larman, Pearson Education.

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III Year – II Semester		L	T	P	C
		3	0	0	3
NETWORK PROGRAMMING (Professional Elective II)					

Course Objectives:
Having successfully completed this course, the student will be able to:

- Demonstrate mastery of main protocols comprising the Internet.
- Develop skills in network programming techniques.
- Implement network services that communicate through the Internet.
- Apply the client-server model in networking applications.
- Practice networking commands available through the operating system

Course Outcomes: At the end of the course, student will be able to

- Identifying different models and sockets
- Demonstrate different TCP Echo server functions and I/O models
- Rationalize IPV4 and IPV6 Socket options
- Identifying daemon processing and Advanced input and output functions
- Analyze Broadcasting and multicasting

UNIT I:
Introduction to Network Programming: Introduction to Network Programming: OSI model, UNIX standards, TCP and UDP & TCP connection establishment and Format, Buffer sizes and limitation, standard internet services, Protocol usage by common internet application Elementary Sockets: Sockets introduction, Elementary TCP sockets.

UNIT II:
TCP client server: Introduction, TCP Echo server functions, Normal startup, terminate and signal handling server process termination, Crashing and Rebooting of server host shutdown of server host.I/O Multiplexing: I/O Models, the select and poll functions, Batch input and buffering, shutdown function.

UNIT III:
UDP and Socket options: Elementary UDP sockets: Introduction UDP Echo server functions, lost datagram, summary of UDP example, Lack of flow control with UDP. **Socket options:** getsockopt and setsockopt functions. Socket states, Generic socket options IPV4 socket options, IPV6 socket options, ICMPV6 socket options and TCP socket options, SCTP socket options, fcntl function.

UNIT IV:
Advanced Sockets and Daemon Processes: IPV4 and IPV6 interoperability, introduction, IPV4 client: IPV6 server, IPV6 client: IPV4 Server, IPV6 Address-testing macros. Daemon Processes and inetdSuperserver –Introduction, syslogd Daemon, syslog Function, daemon_init Function, inetd Daemon, daemon_inetd. Advanced I/O functions: Socket timeouts, recv and send functions, ready and writev functions, recvmsg and send msg functions, Ancillary data.

UNIT V:
Broadcasting and Multicasting: Broadcasting introduction, broadcast addresses, unicast versus Broadcast, dg_cli function using broadcasting, race conditions, Multicasting addresses, multicasting versus broadcasting on a LAN, multicasting on a WAN, source-specific multicast, multcast socket options. **Raw Sockets**: Introduction, Raw Socket Creation, Raw Socket Output, Raw Socket Input, Ping Program, Traceroute Program



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Text Books:

1. UNIX Network Programming, by W. Richard Stevens, Bill Fenner, Andrew M. Rudoff, Pearson Education
2. UNIX Network Programming, 1st Edition, W. Richard Stevens. PHI.

Reference Books:

1. UNIX Systems Programming using C++ T CHAN, PHI.
2. UNIX for Programmers and Users, 3rd Edition Graham GLASS, King abls, Pearson Education
3. Advanced UNIX Programming 2nd Edition M. J. ROCHKIND, Pearson Education

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III Year – II Semester		L	T	P	C
		3	0	0	3
MEAN STACK DEVELOPMENT (Job Oriented Course)					

Course Outcomes:
At the end of the Course, Student will be able to:

- Build static web pages using HTML 5 elements.
- Apply JavaScript to embed programming interface for web pages and also to perform Client side validations.
- Build a basic web server using Node.js, work with Node Package Manager (NPM) and recognize the need for Express.js.
- Develop JavaScript applications using typescript and work with document database using MongoDB.
- Utilize Angular JS to design dynamic and responsive web pages.

UNIT-I:
HTML 5: Introduction to Web, Overview of Web Technologies, HTML - Introduction, HTML - Need, Case-insensitivity, Platform-independency, DOCTYPE Declaration, Types of Elements, HTML Elements - Attributes, Metadata Element, Sectioning Elements, Paragraph Element, Division and Span Elements, List Element, Link Element, Character Entities, HTML5 Global Attributes, Creating Table Elements, Table Elements : Colspan/ Rowspan Attributes, border, cellspacing and cellpadding attributes, Creating Form Elements, Input Elements - Attributes, Color and Date Pickers, Select and Datalist Elements, Editing Elements, Media, Iframe, Why HTML Security, HTML Injection, Clickjacking, HTML5 Attributes & Events Vulnerabilities, Local Storage Vulnerabilities, HTML5 - Cross-browser support, Best Practices For HTML Web Pages.

UNIT-II:
JavaScript: Why we need JavaScript, What is JavaScript, Environment Setup, Working with Identifiers, Type of Identifiers, Primitive and Non Primitive Data Types, Operators and Types of Operators, Types of Statements, Non - Conditional Statements, Types of Conditional Statements, If and Switch Statements, Types of Loops, Types of Functions, Declaring and Invoking Function, Arrow Function, Function Parameters, Nested Function, Built-in Functions, Variable Scope in Functions, Working With Classes, Creating and Inheriting Classes, In-built Events and Handlers, Working with Objects, Types of Objects, Creating Objects, Combining and cloning Objects using Spread operator, Destructuring Objects, Browser and Document Object Model, Creating Arrays, Destructuring Arrays, Accessing Arrays, Array Methods, Introduction to Asynchronous Programming, Callbacks, Promises, Async and Await, Executing Network Requests using Fetch API, Creating and consuming Modules.

UNIT-III:
Node.js: Why and What Node.js, How to use Node.js, Create a web server in Node.js, Node Package Manager, Modular programming in Node.js, Restarting Node Application, File Operations.
Express.js: Express Development Environment, Defining a route, Handling Routes, Route and Query Parameters, How Middleware works, Chaining of Middlewares, Types of Middlewares, Connecting to MongoDB with Mongoose, Validation Types and Defaults, Models, CRUD Operations, API Development, Why Session management, Cookies, Sessions, Why and What Security, Helmet Middleware, Using a Template Engine Middleware, Stylus CSS Preprocessor.

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UNIT-IV:

Typescript: Installing TypeScript, Basics of TypeScript, Function, Parameter Types and Return Types, Arrow Function, Function Types, Optional and Default Parameters, Rest Parameter, Creating an Interface, Duck Typing, Function Types, Extending Interfaces, Classes, Constructor, Access Modifiers, Properties and Methods, Creating and using Namespaces, Creating and using Modules, Module Formats and Loaders, Module Vs Namespace, What is Generics, What are Type Parameters, Generic Functions, Generic Constraints.

MongoDB: Introduction Module Overview, Document Database Overview, Understanding JSON, MongoDB Structure and Architecture, MongoDB Remote Management, Installing MongoDB on the local computer (Mac or Windows), Introduction to MongoDB Cloud, Create MongoDB Atlas Cluster, GUI tools Overview, Install and Configure MongoDB Compass, Introduction to the MongoDB Shell, MongoDB Shell JavaScript Engine, MongoDB Shell JavaScript Syntax, Introduction to the MongoDB Data Types, Introduction to the CRUD Operations on documents, Create and Delete Databases and Collections, Introduction to MongoDB Queries.

UNIT-V:

What is Angular, Features of Angular, Angular Application Setup, Components and Modules, Executing Angular Application, Elements of Template, Change Detection, Structural Directives - ngIf, ngFor, ngSwitch, Custom Structural Directive, Attribute Directives - ngStyle, ngClass, Custom Attribute Directive, Property Binding, Attribute Binding, Style and Event Binding, Built in Pipes, Passing Parameters to Pipes, Nested Components Basics, Passing data from Container Component to Child Component, Passing data from Child Component to ContainerComponent, Shadow DOM, Component Life Cycle, Template Driven Forms, Model Driven Forms or Reactive Forms, Custom Validators in Reactive Forms, Custom Validators in Template Driven forms, Dependency Injection, Services Basics, RxJS Observables, Server Communication using HttpClient, Communicating with different backend services using Angular HttpClient, Routing Basics, Router Links, Route Guards, Asynchronous Routing, Nested Routes.

Text Books:

1. Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson.
2. Pro Mean Stack Development, 1st Edition, ELadElrom, Apress O'Reilly.
3. Full Stack JavaScript Development with MEAN, Colin J Ihrig, Adam Bretz, 1st edition, SitePoint, SitePoint Pty. Ltd., O'Reilly Media.
4. MongoDB – The Definitive Guide, 2nd Edition, Kristina Chodorow,O'Reilly.

Reference Books:

1. Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book,1st Edition, Dream Tech.
2. An Introduction to Web Design, Programming, 1st Edition, Paul S Wang, Sanda SKatila, Cengage Learning.

Web Links:

1. https://infyspringboard.onwingspan.com/en/app/toc/lex_17739732834840810000_shared/overview (HTML5)
2. https://infyspringboard.onwingspan.com/en/app/toc/lex_18109698366332810000_shared/overview (Javascript)
3. https://infyspringboard.onwingspan.com/en/app/toc/lex_32407835671946760000_shared/overview (Node.js & Express.js)
4. https://infyspringboard.onwingspan.com/en/app/toc/lex_9436233116512678000_shared/overview (Typescript)
5. https://infyspringboard.onwingspan.com/en/app/toc/lex_20858515543254600000_shared/overview (Angular JS)
6. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_013177169294712832113_shared/overview (MongoDB)

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III Year – II Semester		L	T	P	C
		0	0	3	1.5
MACHINE LEARNING USING PYTHON LAB					

Course Objectives:
This course will enable students to learn and understand different Data sets in implementing the machine learning algorithms.

Course Outcomes (Cos): At the end of the course, student will be able to

- Implement procedures for the machine learning algorithms
- Design and Develop Python programs for various Learning algorithms
- Apply appropriate data sets to the Machine Learning algorithms
- Develop Machine Learning algorithms to solve real world problems

Requirements: Develop the following program using Anaconda/ Jupiter/ Spider and evaluate ML models.

Experiment-1:
Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.

Experiment-2:
For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.

Experiment-3:
Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

Experiment-4:
Exercises to solve the real-world problems using the following machine learning methods: a) Linear Regression b) Logistic Regression c) Binary Classifier

Experiment-5: Develop a program for Bias, Variance, Remove duplicates , Cross Validation
Experiment-6: Write a program to implement Categorical Encoding, One-hot Encoding

Experiment-7:
Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.

Experiment-8:
Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions.

Experiment-9: Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.



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Experiment-10:
Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.

Experiment-11: Apply EM algorithm to cluster a Heart Disease Data Set. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.

Experiment-12: Exploratory Data Analysis for Classification using Pandas or Matplotlib.

Experiment-13:
Write a Python program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set

Experiment-14:
Write a program to Implement Support Vector Machines and Principle Component Analysis

Experiment-15:
Write a program to Implement Principle Component Analysis

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		0	0	3	1.5
COMPILER DESIGN LAB					

Course Objectives:
To enlighten the student with knowledge base in compiler design and its applications

Course Outcomes: The end of the course student will be able to
- Design simple lexical analyzers
- Determine predictive parsing table for a CFG
- Apply Lex and Yacc tools
- Examine LR parser and generating SLR Parsing table
- Relate Intermediate code generation for subset C language

List of Experiments:
1. Write a C program to identify different types of Tokens in a given Program.
2. Write a Lex Program to implement a Lexical Analyzer using Lex tool.
3. Write a C program to Simulate Lexical Analyzer to validating a given input String.
4. Write a C program to implement the Brute force technique of Top down Parsing.
5. Write a C program to implement a Recursive Descent Parser.
6. Write C program to compute the *First* and *Follow* Sets for the given Grammar.
7. Write a C program for eliminating the left recursion and left factoring of a given grammar
8. Write a C program to check the validity of input string using Predictive Parser.
9. Write a C program for implementation of LR parsing algorithm to accept a given input string.
10. Write a C program for implementation of a Shift Reduce Parser using Stack Data Structure to accept a given input string of a given grammar.
11. Simulate the calculator using LEX and YACC tool.
12. Generate YACC specification for a few syntactic categories.
13. Write a C program for generating the three address code of a given expression/statement.
14. Write a C program for implementation of a Code Generation Algorithm of a given expression/statement.

Text Books & Reference Books :
1. Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman, Pearson Publishers, 2007.
2. John R Levine, Tony Mason, Doug Brown, "Lex and Yacc", Orielly, 2nd Edition, 2009.

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CRYPTOGRAPHY NETWORK SECURITY LAB					

Course Objectives:

- To learn basic understanding of cryptography, how it has evolved, and some key encryption techniques used today.
- To understand and implement encryption and decryption using Ceaser Cipher, Substitution Cipher, Hill Cipher.

Course Outcomes: At the end of the course, student will be able to

- Apply the knowledge of symmetric cryptography to implement encryption and decryption using Ceaser Cipher, Substitution Cipher, Hill Cipher
- Demonstrate the different algorithms like DES, BlowFish, and Rijndael, encrypt the text "Hello world" using Blowfish Algorithm.
- Analyze and implement public key algorithms like RSA, Diffie-Hellman Key Exchange mechanism, the message digest of a text using the SHA-1 algorithm

List of Experiments:

1. Write a C program that contains a string (char pointer) with a value \Hello World'. The program should XOR each character in this string with 0 and displays the result.
2. Write a C program that contains a string (char pointer) with a value \Hello World'. The program should AND or and XOR each character in this string with 127 and display the result
3. Write a Java program to perform encryption and decryption using the following algorithms:
   a) Ceaser Cipher
   b) Substitution Cipher
   c) Hill Cipher
4. Write a Java program to implement the DES algorithm logic
5. Write a C/JAVA program to implement the BlowFish algorithm logic
6. Write a C/JAVA program to implement the Rijndael algorithm logic.
7. Using Java Cryptography, encrypt the text "Hello world" using BlowFish. Create your own key using Java key tool.
8. Write a Java program to implement RSA Algorithm
9. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript. Consider the end user as one of the parties (Alice) and the JavaScript application as other party (bob).
10. Calculate the message digest of a text using the SHA-1 algorithm in JAVA.

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		0	0	4	2
BIG DATA: SPARK (Skill Oriented Course)					

Course Objectives:
The main objective of the course is to process Big Data with advance architecture like spark and streaming data in Spark

Course Outcomes:
By the end of the course , the student will be able to
- Develop MapReduce Programs to analyze large dataset Using Hadoop and Spark
- Write Hive queries to analyze large dataset Outline the Spark Ecosystem and its components
- Perform the filter, count, distinct, map, flatMap RDD Operations in Spark.
- Build Queries using Spark SQL
- Apply Spark joins on Sample Data Sets
- Make use of sqoop to import and export data from hadoop to database and vice-versa

List of Experiments:

1.

EXPERIMENT-1:
To Study of Big Data Analytics and Hadoop Architecture
(i) know the concept of big data architecture
(ii) know the concept of Hadoop architecture
https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01256841991858585686_shared/overview

2. Loading DataSet in to HDFS for Spark Analysis

EXPERIMENT-2:
Installation of Hadoop and cluster management
(i) Installing Hadoop single node cluster in ubuntu environment
(ii) Knowing the differencing between single node clusters and multi-node clusters
(iii) Accessing WEB-UI and the port number
(iv) Installing and accessing the environments such as hive and sqoop
(We can restrict to standalone or if the facilities available can try for pseudo-distribution mode {or} fully distribution mode)
https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_013295035317460992435 39_shared?collectionId=lex_auth_013295035804901376435 44_shared&collectionType=Collection

EXPERIMENT-3:
File management tasks & Basic linux commands
(i) Creating a directory in HDFS
(ii) Moving forth and back to directories
(iii) Listing directory contents
(iv) Uploading and downloading a file in HDFS
(v) Checking the contents of the file

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(vi) Copying and moving files
(vii) Copying and moving files between local to HDFS environment
(viii) Removing files and paths
(ix) Displaying few lines of a file
(x) Display the aggregate length of a file
(xi) Checking the permissions of a file
(xii) Zipping and unzipping the files with & without permission pasting it to a location
(xiii) Copy, Paste commands
https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01257430580733542457_shared?collectionId=lex_auth_01256841991858585686_shared&collectionType=Course

EXPERIMENT-4:
Map-reducing
(i) Definition of Map-reduce
(ii) Its stages and terminologies
(iii) Word-count program to understand map-reduce
(Mapper phase, Reducer phase, Driver code)
https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01257421539761356848_shared?collectionId=lex_auth_01256841991858585686_shared&collectionType=Course

EXPERIMENT-5:
Implementing Matrix-Multiplication with Hadoop Map-reduce

EXPERIMENT-6:
Compute Average Salary and Total Salary by Gender for an Enterprise.

EXPERIMENT-7:
(i) Creating hive tables(External and internal)
(ii) Loading data to external hive tables from sql tables(or)Structured c.s.v using scoop
(iii) Performing operations like filterations and updations
(iv) Performing Join(inner, outer etc)
(v) Writing User defined function on hive tables
https://infyspringboard.onwingspan.com/web/en/viewer/webmodule/lex_auth_01257841711418572848_shared?collectionId=lex_auth_01258388119638835242_shared&collectionType=Course

EXPERIMENT-8:
Create a sql table of employees
Employee table with id,designation
Salary table (salary ,dept id)
Create external table in hive with similar schema of above tables,Move data to hive using scoop and load the contents into tables,filter a new table and write a UDF to encrypt the table with AES-algorithm, Decrypt it with key to show contents

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https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_01260690964198195214 3_shared?collectionId=lex_auth_012605268423008256169 2_shared&collectionType=Course

EXPERIMENT-9:
(i) Pyspark Definition(Apache Pyspark) and difference between Pyspark, Scala, pandas
(ii) Pyspark files and class methods
(i) get(file name)
(ii) get root directory()

EXPERIMENT-10 :
Pyspark -RDD'S
(i) what is RDD's?
(ii) ways to Create RDD
(i) parallelized collections
(ii) external dataset
(iii) existing RDD's
(iv) Spark RDD's operations
(Count, foreach(), Collect, join,Cache()
https://infyspringboard.onwingspan.com/web/en/app/toc/lex_3509975869549336000_shared/overviw

EXPERIMENT-11 :

Perform pyspark transformations
(i) map and flatMap
(ii) to remove the words, which are not necessary to analyze this text.
(iii) groupBy
(iv) What if we want to calculate how many times each word is coming in corpus ?
(v) .How do I perform a task (say count the words 'spark' and 'apache' in rdd3) separatly on each partition and get the output of the task performed in these partition ?
(vi) unions of RDD
(vii) join two pairs of RDD Based upon their key
https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013301505844518912251 82_shared/overview

EXPERIMENT-12:
Pyspark sparkconf-Attributes and applications
(i) What is Pyspark spark conf ()
(ii) Using spark conf create a spark session to write a dataframe to read details in a c.s.v and later move that c.s.v to another location

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Hardware and software configuration:

Hardware Configuration for each Node (Suggested)

Operating System:
NAME="Red Hat Enterprise Linux Server", VERSION="7.9 (Maipo)"
CPU Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
CPU(s): 32
RAM: 64G

Software Required

Java: openjdk version "1.8.0_202" (installed in all nodes)
For Hive metastore – we have installed MySQL
MySQL: Ver 8.0.19 for Linux on x86_64 (MySQL Community Server - GPL)

Resource Links for installation

- Hadoop Installation steps: Apache Hadoop 3.3.2 – Hadoop: Setting up a Single Node Cluster. & Apache Hadoop 3.3.2 – Hadoop Cluster Setup
- Links to download different versions of Hadoop : Index of /hadoop/ common (apache.org) &Index of /dist/hadoop/core (apache.org)

Text Books:

1. Spark in Action, Marko Bonaci and Petar Zecevic, Manning.
2. PySpark SQL Recipes: With HiveQL, Dataframe and Graphframes, Raju Kumar Mishra and Sundar Rajan Raman, Apress Media.

Web Links:	
1.	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013301505844518912251822_shared/overview
2.	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01258388119638835242_shared/overview
3.	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012605268423008256169 2_shared/overview

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MEAN STACK TECHNOLOGIES-MODULE I
(HTML 5, JAVASCRIPT, EXPRESS.JS, NODE.JS AND TYPESCRIPT)
(Skill Oriented Course)

Course Outcomes:
At the end of the Course, Student will be able to:

- Develop professional web pages of an application using HTML elements like lists, navigations, tables, various form elements, embedded media which includes images, audio, video and CSS Styles.
- Utilize JavaScript for developing interactive HTML web pages and validate form data.
- Build a basic web server using Node.js and also working with Node Package Manager (NPM).
- Build a web server using Express.js
- Make use of Typescript to optimize JavaScript code by using the concept of strict type checking.

List of Exercises

1.a	**Course Name:** HTML5 - The Language
	Module Name: Case-insensitivity, Platform-independency, DOCTYPE Declaration, Types of Elements, HTML Elements - Attributes, Metadata Element
	Include the Metadata element in Homepage.html for providing description as "IEKart's is an online shopping website that sells goods in retail. This company deals with various categories like Electronics, Clothing, Accessories etc.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28320667711144660000_shared?collectionId=lex_17739732834840810000_shared&collectionType=Course
1.b	**Course Name:** HTML5 - The Language
	Module Name: Sectioning Elements
	Enhance the Homepage.html of IEKart's Shopping Application by adding appropriate sectioning elements.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_6372291347110857000_shared?collectionId=lex_1773973283484081000 0_shared&collectionType=Course
1.c	**Course Name:** HTML5 - The Language
	Module Name: Paragraph Element, Division and Span Elements, List Element
	Make use of appropriate grouping elements such as list items to "About Us" page of IEKart's Shopping Application
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_32785192040894940000_shared?collectionId=lex_17739732834840810000_shared&collectionType=Course
1.d	**Course Name:** HTML5 - The Language
	Module Name: Link Element
	Link "Login", "SignUp" and "Track order" to "Login.html", "SignUp.html" and "Track.html" page respectively. Bookmark each category to its details of IEKart's Shopping application.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_15515105953273338000_shared?collectionId=lex_17739732834840810000_shared&collectionType=Course
1.e	**Course Name:** HTML5 - The Language
	Module Name: Character Entities
	Add the © symbol in the Home page footer of IEKart's Shopping application.

	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_547667376938096260_shared?collectionId=lex_17739732834840810000_shared&collectionType=Course
1.f	**Course Name:** HTML5 - The Language
	Module Name: HTML5 Global Attributes
	Add the global attributes such as contenteditable, spellcheck, id etc. to enhance the Signup Page functionality of IEKart's Shopping application.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28723566050321920000_shared?collectionId=lex_177397328348408100000_shared&collectionType=Course
2.a	**Course Name:** HTML5 - The Language
	Module Name: Creating Table Elements, Table Elements : Colspan/Rowspan Attributes, border, cellspacing, cellpadding attributes
	Enhance the details page of IEKart's Shopping application by adding a table element to display the available mobile/any inventories.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013168035284033536113_shared?collectionId=lex_17739732834840810000_shared&collectionType=Course
2.b	**Course Name:** HTML5 - The Language
	Module Name: Creating Form Elements, Color and Date Pickers, Select and Datalist Elements
	Using the form elements create Signup page for IEKart's Shopping application.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_13975270903118459000_shared?collectionId=lex_177397328348408100000_shared&collectionType=Course
2.c	**Course Name:** HTML5 - The Language
	Module Name: Input Elements - Attributes
	Enhance Signup page functionality of IEKart's Shopping application by adding attributes to input elements.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_14048414537062347000_shared?collectionId=lex_177397328348408100000_shared&collectionType=Course
2.d	**Course Name:** HTML5 - The Language
	Module Name: Media, Iframe
	Add media content in a frame using audio, video, iframe elements to the Home page of IEKart's Shopping application.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_30738402225794945000_shared?collectionId=lex_177397328348408100000_shared&collectionType=Course
3.a	**Course Name:** Javascript
	Module Name: Type of Identifiers
	Write a JavaScript program to find the area of a circle using radius (var and let - reassign and observe the difference with var and let) and PI (const)
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013053264414818304732_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course
3.b	**Course Name:** Javascript
	Module Name: Primitive and Non Primitive Data Types
	Write JavaScript code to display the movie details such as movie name, starring, language, and ratings. Initialize the variables with values of appropriate types. Use template literals wherever necessary.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-

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	module/lex_21528322245232402000_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course
3.c	**Course Name:** Javascript
	Module Name: Operators and Types of Operators
	Write JavaScript code to book movie tickets online and calculate the total price, considering the number of tickets and price per ticket as Rs. 150. Also, apply a festive season discount of 10% and calculate the discounted amount.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_13808338384481720000_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course
3.d	**Course Name:** Javascript
	Module Name: Types of Statements, Non - Conditional Statements, Types of Conditional Statements, if Statements, switch Statements
	Write a JavaScript code to book movie tickets online and calculate the total price based on the 3 conditions: (a) If seats to be booked are not more than 2, the cost per ticket remains Rs. 150. (b) If seats are 6 or more, booking is not allowed. (c) If se
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_16257498471333610000_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course
3.e	**Course Name:** Javascript
	Module Name: Types of Loops
	Write a JavaScript code to book movie tickets online and calculate the total price based on the 3 conditions: (a) If seats to be booked are not more than 2, the cost per ticket remains Rs. 150. (b) If seats are 6 or more, booking is not allowed. (c) If
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_6238536888292970000_shared?collectionId=lex_1810969836633281000 0_shared&collectionType=Course
4.a	**Course Name:** Javascript
	Module Name: Types of Functions, Declaring and Invoking Function, Arrow Function, Function Parameters, Nested Function, Built-in Functions, Variable Scope in Functions
	Write a JavaScript code to book movie tickets online and calculate the total price based on the 3 conditions: (a) If seats to be booked are not more than 2, the cost per ticket remains Rs. 150. (b) If seats are 6 or more, booking is not allowed. (c) If
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_15455199570613326000_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course
4.b	**Course Name:** Javascript
	Module Name: Working With Classes, Creating and Inheriting Classes
	Create an Employee class extending from a base class Person. Hints: (i) Create a class Person with name and age as attributes. (ii) Add a constructor to initialize the values (iii) Create a class Employee extending Person with additional attributes role
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_01259981111760512458_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course
4.c	**Course Name:** Javascript
	Module Name: In-built Events and Handlers
	Write a JavaScript code to book movie tickets online and calculate the total price based on the 3 conditions: (a) If seats to be booked are not more than 2, the cost per ticket remains Rs. 150. (b) If seats are 6 or more, booking is not allowed. (c) If se
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_4192188372573027000_shared?collectionId=lex_1810969836633281000



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	0_shared&collectionType=Course
4.d	**Course Name:** Javascript
	Module Name: Working with Objects, Types of Objects, Creating Objects, Combining and cloning Objects using Spread operator, Destructuring Objects, Browser Object Model, Document Object Model
	If a user clicks on the given link, they should see an empty cone, a different heading, and a different message and a different background color. If user clicks again, they should see a re-filled cone, a different heading, a different message, and a diffe
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_13197025862804100000_shared?collectionId=lex_181096983663328100 00_shared&collectionType=Course
5.a	**Course Name:** Javascript
	Module Name: Creating Arrays, Destructuring Arrays, Accessing Arrays, Array Methods
	Create an array of objects having movie details. The object should include the movie name, starring, language, and ratings. Render the details of movies on the page using the array.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013053270191734784711_shared?collectionId=lex_181096983663 32810000_shared&collectionType=Course
5.b	**Course Name:** Javascript
	Module Name: Introduction to Asynchronous Programming, Callbacks, Promises, Async and Await, Executing Network Requests using Fetch API
	Simulate a periodic stock price change and display on the console. Hints: (i) Create a method which returns a random number - use Math.random, floor and other methods to return a rounded value. (ii) Invoke the method for every three seconds and stop when
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_012599811633905664460_shared?collectionId=lex_181096983663 32810000_shared&collectionType=Course
5.c	**Course Name:** Javascript
	Module Name: Creating Modules, Consuming Modules
	Validate the user by creating a login module. Hints: (i) Create a file login.js with a User class. (ii) Create a validate method with username and password as arguments. (iii) If the username and password are equal it will return "Login Successful" else w
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013052857053585408667_shared?collectionId=lex_181096983663 32810000_shared&collectionType=Course
6.a	**Course Name:** Node.js
	Module Name: How to use Node.js
	Verify how to execute different functions successfully in the Node.js platform.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_19002830632103186000_shared?collectionId=lex_324078356719467600 00_shared&collectionType=Course
6.b	**Course Name:** Node.js
	Module Name: Create a web server in Node.js
	Write a program to show the workflow of JavaScript code executable by creating web server in Node.js.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28177338996267815000_shared?collectionId=lex_324078356719467600 00_shared&collectionType=Course



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6.c	**Course Name:** Node.js
	Module Name: Modular programming in Node.js
	Write a Node.js module to show the workflow of Modularization of Node application.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28865394191004004000_shared?collectionId=lex_324078356719467600000_shared&collectionType=Course
6.d	**Course Name:** Node.js
	Module Name: Restarting Node Application
	Write a program to show the workflow of restarting a Node application.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_9174073856000159000_shared?collectionId=lex_3240783567194676000 0_shared&collectionType=Course
6.e	**Course Name:** Node.js
	Module Name: File Operations
	Create a text file src.txt and add the following data to it. Mongo, Express, Angular, Node.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_33376440180246100000_shared?collectionId=lex_324078356719467600000_shared&collectionType=Course
7.a	**Course Name:** Express.js
	Module Name: Defining a route, Handling Routes, Route Parameters, Query Parameters
	Implement routing for the AdventureTrails application by embedding the necessary code in the routes/route.js file.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_29394215542149950000_shared?collectionId=lex_324078356719467600000_shared&collectionType=Course
7.b	**Course Name:** Express.js
	Module Name: How Middleware works, Chaining of Middlewares, Types of Middlewares
	In myNotes application: (i) we want to handle POST submissions. (ii) display customized error messages. (iii) perform logging.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_13930661312009580000_shared?collectionId=lex_324078356719467600000_shared&collectionType=Course
7.c	**Course Name:** Express.js
	Module Name: Connecting to MongoDB with Mongoose, Validation Types and Defaults
	Write a Mongoose schema to connect with MongoDB.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_01303558877548544069 1_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course
7.d	**Course Name:** Express.js
	Module Name: Models
	Write a program to wrap the Schema into a Model object.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_01303559389686988866 2_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course
8.a	**Course Name:** Express.js
	Module Name: CRUD Operations
	Write a program to perform various CRUD (Create-Read-Update-Delete) operations using Mongoose library functions.

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	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013035684270129152696_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course
8.b	**Course Name:** Express.js
	Module Name: API Development
	In the myNotes application, include APIs based on the requirements provided. (i) API should fetch the details of the notes based on a notesID which is provided in the URL. Test URL - http://localhost:3000/notes/7555 (ii) API should update the details bas
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013035745250975744755_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course
8.c	**Course Name:** Express.js
	Module Name: Why Session management, Cookies
	Write a program to explain session management using cookies.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24299316914857090000_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course
8.d	**Course Name:** Express.js
	Module Name: Sessions
	Write a program to explain session management using sessions.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_905413034723449100_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course
8.e	**Course Name:** Express.js
	Module Name: Why and What Security, Helmet Middleware
	Implement security features in myNotes application
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_31677453061177940000_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course
9.a	**Course Name:** Typescript
	Module Name: Basics of TypeScript
	On the page, display the price of the mobile-based in three different colors. Instead of using the number in our code, represent them by string values like GoldPlatinum, PinkGold, SilverTitanium.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28910354929502245000_shared?collectionId=lex_943623311651267800 0_shared&collectionType=Course
9.b	**Course Name:** Typescript
	Module Name: Function
	Define an arrow function inside the event handler to filter the product array with the selected product object using the productId received by the function. Pass the selected product object to the next screen.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_10783156469383723000_shared?collectionId=lex_943623311651267800 0_shared&collectionType=Course
9.c	**Course Name:** Typescript
	Module Name: Parameter Types and Return Types
	Consider that developer needs to declare a function - getMobileByVendor which accepts string as input parameter and returns the list of mobiles.
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712912427057152901_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course

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9.d	**Course Name:** Typescript
	Module Name: Arrow Function
	Consider that developer needs to declare a manufacturer's array holding 4 objects with id and price as a parameter and needs to implement an arrow function - myfunction to populate the id parameter of manufacturers array whose price is greater than or equ
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_01271291087550054490 4_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
9.e	**Course Name:** Typescript
	Module Name: Optional and Default Parameters
	Declare a function - getMobileByManufacturer with two parameters namely manufacturer and id, where manufacturer value should passed as Samsung and id parameter should be optional while invoking the function, if id is passed as 101 then this function shoul
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_01271291494064128090 6_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
10.a	**Course Name:** Typescript
	Module Name: Rest Parameter
	Implement business logic for adding multiple Product values into a cart variable which is type of string array.
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_01271292186091520090 9_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
10.b	**Course Name:** Typescript
	Module Name: Creating an Interface
	Declare an interface named - Product with two properties like productId and productName with a number and string datatype and need to implement logic to populate the Product details.
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_01271292524427673691 0_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
10.c	**Course Name:** Typescript
	Module Name: Duck Typing
	Declare an interface named - Product with two properties like productId and productName with the number and string datatype and need to implement logic to populate the Product details.
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_01271292599545856091 2_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
10.d	**Course Name:** Typescript
	Module Name: Function Types
	Declare an interface with function type and access its value.
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_01271294894534656091 8_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
11.a	**Course Name:** Typescript
	Module Name: Extending Interfaces
	Declare a productList interface which extends properties from two other declared interfaces like Category,Product as well as implementation to create a variable of this interface type.
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-



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	on/lex_auth_01271295165213900892 0_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
11.b	**Course Name:** Typescript
	Module Name: Classes
	Consider the Mobile Cart application, Create objects of the Product class and place them into the productlist array.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_3705824317381604400_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
11.c	**Course Name:** Typescript
	Module Name: Constructor
	Declare a class named - Product with the below-mentioned declarations: (i) productId as number property (ii) Constructor to initialize this value (iii) getProductId method to return the message "Product id is <<id value>>".
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_01271295461678284892 7_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
11.d	**Course Name:** Typescript
	Module Name: Access Modifiers
	Create a Product class with 4 properties namely productId, productName, productPrice, productCategory with private, public, static, and protected access modifiers and accessing them through Gadget class and its methods.
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_01271295351717068893 1_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
12.a	**Course Name:** Typescript
	Module Name: Properties and Methods
	Create a Product class with 4 properties namely productId and methods to setProductId() and getProductId().
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_9356738095572543000_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
12.b	**Course Name:** Typescript
	Module Name: Creating and using Namespaces
	Create a namespace called ProductUtility and place the Product class definition in it. Import the Product class inside productlist file and use it.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_20787271128051925000_shared?collectionId=lex_943623311651267800 0_shared&collectionType=Course
12.c	**Course Name:** Typescript
	Module Name: Creating and using Modules
	Consider the Mobile Cart application which is designed as part of the functions in a module to calculate the total price of the product using the quantity and price values and assign it to a totalPrice variable.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24788158187785620000_shared?collectionId=lex_943623311651267800 0_shared&collectionType=Course
12.d	**Course Name:** Typescript
	Module Name: What is Generics, What are Type Parameters, Generic Functions, Generic Constraints
	Create a generic array and function to sort numbers as well as string values.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-

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	module/lex_446287045482942800_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course

Software configuration and installation

1. HTML & Javascript
   - Simple editors such as Notepad or go for IDEs like Visual Studio Code(recommended), Eclipse etc. which makes coding easier.
   - And, to execute application, you can use any commonly used browser such as Google Chrome(recommended), Mozilla Firefox etc
   - Setup details: Environmental Setup for HTML5 - Viewer Page | Infosys Springboard (onwingspan.com)
   - Environment Setup: Internal - Viewer Page | Infosys Springboard (onwingspan.com)
2. Node JS
   Download **Node.js** from the official site
   Setup details : How to use Node.js - Viewer Page | Infosys Springboard (onwingspan.com)
3. Typescript
   Installing TypeScript - Internal - Viewer Page | Infosys Springboard (onwingspan.com)

Text Books:

1. Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson.
2. Pro Mean Stack Development, 1st Edition, ELadElrom, Apress O'Reilly.
3. Full Stack JavaScript Development with MEAN, Colin J Ihrig, Adam Bretz, 1st edition, SitePoint, SitePoint Pty. Ltd., O'Reilly Media.

Reference Books:

1. Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, 1st Edition, Dream Tech.
2. An Introduction to Web Design, Programming, 1st Edition, Paul S Wang, Sanda S Katila, Cengage Learning.

Web Links:

1. https://infyspringboard.onwingspan.com/en/app/toc/lex_17739732834840810000_shared/overview (HTML5)
2. https://infyspringboard.onwingspan.com/en/app/toc/lex_18109698366332810000_shared/overview (Javascript)
3. https://infyspringboard.onwingspan.com/en/app/toc/lex_32407835671946760000_shared/overview (Node.js & Express.js)
4. https://infyspringboard.onwingspan.com/en/app/toc/lex_9436233116512678000_shared/overview (Typescript)

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III Year – II Semester		L	T	P	C
		2	0	0	0
EMPLOYABILITY SKILLS-II					

Course Objectives:
The main objective of this course is to assist students in developing employability skills and personal qualities related to gaining and sustaining employment.

Course Outcomes: After completion of this course
- Solve various Basic Mathematics problems by following different methods
- Follow strategies in minimizing time consumption in problem solving Apply shortcut methods to solve problems
- Confidently solve any mathematical problems and utilize these mathematical skills both in their professional as well as personal life.
- Analyze, summarize and present information in quantitative forms including table, graphs and formulas

UNIT I:
Numerical ability l: Number system, HCF & LCM, Average, Simplification, Problems on numbers
Numerical ability II: Ratio & Proportion, Partnership, Percentages, Profit & Loss

UNIT II:
Arithmetical ability l: Problems on ages, Time & Work, Pipes & Cistern, Chain Rule.
Arithmetical ability ll: Time & Distance, Problems on boats &Steams, Problems on Trains

UNIT III:
Arithmetical ability lll: Allegation, Simple interest and compound interest, Races & Games of skills, Calendar and Clock,
Logical ability: Permutations and Combination and Probability.

UNIT IV:
Mensuration: Geometry, Areas, Volumes

UNIT V:
Data interpretation: Tabulation, Bar graphs, Pie charts, line graphs

Text Books And Reference Books:
1. R. S. Aggarwal "Quantitative Aptitude", Revised ed., S Chand publication, 2017 ISBN:8121924987

E- resources:
1. https://blog.feedspot.com/aptitude_youtube_channels/
2. https://www.tutorialspoint.com/quantitative_aptitude/
3. https://www.careerbless.com/aptitude/qa/home.php

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III Year – II Semester	Minor Course	L	T	P	C
		3	0	2	4
DATA STRUCTURES AND ALGORITHMS					

Course Objectives:

The objective of the course is to

- Introduce the fundamental concept of data structures and abstract data types
- Emphasize the importance of data structures in developing and implementing efficient algorithms
- Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms
- Demonstrate the different data structures implementation

Course Outcomes:

After completing this course a student will be able to:

- Use basic data structures such as arrays and linked list.
- Programs to demonstrate fundamental algorithmic problems including Tree Traversals, Graph traversals, and shortest paths.
- Use various searching and sorting algorithms.

UNIT I:

Data Structures - Definition, Classification of Data Structures, Operations on Data Structures, Abstract Data Type (ADT), Preliminaries of algorithms. Time and Space complexity.
Searching - Linear search, Binary search, Fibonacci search.
Sorting- Insertion sort, Selection sort, Exchange (Bubble sort, quick sort), distribution (radix sort), merging (Merge sort) algorithms.

UNIT II:

Linked List: Introduction, Single linked list, Representation of Linked list in memory, Operations on Single Linked list-Insertion, Deletion, Search and Traversal ,Reversing Single Linked list, Applications on Single Linked list- Polynomial Expression Representation
,Addition and Multiplication, Sparse Matrix Representation using Linked List, Advantages and Disadvantages of Single Linked list, Double Linked list-Insertion, Deletion, Circular Linked list-Insertion, Deletion.

UNIT III:

Queues: Introduction to Queues, Representation of Queues-using Arrays and using Linked list, Implementation of Queues-using Arrays and using Linked list, Application of Queues- Circular Queues, Deques, Priority Queues, Multiple Queues.
Stacks: Introduction to Stacks, Array Representation of Stacks, Operations on Stacks, Linked list Representation of Stacks, Operations on Linked Stack, Applications-Reversing list, Factorial Calculation, Infix to Postfix Conversion, Evaluating Postfix Expressions.

UNIT IV:

Trees: Basic Terminology in Trees, Binary Trees-Properties, Representation of Binary Trees using Arrays and Linked lists. Binary Search Trees- Basic Concepts, BST Operations: Insertion, Deletion, Tree Traversals,



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UNIT V:

Graphs: Basic Concepts, Representations of Graphs-Adjacency Matrix and using Linked list, Graph Traversals (BFT & DFT), Applications- Minimum Spanning Tree Using Prims & Kruskals Algorithm, Dijkstra's shortest path

Exercise -1 (Searching):

a) Write C program that use both recursive and non recursive functions to perform Linear search for a Key value in a given list.

b) Write C program that use both recursive and non recursive functions to perform Binary search for a Key value in a given list.

Exercise -2 (Sorting-I):

a) Write C program that implement Bubble sort, to sort a given list of integers in ascending order

b) Write C program that implement Quick sort, to sort a given list of integers in ascending order

c) Write C program that implement Insertion sort, to sort a given list of integers in ascending order

Exercise -3(Sorting-II):

a) Write C program that implement radix sort, to sort a given list of integers in ascending order

b) Write C program that implement merge sort, to sort a given list of integers in ascending order

Exercise -4(Singly Linked List):

a) Write a C program that uses functions to create a singly linked list

b) Write a C program that uses functions to perform insertion, deletion operations on a singly linked list

c) Write a C program to reverse elements of a single linked list.

Exercise -5(Queue)

a) Write C program that implement Queue (its operations) using arrays.

b) Write C program that implement Queue (its operations) using linked lists

Exercise -6(Stack)

a) Write C program that implement stack (its operations) using arrays

b) Write C program that implement stack (its operations) using Linked list

c) Write a C program that uses Stack operations to evaluate postfix expression

Exercise -7(Binary Tree)

Write a recursive C program for traversing a binary tree in preorder, inorder and postorder.

Exercise -8(Binary Search Tree)

a) Write a C program to Create a BST

b) Write a C program to insert a node into and delete a node from a BST.

Text Books:

1) Data Structures Using C. 2nd Edition.Reema Thareja, Oxford.
2) Data Structures and algorithm analysis in C, 2nded, Mark Allen Weiss.

Reference Books:

1) Fundamentals of Data Structures in C, 2nd Edition, Horowitz, Sahni, Universities Press.
2) Data Structures: A PseudoCode Approach, 2/e, Richard F.Gilberg, Behrouz A. Forouzon, Cengage.
3) Data Structures with C, Seymour Lipschutz TMH



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e-Resources:

1) http://algs4.cs.princeton.edu/home/
2) https://faculty.washington.edu/jstraub/dsa/Master_2_7a.pdf

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IV Year – I Semester		L	T	P	C
		3	0	0	3
CLOUD COMPUTING (Professional Elective-III)					

Course Objectives:

- To explain the evolving computer model caned cloud computing.
- To introduce the various levels of services that can be achieved by cloud.
- To describe the security aspects in cloud.
- To motivate students to do programming and experiment with the various cloud computing environments.

Course Outcomes: At the end of the course, student will be able to

- Illustrate the key dimensions of the challenge of Cloud Computing
- Classify the Levels of Virtualization and mechanism of tools.
- Analyze Cloud infrastructure including Google Cloud and Amazon Cloud.
- Create Combinatorial Auctions for cloud resource and design scheduling algorithms for computing cloud
- Assess control storage systems and cloud security, the risks involved its impact and develop cloud application

UNIT I: Systems Modeling, Clustering and Virtualization: Scalable Computing over the Internet-The Age of Internet Computing, Scalable computing over the internet, Technologies for Network Based Systems, System models for Distributed and Cloud Computing, , Performance, Security and Energy Efficiency

UNIT II: Virtual Machines and Virtualization of Clusters and Data Centers: Implementation Levels of Virtualization, Virtualization Structures/ Tools and Mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data-Center Automation.
UNIT III: Cloud Platform Architecture: Cloud Computing and Service Models, Public Cloud Platforms, Service Oriented Architecture, Programming on Amazon AWS and Microsoft Azure

UNIT IV: Cloud Resource Management and Scheduling: Policies and Mechanisms for Resource Management, Applications of Control Theory to Task Scheduling on a Cloud, Stability of a Two Level Resource Allocation Architecture, Feedback Control Based on Dynamic Thresholds. Coordination of Specialized Autonomic Performance Managers, Resource Bundling, Scheduling Algorithms for Computing Clouds-Fair Queuing, Start Time Fair Queuing.

UNIT V: Storage Systems: Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system.

Text Books:

1. Distributed and Cloud Computing, Kai Hwang, Geoffry C. Fox, Jack J. Dongarra MK Elsevier.
2. Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier.

Reference Books:

1. Cloud Computing, A Hands on approach, ArshadeepBahga, Vijay Madisetti, University Press
2. Cloud Computing, A Practical Approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH
3. Mastering Cloud Computing, Foundations and Application Programming, Raj Kumar Buyya, Christen vecctiola, S Tammaraiselvi, TMH

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IV Year – I Semester		L	T	P	C
		3	0	0	3
NEURAL NETWORKS AND SOFT COMPUTING (Professional Elective-III)					

Course Objectives: The main objective of the course is

- To introduce the foundations of Artificial Neural Networks.
- To acquire the knowledge on Soft Computing Concepts.
- To learn various types of Genetic algorithms and its applications.
- To gain knowledge to apply optimization strategies.

Course Outcomes: At the end of the course, student will be able to

- Understand the concepts of Artificial intelligence and soft computing techniques
- Analyze the concepts of Neural Networks and select the Learning Networks in modeling real world systems.
- Implement the concepts of Fuzzy reasoning and concepts of Genetic algorithm and its applications to soft computing.
- Classify Biologically inspired algorithm such as neural networks, genetic algorithms, ant colony optimization, and bee colony optimization.
- Design hybrid system incorporating neural network, genetic algorithms, fuzzy systems.

UNIT I: Soft Computing and Artificial Intelligence: Introduction of Soft Computing, Soft Computing vs. Hard Computing, Various Types of Soft Computing Techniques, Applications of Soft Computing, AI Search Algorithm, Predicate Calculus, Rules of Interference, Semantic Networks, Frames, Objects, Hybrid Models.

UNIT II: Artificial Neural Networks and Paradigms: Introduction to Neuron Model, Neural Network Architecture, Learning Rules, Perceptrons, Single Layer Perceptrons, Multilayer Perceptrons, Back propagation Networks, Kohnen's self organizing networks, Hopfield network, Applications of NN.

UNIT III: Fuzzy Logic: Introduction, Fuzzy sets and Fuzzy reasoning, Basic functions on fuzzy sets, relations, rule based models and linguistic variables, fuzzy controls, Fuzzy decision making, applications of fuzzy logic.

UNIT IV: Genetic Algorithms and Swarm Optimizations: Introduction, Genetic Algorithm, Fitness Computations, Cross Over, Mutation, Evolutionary Programming, Classifier Systems, Genetic Programming Parse Trees, Variants of GA, Applications, Ant Colony Optimization, Particle Swarm Optimization, Artificial Bee Colony Optimization.

UNIT V: Hybrid Systems: Neuro fuzzy hybrid systems, Adaptive neuro fuzzy inference systems, Fuzzy backpropagation network, Genetic neuro hybrid system, Genetic algorithm based backpropagation network, Genetic-fuzzy hybrid systems.

Text Books:

1. Simon S. Haykin, Neural Networks, Prentice Hall, 2nd edition.
2. S. Rajasekaran & G. A. Vijayalakshmi Pai "Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications", PHI,2003.

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Reference Books:

1. S. N. Sivanandam & S. N. Deepa ”Principles of Soft Computing” Wiley – India, 2nd Edition, 2007.
2. Jang J.S.R., Sun C.T. and Mizutani E, "Neuro-Fuzzy and Soft computing", Prentice Hall, 1998.
3. Jacek M. Zurada, Introduction to Artificial Neural Systems, Jaico Publishing House,1994
4. Zimmermann, “Fuzzy Set Theory and its Application”, 3rd Edition.
5. D.E. Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y, 1989.
6. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill, 3rd edition 2009.

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year – I Semester		L	T	P	C
		3	0	0	3
AD-HOC AND SENSOR NETWORKS (Professional Elective-III)					

Course Objectives:
From the course the student will learn

- Architect sensor networks for various application setups.
- Devise appropriate data dissemination protocols and model links cost.
- Understanding of the fundamental concepts of wireless sensor networks and has a basic knowledge of the various protocols at various layers.
- Evaluate the performance of sensor networks and identify bottlenecks.

Course Outcomes: At the end of the course, student will be able to

- Evaluate the principles and characteristics of mobile ad hoc networks (MANETs) and what distinguishes them from infrastructure-based networks.
- Determine the principles and characteristics of wireless sensor networks.
- Discuss the challenges in designing MAC, routing and transport protocols for wireless ad-hoc sensor networks.
- Illustrate the various sensor network Platforms, tools and applications.
- Demonstrate the issues and challenges in security provisioning and also familiar with the mechanisms for implementing security and trust mechanisms in MANETs and WSNs.

UNIT I: Introduction to Ad Hoc Wireless Networks- Cellular and Ad Hoc Wireless Networks, Characteristics of MANETs, Applications of MANETs, Issues and Challenges of MANETs, Ad Hoc Wireless Internet, MAC protocols for Ad hoc Wireless Networks-Issues, Design Goals and Classifications of the MAC Protocols.

UNIT II: Routing Protocols for Ad Hoc Wireless Networks- Issues in Designing a Routing Protocol, Classifications of Routing Protocols, Topology-based versus Position-based Approaches, Issues and design goals of a Transport layer protocol, Classification of Transport layer solutions, TCP over Ad hoc Wireless Networks, Solutions for TCP over Ad Hoc Wireless Networks, Other Transport layer protocols.

UNIT III: Security protocols for Ad hoc Wireless Networks- Security in Ad hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad hoc Wireless Networks, Cooperation in MANETs, Intrusion Detection Systems.

UNIT IV: Basics of Wireless Sensors and Applications- The Mica Mote, Sensing and Communication Range, Design Issues, Energy Consumption, Clustering of Sensors, Applications, Data Retrieval in Sensor Networks-Classification of WSNs, MAC layer, Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs.

UNIT V: Security in WSNs- Security in WSNs, Key Management in WSNs, Secure Data Aggregation in WSNs, Sensor Network Hardware-Components of Sensor Mote, Sensor Network Operating Systems–TinyOS, LA-TinyOS, SOS, RETOS, Imperative Language-nesC, **Dataflow Style Language-**TinyGALS, Node-Level Simulators, NS-2 and its sensor network extension, TOSSIM.

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Text Books:

1. Ad Hoc Wireless Networks – Architectures and Protocols, 1st edition, C. Siva Ram Murthy, B. S. Murthy, Pearson Education, 2004
2. Ad Hoc and Sensor Networks – Theory and Applications, 2nd edition *Carlos Corderio Dharma P.Aggarwal*, World Scientific Publications / Cambridge University Press, March 2006

Reference Books:

1. Wireless Sensor Networks: An Information Processing Approach, 1st edition, *Feng Zhao, Leonidas Guibas,* Elsevier Science imprint, Morgan Kauffman Publishers, 2005, rp2009
2. Wireless Ad hoc Mobile Wireless Networks – Principles, Protocols and Applications, 1st edition, Subir Kumar Sarkar, et al., Auerbach Publications, Taylor & Francis Group, 2008
3. Ad hoc Networking, 1st edition,*Charles E.Perkins,* Pearson Education, 2001
4. Wireless Ad hoc Networking, 1st edition, *Shih-Lin Wu, Yu-Chee Tseng,* Auerbach Publications, Taylor & Francis Group, 2007
5. Wireless Sensor Networks – Principles and Practice, 1st edition, Fei Hu, Xiaojun Cao, An Auerbach book, CRC Press, Taylor & Francis Group, 2010

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year – I Semester		L	T	P	C
		3	0	0	3
CYBER SECURITY & FORENSICS (Professional Elective-III)					

Course Objectives:
The aim of the course is to

- identify security risks and take preventive steps
- understand the forensics fundamentals
- understand the evidence capturing process
- understand the preservation of digital evidence

Course Outcomes: At the end of the course, student will be able to

- Explain the Cybercrime Fundamentals
- Describe the types of attacks on networks
- Analyze various tools available for Cybercrime Investigation
- Explain the Computer Forensics and Investigation Fundamentals and tools
- Analyze the legal perspectives of Cybercrime

UNIT I: Introduction to Cybercrime: Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Cybercriminals, Classifications of Cybercrime, Cyberstalking, Cybercafe and Cybercrimes, Botnets. Attack Vector, Proliferation of Mobile and Wireless Devices, Security Challenges Posed by Mobile Devices, Attacks on Mobile/Cell Phones, Network and Computer Attacks.

UNIT II: Tools and Methods : Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, Sniffers, Spoofing, Session Hijacking Buffer over flow, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks, Identity Theft (ID Theft), Foot Printing and Social Engineering, Port Scanning, Enumeration.

UNIT III: Cyber Crime Investigation: Introduction, Investigation Tools, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Hands on Case Studies. Encryption and Decryption Methods, Search and Seizure of Computers, Recovering Deleted Evidences, Password Cracking.

UNIT IV: Computer Forensics and Investigations: Understanding Computer Forensics, Preparing for Computer Investigations. Current Computer Forensics Tools: Evaluating Computer Forensics Tools, Computer Forensics Software Tools, Computer Forensics Hardware Tools, Validating and Testing Forensics Software, Face, Iris and Fingerprint Recognition, Audio Video Analysis, Windows System Forensics, Linux System Forensics, Graphics and Network Forensics, E-mail Investigations, Cell Phone and Mobile Device Forensics.

UNIT V: Cyber Crime Legal Perspectives: Introduction, Cybercrime and the Legal Landscape around the World, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime and Punishment, Cyberlaw, Technology and Students: Indian Scenario.

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Text Books:

1. Sunit Belapure Nina Godbole "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", WILEY, 2011.
2. Nelson Phillips and Enfinger Steuart, "Computer Forensics and Investigations", Cengage Learning, New Delhi, 2009.

Reference Books:

1. Michael T. Simpson, Kent Backman and James E. Corley, "Hands on Ethical Hacking and Network Defence", Cengage, 2019.
2. Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media, New Delhi.
3. Alfred Basta, Nadine Basta,Mary Brown and Ravinder Kumar "Cyber Security and Cyber Laws" , Cengage,2018.

E-Resources:

1. CERT-In Guidelines- http://www.cert-in.org.in/
2. https://www.coursera.org/learn/introduction-cybersecurity-cyber-attacks [Online Course]
3. https://computersecurity.stanford.edu/free-online-videos [Free Online Videos]
4. Nickolai Zeldovich. 6.858 Computer Systems Security. Fall 2014. Massachusetts Institute of Technology: MIT OpenCourseWare, https://ocw.mit.edu License: Creative Commons BY-NC-SA.

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year – I Semester		L	T	P	C
		3	0	0	3
DEEP LEARNING TECHNIQUES (Professional Elective-IV)					

Course Objectives: The main objective of the course is to make students:

- Learn deep learning methods for working with sequential data,
- Learn deep recurrent and memory networks,
- Learn deep Turing machines,
- Apply such deep learning mechanisms to various learning problems.
- Know the open issues in deep learning, and have a grasp of the current research directions.

Course Outcomes: After the completion of the course, student will be able to

- Demonstrate the fundamental concepts learning techniques of Artificial Intelligence, Machine Learning and Deep Learning.
- Discuss the Neural Network training, various random models**.**
- Explain the Techniques of Keras, TensorFlow, Theano and CNTK
- Classify the Concepts of CNN and RNN
- Implement Interactive Applications of Deep Learning.

UNIT I:
Fundamentals of Deep Learning: Artificial Intelligence, History of Machine learning: Probabilistic Modeling, Early Neural Networks, Kernel Methods, Decision Trees, Random forests and Gradient Boosting Machines, **Fundamentals of Machine Learning:** Four Branches of Machine Learning, Evaluating Machine learning Models, Overfitting and Underfitting. **[Text Book 2]**

UNIT II: Introducing Deep Learning: Biological and Machine Vision, Human and Machine Language, Artificial Neural Networks, Training Deep Networks, Improving Deep Networks. **[Text Book3]**

UNIT III: Neural Networks: Anatomy of Neural Network, Introduction to Keras: Keras, TensorFlow, Theano and CNTK, Setting up Deep Learning Workstation, Classifying Movie Reviews: Binary Classification, Classifying newswires: Multiclass Classification. **[Text Book 2]**

UNIT IV:
Convolutional Neural Networks: Nerual Network and Representation Learing, Convolutional Layers, Multichannel Convolution Operation, **Recurrent Neural Networks:** Introduction to RNN, RNN Code, PyTorch Tensors: Deep Learning with PyTorch, CNN in PyTorch. **[Text Book 3]**

UNIT V:
Interactive Applications of Deep Learning: Machine Vision, Natural Language processing, Generative Adversial Networks, Deep Reinforcement Learning. **[Text Book 1]**
Deep Learning Research: Autoencoders**,** Deep Generative Models: Boltzmann Machines Restricted Boltzmann Machines, Deep Belief Networks. **[Text Book 1]**

Text Books:

1. Deep Learning- Ian Goodfellow, Yoshua Bengio and Aaron Courvile, MIT Press, 2016
2. Deep Learning with Python - Francois Chollet, Released December 2017, Publisher(s): Manning Publications, ISBN: 9781617294433
3. Deep Learning Illustrated: A Visual, Interactive Guide to Artificial Intelligence - Jon Krohn, Grant Beyleveld, Aglaé Bassens, Released September 2019, Publisher(s): Addison-Wesley Professional, ISBN: 9780135116821



4. Deep Learning from Scratch - Seth Weidman, Released September 2019, Publisher(s): O'Reilly Media, Inc., ISBN: 9781492041412

Reference Books:

1. Artificial Neural Networks, Yegnanarayana, B., PHI Learning Pvt. Ltd, 2009.
2. Matrix Computations, Golub, G.,H., and Van Loan,C.,F, JHU Press,2013.
3. Neural Networks: A Classroom Approach, Satish Kumar, Tata McGraw-Hill Education, 2004.

Web Link:

1. Swayam NPTEL: Deep Learning: https://onlinecourses.nptel.ac.in/noc22_cs22/preview

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year – I Semester		L	T	P	C
		3	0	0	3
SOCIAL NETWORKS & SEMANTIC WEB (Professional Elective-IV)					

Course Objectives:

- To learn Web Intelligence
- To learn Knowledge Representation for the Semantic Web
- To learn Ontology Engineering
- To learn Semantic Web Applications, Services and Technology
- To learn Social Network Analysis and semantic web

Course Outcomes: After the completion of the course, student will be able to

- Demonstrate social network analysis and measures.
- Analyze random graph models and navigate social networks data
- Apply the network topology and Visualization tools.
- Analyze the experiment with small world models and clustering models.
- Compare the application driven virtual communities from social network Structure.

UNIT I: Web Intelligence: Thinking and Intelligent Web Applications, The Information Age ,The World Wide Web, Limitations of Today's Web, The Next Generation Web, Machine Intelligence, Artificial Intelligence, Ontology, Inference engines, Software Agents, Berners-Lee www, Semantic Road Map, Logic on the semantic Web.

UNIT II: Knowledge Representation for the Semantic Web: Ontologies and their role in the semantic web, Ontologies Languages for the Semantic Web –Resource Description Framework(RDF) / RDF Schema, Ontology Web Language(OWL), UML, XML/XML Schema.

UNIT III: Ontology Engineering: Ontology Engineering, Constructing Ontology, Ontology Development Tools, Ontology Methods, Ontology Sharing and Merging, Ontology Libraries and Ontology Mapping, Logic, Rule and Inference Engines.

UNIT IV: Semantic Web Applications, Services and Technology: Semantic Web applications and services, Semantic Search, e-learning, Semantic Bioinformatics, Knowledge Base ,XML Based Web Services, Creating an OWL-S Ontology for Web Services, Semantic Search Technology, Web Search Agents and Semantic Methods,

UNIT V: Social Network Analysis and semantic web: What is social Networks analysis, development of the social networks analysis, Electronic Sources for Network Analysis – Electronic Discussion networks, Blogs and Online Communities, Web Based Networks, Building Semantic Web Applications with social network features.

Text Books:

1. Thinking on the Web – Berners Lee, Godel and Turing, Wiley inter science, 2008.
2. Social Networks and the Semantic Web, Peter Mika, Springer, 2007.

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Reference Books:

1. Semantic Web Technologies, Trends and Research in Ontology Based Systems, J. Davies, R. Studer, P. Warren, John Wiley & Sons.
2. Semantic Web and Semantic Web Services -Liyang Lu Chapman and Hall/CRC Publishers,(Taylor & Francis Group)
3. Information sharing on the semantic Web – Heiner Stuckenschmidt; Frank Van Harmelen, Springer Publications.
4. Programming the Semantic Web, T. Segaran, C. Evans, J. Taylor, O'Reilly, SPD.

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IV Year – I Semester		L	T	P	C
		3	0	0	3
COMPUTER VISION (Professional Elective-IV)					

Course Objectives:
To introduce students the fundamentals of image formation; To introduce students the major ideas, methods, and techniques of computer vision and pattern recognition; To develop an appreciation for various issues in the design of computer vision and object recognition systems; and To provide the student with programming experience from implementing computer vision and object recognition applications.

Course Outcomes: After completing the course Student will be able to:
1. Identify basic concepts, terminology, theories, models and methods in the field of computer vision,
2. Describe known principles of feature detection and matching,
3. Describe basic methods of computer vision related to image stitching, photography like high dynamic range imaging and blur removal.
4. Suggest a design of a computer vision system for a 3D Reconstruction, Albedos, image based rendering views and depths.

UNIT I: Introduction: Image Formation: Geometric Primitives and Transformation, Photometric Image Formation, Digital Camera, Image Processing: Point Operators, Linear Filtering, More Neighborhood Operators, Fourier Transforms, Pyramids and Wavelets, Geometric Transformations, Global Optimization.

UNIT II: Feature Detection and Matching: Points and Patches, Edges, Lines, Segmentation: Active Contours, Split and Merge, Mean Shift and Mode Finding, Normalized Cuts, Feature-Based Alignment: 2D and 3D Feature-based Alignment, Pose Estimation, Geometric Intrinsic Calibration.

UNIT III: Structure and Motion: Triangular, Two-frame Structure from Motion, Factorization, Bundle Adjustment, Constrained Structure and Motion, Dense Motion Estimation: Translation Alignment, Parametric Motion, Spline-based Motion, Optical Flow, Layered motion

UNIT IV: Image Stitching: Motion Models, Global Alignment, Composing, Computational Photography: Photometric Calibration, High Dynamic Range Imaging, Super-Resolution and Blur Removal, image Matting and Compositing, Texture Analysis and Synthesis.

UNIT V: 3D Reconstruction: Shape From X, Active Range Finding, Surface Representation, Point-based Representation, Volumetric Representation, Model-based Reconstruction, Recovering Texture Maps and Albedos, Image- based Rendering: View Interpolation, Layered Depth Images, Light Fields and Lumigraphs, Environment Mattes, Video-based Rendering.

Text Books:
1. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited, 2011.
2. Simon J.D Prince, Computer Vision: Models, Learning and Inference, 1st Edition, 2012.

Reference Books:
1. Computer Vision - A modern approach, by D. Forsyth and J. Ponce, Prentice Hall Robot Vision, by B. K. P. Horn, McGraw-Hill.
2. Haralick& Shapiro, “Computer and Robot Vision”, Vol II
3. G_erardMedioni and Sing Bing Kang “Emerging topics in computer vision”166

NPTEL LINK: https://onlinecourses.nptel.ac.in/noc22_ee48/preview

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year – I Semester		L	T	P	C
		3	0	0	3
BLOCK-CHAIN TECHNOLOGIES (Professional Elective-V)					

Course Objectives:
To understand block chain technology and Cryptocurrency works

Course Outcomes:
After the completion of the course, student will be able to

- Demonstrate the block chain basics, Crypto currency
- To compare and contrast the use of different private vs. public block chain and use cases
- Design an innovative Bit coin Block chain and scripts, Block chain Science on varies coins
- Classify Permission Block chain and use cases – Hyper ledger, Corda
- Make Use of Block-chain in E-Governance, Land Registration, Medical Information Systems and others

UNIT I: Introduction: Introduction, basic ideas behind block chain, how it is changing the landscape of digitalization, introduction to cryptographic concepts required, Block chain or distributed trust, Currency, Cryptocurrency, How a Cryptocurrency works, Financial services, Bitcoin prediction markets.

UNIT II: Hashing, public key cryptosystems, private vs public block chain and use cases, Hash Puzzles, Extensibility of Block chain concepts, Digital Identity verification, Block chain Neutrality, Digital art, Block chain Environment

UNIT III: Introduction to Bitcoin : Bitcoin Block chain and scripts, Use cases of Bitcoin Blockchain scripting language in micropayment, escrow etc Downside of Bit coin mining, Block chain Science: Grid coin, Folding coin, Block chain Genomics, Bit coin MOOCs.

UNIT IV: Ethereum continued, IOTA, The real need for mining, consensus, Byzantine Generals Problem, and Consensus as a distributed coordination problem, Coming to private or permissioned block chains, Introduction to Hyper ledger, Currency, Token, Campus coin, Coin drop as a strategy for Public adoption, Currency Multiplicity, Demurrage currency

UNIT V: Technical challenges, Business model challenges, Scandals and Public perception, Government Regulations, Uses of Block chain in E-Governance, Land Registration, Medical Information Systems.

Text Books:
1. Blockchain Blue print for Economy by Melanie Swan

Reference Books:
1. Blockchain Basics: A Non-Technical Introduction in 25 Steps 1st Edition, by Daniel Drescher

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year – I Semester		L	T	P	C
		3	0	0	3
WIRELESS NETWORK SECURITY (Professional Elective-V)					

Course Objectives:
The objective of this course is to understand the importance of Wireless networks security and its application

Course Outcomes: After the completion of the course, student will be able to
- Explain the Threats in networks and provide Authentication to real time problems.
- Identify and investigate in-depth both early and contemporary threats to wireless networks security
- Ability to analyze and determine for any organization the database security requirements and appropriate solutions
- Determined IP Security Issues and solve real time problems.
- Build wireless Development Strategies in real time issues

UNIT I: Introduction to Wireless: History of Wireless Technologies, History of Wireless Security, State of the Wireless Security Industry, 2001 **Wireless Threats:** Uncontrolled Terrain, Communications Jamming, DoS Jamming, Injections and Modifications of Data, Man-in-the-Middle (MITM) Attack, Rogue Client, Rogue Network Access Points, Attacker Equipment,

UNIT II: Introduction to Wireless Security Protocols and Cryptography: Recovery the FUD, OSI Model, OSI Simplified, Internet Model, Wireless LAN Security Protocols, Cryptography, SSL/TLS, Secure Shell Protocols, Terminal Access and File Transfer, Port Forwarding a Word of Caution, Man-in-the-Middle of SSL/TLS and SSH, WTLS, WEP,802.1x, IP Security

UNIT III:
Security Considerations to Wireless Devices: Wireless Device Security Issues, Physical Security, Information Leakage, Device Security Features, Application Security, Detailed Device Analysis, Laptops, Personal Digital Assistants (PDAS), Wireless Infrastructure **Wireless Technologies and Applications:** Introduction to Cellular Networks- FDMA, TDMA, CDMA, Spread Spectrum Primer, Analogy, TDMA Vs CDMA, PDC, Security Threats

UNIT IV:
Introduction to Wireless Data Networks: Cellular Digital Packet Data (CDPD), CDPD Architecture, CDPD Security, Mobitex- Mobitex Architecture, Mobitex Security Architecture, Security Issues, Gateway, Security Model **Wireless Standards and Technologies:** Current and Future Technologies- Infrared, Radio, Spread Spectrum, OFDM, Current and Future Standards- IEEE 802 Standards, ETSI, Home RF, Ultra-wide band Radio (UWB)

UNIT V: Wireless Deployment Strategies: Implementing Wireless LAN's- Security Considerations Common Wireless Network Applications, Enterprise Campus Designs, Wireless IST Design, Retail and Manufacturing Design, Small Office/Home Office Design (SOHO)

Text Books:
1. Wireless Security, Merritt Maxim and David Pollino, Osborne/McGraw Hill, New Delhi, 2005
2. Wireless Security Models: Threats and Solutions, Nichols and Lekka, Tata McGraw Hill, New Delhi 2006

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Reference Books:

1. Behrouz A.Forouzan, ―Cryptography & Network Security‖, Tata McGraw Hill, India, New Delhi, 2009
2. William Stallings, ―Cryptography and Network Security, Prentice Hall, New Delhi, 2006
3. Bruce Schneier, "Applied Cryptography", John Wiley & Sons, New York, 2004

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year – I Semester		L	T	P	C
		3	0	0	3
ETHICAL HACKING (Professional Elective-V)					

Course Objectives:

- The aim of the course is to introduce the methodologies and framework of ethical hacking for enhancing the security.
- The course includes-Impacts of Hacking; Types of Hackers; Information Security Models, Information Security Program, Business Perspective, Planning a Controlled Attack
- Framework of Steps (Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Deliverable and Integration)

Course Outcomes: At the end of the course, student will be able to

- Explain the concepts related to hacking, ports and protocols, pen testing and virtualization
- Determine the applicable footprinting techniques and scanning methods
- Explain the process of system hacking and Explain the concepts Trojans, backdoors, worms and virus and it's countermeasures
- Demonstrate systematic understanding of the concepts of Sniffing and Social Engineering and it's attacks
- Determine the applicable methods of cryptography, stegnography and Vulnerability Assessment

UNIT I:

Introduction to Hacking: Hacking, Types and phases of hacking, **Introduction to Ports & Protocols**: Ports, Protocols, Primary Network Types, **Virtualization & Introduction to Kali Linux:** Virtualization, Virtualization software, supported platforms, **Introduction to Penetration Testing:** Penetration test, Categories and Types of Penetration tests, Structure of Penetration Test Report.

UNIT II:

Footprinting: Footprinting, Types, Using ping and ns Lookup commands in Windows command line, **Scanning:** Scanning, Basics of Scanning, Basic Techniques of Scanning, Enumerating DNS using dns enum, Performing flag scan using hping3.

UNIT III:

Hacking into System: System Hacking, Password Cracking, Default password databases, Manual and Automated Password Cracking, Process of System Hacking, Using Keyloggers, **Trojans & Backdoors:** Trojans, Working of Trojan, Infection Techniques, Attack, Lifecycle and Classification of Virus, Worms, Virus Construction Kit.

UNIT IV:

Sniffing, Packet Analysis & Session Hijacking: Sniffing, Packet Analysis, Types of Sniffing, Active and Passive Sniffing Techniques, Session Hijacking, **Social Engineering:** Social Engineering, Process, Identity Theft, Human and Computer Based Social Engineering Techniques, Phishing Process, Types of Phishing Attacks, Social Engineering Toolkit (SET)

UNIT V:

Cryptography: Cryptography, Digital Signature, Hash Functions, **Steganography:** Steganography Process, watermarking, Steganography Methods and Attacks, Steganography tools, **Vulnerability Assessment:** Vulnerability, The Open Web Application Security Project (OWASP), Prevention, Damn Vulnerable Web Application (DVWA), installation and testing of DVWA

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Text Books:

1. Hacking: Be a Hacker with Ethics, Harsh Bothra, Khanna Publications, 2019
2. Ethical Hacking and Penetration Testing Guide, Rafay Baloch, 2014

Reference Books:

1. Kali Linux Wireless Penetration Testing Beginner's Guide, Vivek Ramachandran, Cameron Buchanan, Packt Publishing, 2015
2. SQL Injection Attacks and Defense, 1st Edition, Justin Clarke-Salt, Syngress Publication
3. Mastering Modern Web Penetration Testing, Prakhar Prasad, Packt Publishing, October 2016

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year – I Semester		L	T	P	C
		3	0	0	3
API AND MICROSERVICES (Job Oriented Course)					

Course Outcomes:
At the end of this course, the student will be able to

- Develop a Spring Data JPA application with Spring Boot
- Implement CRUD operations using Spring Data JPA
- Implement pagination and sorting mechanism using Spring Data JPA
- Implement query methods for querying the database using Spring Data JPA
- Implement a custom repository to customize a querying mechanism using Spring Data JPA
- Understand update operation using query approaches in Spring Data JPA
- Implement Spring Transaction using Spring Data JPA
- Develop RESTful endpoints using Spring REST Processing URI parameters
- Write RESTful services using Spring REST that consumes and produces data in different formats
- Handle exceptions and errors in Spring REST endpoints
- Write Spring based REST clients to consume RESTful services programmatically
- Create secure RESTful endpoints using Spring Security Document and version the Spring REST endpoints Implement CORS in a Spring REST application

UNIT I:
Spring 5 Basics : Why Spring, What is Spring Framework, Spring Framework - Modules, Configuring IoC container using Java-based configuration, Introduction To Dependency Injection, Constructor Injection, Setter Injection, What is AutoScanning

UNIT II:
Spring Boot: Creating a Spring Boot Application, Spring Boot Application Annotation, What is Autowiring , Scope of a bean, Logger, Introduction to Spring AOP, Implementing AOP advices, Best Practices : Spring Boot Application

UNIT III:
Spring Data JPA with Boot: Limitations of JDBC API, Why Spring Data JPA, Spring Data JPA with Spring Boot, Spring Data JPA Configuration, Pagination and Sorting, Query Approaches, Named Queries and Query, Why Spring Transaction, Spring Declarative Transaction, Update Operation in Spring Data JPA, Custom Repository Implementation, Best Practices - Spring Data JPA

UNIT IV:
Web Services: Why Web services, SOA - Service Oriented Architecture, What are Web Services, Types of Web Services, SOAP based Web Services, RESTful Web Services, How to create RESTful Services

UNIT V:
Spring REST: Spring REST - An Introduction, Creating a Spring REST Controller, @RequestBody and ResponseEntity, Parameter Injection, Usage of @PathVariable, @RequestParam and @MatrixVariable, Exception Handling, Data Validation, Creating a REST Client, Versioning a Spring REST endpoint, Enabling CORS in Spring REST, Securing Spring REST endpoints

Hardware and software configuration
- 4 or 8 GB RAM/126 GB ROM
- Swagger tool suite(opensource)
- OpenJDK 17 or Java 11,Maven 3.2 or above and MySQL 8.0 or above,Spring Tool suite, Postman

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Text Books:

1. Spring in action, 5th Edition, Author: Craig Walls, Ryan Breidenbach, Manning books

Web Links [Courses mapped to Infosys Springboard platform]:

Infosys Springboard courses:

1. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_01296689056211763272_shared/overview [Spring 5 Basics with Spring Boot]
2. https://infyspringboard.onwingspan.com/en/app/toc/lex_4313461831752789500_shared/overview [Spring Data JPA with Boot]
3. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_012731900963905536190_shared/overview [Spring REST]

Web references:

1. Dependency Injection in spring - javatpoint
2. Autowiring in Spring - javatpoint
3. https://docs.spring.io/spring-boot/docs/2.0.x/reference/html/using-boot-using-springbootapplication-annotation.html
4. Autowiring in Spring - javatpoint,https://www.baeldung.com/spring-bean-scopes
5. Spring Boot Logging | How does logging works in spring boot with example (educba.com)
6. Spring AOP Tutorial | Aspect Oriented Programming - javatpoint
7. Spring Boot Best Practices (javaguides.net)
8. Introduction to Spring Data JPA | SpringHow
9. https://asbnotebook.com/spring-data-jpa-crud-example/ ,https://www.bezkoder.com/spring-boot-jpa-crud-rest-api/
10. Pagination and Sorting using Spring Data JPA - PagingAndSortingRepository (javaguides.net)
11. https://www.javaguides.net/2018/11/spring-data-jpa-query-creation-from-method-names.html,https://www.javaguides.net/2022/02/spring-data-jpa-namedqueries-example.html
12. https://javadeveloperzone.com/spring/spring-declarative-transaction-management/
13. https://javadeveloperzone.com/spring/spring-declarative-transaction-management/
14. https://javabeat.net/spring-data-custom-repository/
15. https://www.jrebel.com/blog/jpa-application-performance-best-practices
16. https://www.javatpoint.com/service-oriented-architecture,https://www.javatpoint.com/web-services-tutorial
17. https://www.javatpoint.com/soap-web-services,https://www.javatpoint.com/restful-web-services
18. RESTful Web Services - javatpoint
19. https://www.javatpoint.com/restful-web-services-spring-boot
20. https://www.javatpoint.com/restful-web-services-spring-boothttps://dzone.com/articles/lifecycle-of-a-request-response-process-for-a-spri
21. https://www.ibm.com/docs/en/was/8.5.5?topic=applications-defining-uri-patterns-resources-in-restful
22. https://www.baeldung.com/exception-handling-for-rest-with-spring
23. https://howtodoinjava.com/spring-boot2/resttemplate/spring-restful-client-resttemplate-example/
24. https://www.javatpoint.com/restful-web-services-versioning



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25. https://spring.io/guides/gs/rest-service-cors/
26. https://www.javatpoint.com/restful-web-services-basic-authentication-with-spring-security
27. https://www.springboottutorial.com/rest-api-best-practices-with-java-and-spring

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IV Year – I Semester		L	T	P	C
		3	0	0	3
SECURE CODING TECHNIQUES (Job Oriented Course)					

Course Outcomes:
At the end of the Course, student will be able to:
- Differentiate the objectives of information security
- Understand the trend, reasons and impact of the recent Cyber attacks
- Understand OWASP design principles while designing a web application
- Understand Threat modelling
- Importance of security in all phases of SDLC
- Write secure coding using some of the practices in C/C++/Java and Python programming languages

UNIT I:
Network and Information security Fundamentals: Network Basics, Network Components, Network Types, Network Communication Types, Introduction to Networking Models, Cyber Security Objectives and Services, Other Terms of Cyber Security, Myths Around Cyber Security, Myths Around Cyber Security, Recent Cyber Attacks, Generic Conclusion about Attacks, Why and What is Cyber Security, Categories of Attack

UNIT II:
Introduction to Cyber security: Introduction to OWASP Top 10, A1 Injection, A1 Injection Risks Root Causes and its Mitigation, A1 Injection, A2 Broken Authentication and Session Management, A7 Cross Site Scripting XSS,A3 Sensitive Data Exposure, A5 Broken Access Control, A4 XML External Entity (XEE), A6 Security Misconfiguration, A7 Missing Function Level Access Control, A8 Cross Site Request Forgery CSRF, A8 Insecure Deserialization, A9 Using Components With Known Vulnerabilities, A10 Unvalidated Redirects and Forwards, A10 Insufficient Logging and Monitoring, Secure Coding Practices, Secure Design Principles, Threat Modeling, Microsoft SDL Tool

UNIT III:
Secure coding practices and OWASP Top 10: Declarative Security, Programmatic Security, Concurrency, Configuration, Cryptography, Input and Output Sanitization, Error Handling, Input Validation, Logging and auditing, Session Management, Exception Management, Safe APIs, Type Safety, Memory Management, Tokenizing, Sandboxing, Static and dynamic testing, vulnerability scanning and penetration testing

UNIT IV:
Secure coding practices in C/C++ and Java: Potential Software Risks in C/C++, Defensive coding, Preventative Planning, Clean Code, Iterative Design, Assertions, Pre Post Conditions, Low level design inspections, Unit Tests
Java- Managing Denial of Service, Securing Information, Data Integrity, Accessibility and Extensibility, Securing Objects, Serialization Security

UNIT V:
Secure coding in Python: Interactive Python Scripting, Python Variables, Conditionals, Loops, Functions, External Modules, File operations, Web requests

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Text Books:

1. Networking Fundamentals, 2019 edition, Packt, Author: Gordon Davies
2. Principles of Information Security, Authors: Michael E. Whitman and Herbert J. Mattord, Course technology incorp.
3. CSSLP SECURE SOFTWARE LIFECYCLE PROFESSIONAL ALL-IN-ONE EXAM GUIDE, Third Edition, 3rd Edition, Authors: Wm. Arthur Conklin, Daniel Paul Shoemaker, Released February 2022,Publisher(s): McGraw-Hill,ISBN: 9781264258215
4. OCP Oracle Certified Professional Java SE 11 Programmer II Study Guide: Exam 1Z0-816 and Exam 1Z0-817 Paperback – 6 August 2020, Authors: Scott Selikoff , Jeanne Boyarsky
5. OWASP 2017 Handbook,

https://owasp.org/www-pdf-archive/OWASP_Top_10_2017_RC2_Final.pdf

Web Links:

Infosys Springboard courses

1. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_012683751296065536354_shared/contents [Network Fundamentals]
2. https://infyspringboard.onwingspan.com/en/app/toc/lex_3388902307073574000_shared/overview [Introduction to cybersecurity]
3. https://infyspringboard.onwingspan.com/en/viewer/html/lex_auth_013501569657159680916 0 [Certified Secure Software Lifecycle Professional (CSSLP) 2019: Secure Coding Practices]
4. https://infyspringboard.onwingspan.com/en/viewer/html/lex_auth_013501568992755712966 0 [OWASP Top 10: Web Application Security]
5. https://infyspringboard.onwingspan.com/en/viewer/html/lex_auth_013501593040977920130 93 [Defensive coding fundamentals in C and C++]
6. https://infyspringboard.onwingspan.com/en/viewer/html/lex_auth_013501591729692672131 25 [Java SE 11 Programmer II: Secure Coding in Java SE 11 Applications]
7. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_013501581644931072111 92/overview [Security Programming: Python Scripting Essentials]

Web references:

1. https://www.stealthlabs.com/blog/infographic-top-15-cybersecurity-myths-vs-reality/
2. https://microage.ca/cybersecurity-layering-approach/
3. https://www.synopsys.com/glossary/what-is-threat-modeling.html#:~:text=Threat%20modeling%20is%20a%20structured,An%20abstraction%20of%20the%20system
4. https://www.microsoft.com/en-us/securityengineering/sdl/threatmodeling
5. https://www.checkpoint.com/cyber-hub/threat-prevention/what-is-sandboxing/
6. https://www.skillsoft.com/course/defensive-coding-fundamentals-for-cc-f44c02f9-1bcc-11e7-b15b-0242c0a80b07#:~:text=Defensive%20Programming%20is%20a%20methodology,%2C%20testing%2C%20and%20input%20validation.
7. https://www.oracle.com/java/technologies/javase/seccodeguide.html
8. https://www.skillsoft.com/course/security-programming-python-scripting-essentials-be99adad-1f65-47a8-a4b5-6b5346072b8e

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IV Year – I Semester		L	T	P	C
		3	0	0	3
UNIVERSAL HUMAN VALUES 2: UNDERSTANDING HARMONY					

Human Values Courses
This course also discusses their role in their family. It, very briefly, touches issues related to their role in the society and the nature, which needs to be discussed at length in one more semester forwhich the foundation course named as "H-102 Universal Human Values 2: Understanding Harmony"is designed which may be covered in their III or IV semester. During the Induction Program, students would get an initial exposure to human values through Universal Human Values – I. This exposure is to be augmented by this compulsory full semester foundation course.

Universal Human Values 2: Understanding Harmony
Course code: HSMC (H-102)
Credits: L-T-P-C 2-1-0-3 or 2L:1T:0P 3 credits
Pre-requisites: None. Universal Human Values 1 (desirable)

1. Objective:
The objective of the course is four fold:
1. Development of a holistic perspective based on self-exploration about themselves (human being),family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

2. Course Topics:
The course has 28 lectures and 14 practice sessions in 5 modules:

Module 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education
1. Purpose and motivation for the course, recapitulation from Universal Human Values-I
2. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than asarbitrariness in choice based on liking-disliking

Module 2: Understanding Harmony in the Human Being - Harmony in Myself!
4. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
5. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
6. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
7. Understanding the characteristics and activities of 'I' and harmony in 'I'
8. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
9. Programs to ensureSanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

Module 3: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

10. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
11. Understanding the meaning of Trust; Difference between intention and competence
12. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
13. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
14. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family**.**

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

Module 4: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

18. Understanding the harmony in the Nature
19. Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature
20. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space
21. Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

Module 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics

22. Natural acceptance of human values
23. Definitiveness of Ethical Human Conduct
24. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
25. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people- friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
26. Case studies of typical holistic technologies, management models and production systems
27. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations
28. Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

3. READINGS:

3.1 Text Book

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books,New Delhi, 2010



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3.2 Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

4. MODE OF CONDUCT (L-T-P-C 2-1-0-3 or 2L:1T:0P 3 credits)

Lectures hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them.
Tutorial hours are to be used for practice sessions.
While analysing and discussing the topic, the faculty mentor's role is in pointing to essentialelements to help in sorting them out from the surface elements. In other words, help the studentsexplore the important or critical elements.

In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self-exploration. Scenarios may be used to initiate discussion. The student is encouraged to take up" ordinary" situations rather than" extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions (tutorials)
would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working basedon basic humanvalues.

It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional content may be offered in separate, higher courses.

This course is to be taught by faculty from every teaching department, including HSS faculty. Teacher preparation with a minimum exposure to at least one 8-day FDP on Universal Human Values is deemed essential.

5. ASSESSMENT:

This is a compulsory credit course. The assessment is to provide a fair state of development of thestudent, so participation in classroom discussions, self-assessment, peer assessment etc. will be used in evaluation.
Example:

Assessment by faculty mentor: 10 marks
Self-assessment: 10 marks
Assessment by peers: 10 marks
Socially relevant project/Group Activities/Assignments: 20 marks
Semester End Examination: 50 marks

The overall pass percentage is 40%. In case the student fails, he/she must repeat the course**.**

6. OUTCOME OF THE COURSE:

By the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.

They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

This is only an introductory foundational input. It would be desirable to follow it up by

a) faculty-student or mentor-mentee programs throughout their time with the institution

b) Higher level courses on human values in every aspect of living. E.g. as a professional

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IV Year – I Semester		L	T	P	C
		0	0	4	2
PYTHON: DEEP LEARNING (Skill Oriented Course)					

Course Outcomes:
At the end of the Course, Student will be able to:

- Demonstrate the basic concepts fundamental learning techniques and layers.
- Discuss the Neural Network training, various random models.
- Apply various optimization algorithms to comprehend different activation
- functions to understand hyper parameter tuning
- Build a convolutional neural network, and understand its application to build a
- recurrent neural network, and understand its usage to comprehend auto encoders to briefly explain transfer learning

Pre-requisite knowledge :

- Exploratory data analysis: Collecting, importing, pre-processing, organizing, exploring, analyzing data and deriving insights from data https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012666909428129792728_shared/overview
- Data visualization using Python: Data visualization functions and plots https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012605191343693824145 5_shared/overview
- Regression analysis: Regression, types, linear, polynomial, multiple linear, Generalized linear regression models https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013204080133365760 65_shared/overview
- Clustering using Python: Clustering, techniques, Assessment and evaluation https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013044179942342656119 0_shared/overview
- Machine learning using Python: Machine learning fundamentals, Regression, classification, clustering, introduction to artificial neural networks https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012600400790749184237_shared/overview
- Time series analysis : Patterns, decomposition models, smoothing time, forecasting data https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012605180474425344128 0_shared/overview

List of Exercises:

Note: There are online courses indicated in the reference links section. Learners need to go through the contents in order to perform the given exercises

Exercise 1:

Course name : .Build a Convolution Neural Network for Image Recognition.
Go through the modules of the course mentioned and answer the self-assessment questions given in the link below at the end of the course.
Self Assessment - Deep Learning - Viewer Page | Infosys Springboard (onwingspan.com)

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Exercise 2:

Module name : Understanding and Using ANN : Identifying age group of an actor
Exercise : Design Artificial Neural Networks for Identifying and Classifying an actor using Kaggle Dataset.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_01277649241666355225 9_shared?collectionId=lex_auth_0127481425493114885 9_shared&collectionType=Course

Exercise 3:

Module name : Understanding and Using CNN : Image recognition
Exercise: Design a CNN for Image Recognition which includes hyperparameter tuning.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_01278569444316774491 0_shared?collectionId=lex_auth_0127481425493114885 9_shared&collectionType=Course

Exercise 4:

Module name : Predicting Sequential Data
Exercise: Implement a Recurrence Neural Network for Predicting Sequential Data.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_01279144948849868822_shared?collectionId=lex_auth_0127481425493114885 9_shared&collectionType=Course

Exercise 5:

Module Name: Removing noise from the images
Exercise: Implement Multi-Layer Perceptron algorithm for Image denoising hyperparameter tuning.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_01279205825881702427 2_shared?collectionId=lex_auth_0127481425493114885 9_shared&collectionType=Course

Exercise 6:

Module Name: Advanced Deep Learning Architectures
Exercise: Implement Object Detection Using YOLO.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_01310292337329766487 3_shared?collectionId=lex_auth_0127481425493114885 9_shared&collectionType=Course

Exercise 7:

Module Name: Optimization of Training in Deep Learning
Exercise Name: Design a Deep learning Network for Robust Bi-Tempered Logistic Loss.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_01310791722668032018 4_shared?collectionId=lex_auth_0127481425493114885 9_shared&collectionType=Course

Exercise 8:

Module name: Advanced CNN
Exercise: Build AlexNet using Advanced CNN.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_01311184442254131298 4_shared?collectionId=lex_auth_0127481425493114885 9_shared&collectionType=Course

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Exercise 9:

Module name: Autoencoders Advanced
Exercise: Demonstration of Application of Autoencoders.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013116455128989696208 1_shared?collectionId=lex_auth_0127481425493114885 9_shared&collectionType=Course

Exercise 10 :

Module name: Advanced GANs
Exercise:Demonstration of GAN.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013115545666428928190 1_shared?collectionId=lex_auth_0127481425493114885 9_shared&collectionType=Course

Exercise 11:

Module name : Capstone project
Exercise : Complete the requirements given in capstone project
Description: In this capstone, learners will apply their deep learning knowledge and expertise to a real world challenge.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013119291805696000651_shared?collectionId=lex_auth_0127481425493114885 9_shared&collectionType=Course

Exercise 12:

Module name : Capstone project
Exercise : Complete the requirements given in capstone project
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013119291805696000651_shared?collectionId=lex_auth_0127481425493114885 9_shared&collectionType=Course

Reference Books:

1. Goodfellow, I., Bengio,Y., and Courville, A., Deep Learning, MIT Press, 2016.
2. Bishop, C., M., Pattern Recognition and Machine Learning, Springer, 2006.
3. Navin Kumar Manaswi, “Deep Learning with Applications Using Python”, Apress, 2018.

Hardware and software configuration:

Experimental Environment	**Configuration Instructions**	
Hardware Environment	CPU	Intel® Core ™ i7-6700 CPU 4GHz
	GPU	Nvidia GTX 750, 4GB
	Memory	8 GB
Software Environment	Operating System	Ubuntu 14.04, 64 bit
	Programming Environment	Tensorflow deep learning framework and Python language

Web Links: [Courses mapped to Infosys Springboard platform]

1. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_012782105116811264219_shared/contents [Introduction to Deep Learning]
2. https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013119291805696000651_shared [Deep learning for Developers]

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year – I Semester		L	T	P	C
		0	0	4	2
MEAN STACK TECHNOLOGIES-MODULE II- ANGULAR JS, MONGODB (Skill Oriented Course)					

Course Outcomes:

- Build a component-based application using Angular components and enhance their functionality using directives.
- Utilize data binding for developing Angular forms and bind them with model data.
- Apply Angular built-in or custom pipes to format the rendered data.
- Develop a single page applic
- ation by using synchronous or asynchronous Angular routing.
- Make use of MongoDB queries to perform CRUD operations on document database.

List of Exercises:

1.a	**Course Name:** Angular JS
	Module Name: Angular Application Setup
	Observe the link http://localhost:4200/welcome on which the mCart application is running. Perform the below activities to understand the features of the application.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24049616594198490000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
1.b	**Course Name:** Angular JS
	Module Name: Components and Modules
	Create a new component called hello and render Hello Angular on the page
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28217843279641040000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
1.c	**Course Name:** Angular JS
	Module Name: Elements of Template
	Add an event to the hello component template and when it is clicked, it should change the courseName.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_19226434057992030000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
1.d	**Course Name:** Angular JS
	Module Name: Change Detection
	progressively building the PoolCarz application
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_2560981637120771000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
2.a	**Course Name:** Angular JS
	Module Name: Structural Directives - ngIf
	Create a login form with username and password fields. If the user enters the correct credentials, it should render a "Welcome <<username>>" message otherwise it should render "Invalid Login!!! Please try again..." message
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_012763740226043904259 5_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

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2.b	**Course Name:** Angular JS
	Module Name: ngFor
	Create a courses array and rendering it in the template using ngFor directive in a list format.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_32795774277593590000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
2.c	**Course Name:** Angular JS
	Module Name: ngSwitch
	Display the correct option based on the value passed to ngSwitch directive.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_23388127475984175000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
2.d	**Course Name:** Angular JS
	Module Name: Custom Structural Directive
	Create a custom structural directive called 'repeat' which should repeat the element given a number of times.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24073319904331424000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
3.a	**Course Name:** Angular JS
	Module Name: Attribute Directives - ngStyle
	Apply multiple CSS properties to a paragraph in a component using ngStyle.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24037156998765367000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
3.b	**Course Name:** Angular JS
	Module Name: ngClass
	Apply multiple CSS classes to the text using ngClass directive.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_34596102970741820000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
3.c	**Course Name:** Angular JS
	Module Name: Custom Attribute Directive
	Create an attribute directive called 'showMessage' which should display the given message in a paragraph when a user clicks on it and should change the text color to red.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_14783742359773809000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
4.a	**Course Name:** Angular JS
	Module Name: Property Binding
	Binding image with class property using property binding.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_8951964709153619000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
4.b	**Course Name:** Angular JS
	Module Name: Attribute Binding
	Binding colspan attribute of a table element to the class property.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_7154252883180625000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course



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4.c	**Course Name:** Angular JS
	Module Name: Style and Event Binding
	Binding an element using inline style and user actions like entering text in input fields.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_7417401021103822000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
5.a	**Course Name:** Angular JS
	Module Name: Built in Pipes
	Display the product code in lowercase and product name in uppercase using built-in pipes.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_11810543990912035000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
5.b	**Course Name:** Angular JS
	Module Name: Passing Parameters to Pipes
	Apply built-in pipes with parameters to display product details.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_21187073707540988000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
5.c	**Course Name:** Angular JS
	Module Name: Nested Components Basics
	Load CourseslistComponent in the root component when a user clicks on the View courses list button.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24231999287700136000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
6.a	**Course Name:** Angular JS
	Module Name: Passing data from Container Component to Child Component
	Create an AppComponent that displays a dropdown with a list of courses as values in it. Create another component called the CoursesList component and load it in AppComponent which should display the course details. When the user selects a course from the
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_15758356947336235000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
6.b	**Course Name:** Angular JS
	Module Name: Passing data from Child Component to ContainerComponent
	Create an AppComponent that loads another component called the CoursesList component. Create another component called CoursesListComponent which should display the courses list in a table along with a register .button in each row. When a user clicks on th
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_2494980689916818400_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
6.c	**Course Name:** Angular JS
	Module Name: Shadow DOM
	Apply ShadowDOM and None encapsulation modes to components.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_10312243404892470000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
6.d	**Course Name:** Angular JS
	Module Name: Component Life Cycle



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	Override component life-cycle hooks and logging the corresponding messages to understand the flow.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_10818939635948007000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
7.a	**Course Name:** Angular JS
	Module Name: Template Driven Forms
	Create a course registration form as a template-driven form.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_2810668513603024400_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
7.b	**Course Name:** Angular JS
	Module Name: Model Driven Forms or Reactive Forms
	Create an employee registration form as a reactive form.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_33704702617536004000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
7.c	**Course Name:** Angular JS
	Module Name: Custom Validators in Reactive Forms
	Create a custom validator for an email field in the employee registration form (reactive form)
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_33728128192769250000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
8.a	**Course Name:** Angular JS
	Module Name: Custom Validators in Template Driven forms
	Create a custom validator for the email field in the course registration form.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_27688491925133280000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
8.b	**Course Name:** Angular JS
	Module Name: Services Basics
	Create a Book Component which fetches book details like id, name and displays them on the page in a list format. Store the book details in an array and fetch the data using a custom service.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_32584403823635940000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
8.c	**Course Name:** Angular JS
	Module Name: RxJS Observables
	Create and use an observable in Angular.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_6209609363905256000_shared?collectionId=lex_2085851554325460000_shared&collectionType=Course
9.a	**Course Name:** Angular JS
	Module Name: Server Communication using HttpClient
	Create an application for Server Communication using HttpClient
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_012763739531706368261 5_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
9.b	**Course Name:** Angular JS
	Module Name: Communicating with different backend services using Angular

	HttpClient
	Create a custom service called ProductService in which Http class is used to fetch data stored in the JSON files.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_4266333361795059700_shared?collectionId=lex_2085851554325460000 0_shared&collectionType=Course
10. a	**Course Name:** Angular JS
	Module Name: Routing Basics, Router Links
	Create multiple components and add routing to provide navigation between them.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_3782024852517635000_shared?collectionId=lex_2085851554325460000 0_shared&collectionType=Course
10. b	**Course Name:** Angular JS
	Module Name: Route Guards
	Considering the same example used for routing, add route guard to BooksComponent. Only after logging in, the user should be able to access BooksComponent. If the user tries to give the URL of Bookscomponent in another tab or window, or if the user tries
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_30303325731876470000_shared?collectionId=lex_208585155432546000 00_shared&collectionType=Course
10. c	**Course Name:** Angular JS
	Module Name: Asynchronous Routing
	Apply lazy loading to BookComponent. If lazy loading is not added to the demo, it has loaded in 1.14 s. Observe the load time at the bottom of the browser console. Press F12 in the browser and click the Network tab and check the Load time
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_9878739890118246000_shared?collectionId=lex_2085851554325460000 0_shared&collectionType=Course
10. d	**Course Name:** Angular JS
	Module Name: Nested Routes
	Implement Child Routes to a submodule.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_012768043900444672140_shared?collectionId=lex_208585155432 54600000_shared&collectionType=Course
11. a	**Course Name:** MongoDB Essentials - A Complete MongoDB Guide
	Module Name: Installing MongoDB on the local computer, Create MongoDB Atlas Cluster
	Install MongoDB and configure ATLAS
	https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01281821437313024030083_shared?collectionId=lex_auth_013177169294712832113_shared&collectionType=Course
11. b	**Course Name:** MongoDB Essentials - A Complete MongoDB Guide
	Module Name: Introduction to the CRUD Operations
	Write MongoDB queries to perform CRUD operations on document using insert(), find(), update(), remove()
	https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01281821874166169630118_shared?collectionId=lex_auth_013177169294712832113_shared&collectionType=Course
12. a	**Course Name:** MongoDB Essentials - A Complete MongoDB Guide
	Module Name: Create and Delete Databases and Collections
	Write MongoDB queries to Create and drop databases and collections.
	https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01281821654

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	119219230121_shared?collectionId=lex_auth_01317716929471283211 3_shared&collectionType=Course
12. b	**Course Name:** MongoDB Essentials - A Complete MongoDB Guide
	Module Name: Introduction to MongoDB Queries
	Write MongoDB queries to work with records using find(), limit(), sort(), createIndex(), aggregate().
	https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_013289081626451968250 5_shared?collectionId=lex_auth_01317716929471283211 3_shared&collectionType=Course

Text Books:

1. Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson.
2. Pro Mean Stack Development, 1st Edition, ELadElrom, Apress O'Reilly.
3. Full Stack JavaScript Development with MEAN, Colin J Ihrig, Adam Bretz, 1st edition, SitePoint, SitePoint Pty. Ltd., O'Reilly Media.
4. MongoDB – The Definitive Guide, 2nd Edition, Kristina Chodorow, O'Reilly

Software configuration and installation:

1. Angular
   Setup details: Angular Application Setup - Internal - Viewer Page | Infosys Springboard (onwingspan.com)
2. MongoDB
   TOC - MongoDB Essentials - A Complete MongoDB Guide | Infosys Springboard (onwingspan.com)

Web Links:

1. https://infyspringboard.onwingspan.com/en/app/toc/lex_20858515543254600000_shared/overview (Angular JS)

2. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_01317716929471283211 3_shared/overview (MongoDB)

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IV Year – I Semester	Minor Course	L	T	P	C
		3	0	2	4
SOFTWARE ENGINEERING					

Course Objectives:
This course is designed to acquire the generic software development skill through various stages of software life cycle and also to ensure the quality of software through software development with various protocol based environment

Course Outcomes:
Students taking this subject will gain software engineering skills in the following areas:

- Ability to transform an Object-Oriented Design into high quality, executable code
- Skills to design, implement, and execute test cases at the Unit and Integration level
- Compare conventional and agile software methods
- Prepare SRS document, design document, test cases and software configuration management and risk management related document.
- Develop function oriented and object oriented software design using tools like rational rose.
- Use modern engineering tools necessary for software project management, estimations, time management and software reuse
- Generate test cases for software testing

UNIT I
The Nature of Software, Software Engineering, The Software Process, Software Engineering Practice, Software Myths. A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Technology.

UNIT II
Agility, Agility and the Cost of Change, Agile Process, Extreme Programming (XP), Other Agile Process Models, A Tool Set for the Agile Process, Software Engineering Knowledge, Core Principles, Principles That Guide Each Framework Activity, Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Requirements Model, Negotiating Requirements, Validating Requirements.

UNIT III
Requirements Analysis, Scenario-Based Modeling, UML Models That Supplement the Use Case, Data Modeling Concepts, Class-Based Modeling, Requirements Modeling Strategies, Flow-Oriented Modeling, Creating a Behavioral Model, Patterns for Requirements Modelling,.

UNIT IV
Design within the Context of Software Engineering, The Design Process, Design Concepts, The Design Model, Software Architecture, Architectural Genres, Architectural Styles,
Assessing Alternative Architectural Designs, Architectural Mapping Using Data Flow, Components, Designing Class-Based Components, Conducting Component-Level Design, Component-Level Design for WebApps, Designing Traditional Components, Component- Based Development.

UNIT V
The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, Design Evaluation, Elements of Software Qualtiy Assurance, SQA Tasks, Goals & Metrics, Statistical SQA, Software Reliability, A Strategic Approach to Software Testing, Strategic Issues, Test Strategies

for Conventional Software, Test Strategies for Object-Oriented Software, Test Strategies for WebApps, Validation Testing, System Testing, The Art of Debugging, Software Testing Fundamentals, Internal and External Views of Testing, White-Box Testing, Basis Path Testing.

List of Experiments:

1) Perform the following, for the following experiments:
   i. Do the Requirement Analysis and Prepare SRS
   ii. Draw E-R diagrams, DFD, CFD and structured charts for the project.
1) Course Registration System
2) Students Marks Analyzing System
3) Online Ticket Reservation System
4) Stock Maintenance
5) Draw the UML Diagrams for the problem 1,2, 3, 4.
6) Design the test cases for e-Commerce application (Flipcart, Amazon)
7) Design and Implement ATM system through UML Diagrams.

Text Books:

1) Software Engineering a practitioner's approach, Roger S. Pressman, Seventh Edition, McGraw Hill Higher Education.
2) Software Engineering, Ian Sommerville, Ninth Edition, Pearson.

Reference Books:

1) Software Engineering, A Precise Approach, PankajJalote, Wiley India, 2010.
2) Software Engineering, Ugrasen Suman, Cengage.

e-Resources:

1) https://nptel.ac.in/courses/106/105/106105182/



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MINOR COURSES

PART –B

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PART B	Minor Course	L	T	P	C
		4	0	0	4
COMPUTATIONAL THINKING					

Course Objective:

- The subject is aimed at students with little or no programming experience.
- It aims to provide students with an understanding of the role computation can play in solving problems.
- It also aims to help students, regardless of their major, to feel justifiably confident of their ability to write small programs that allow them to accomplish useful goals.

Course Outcomes:

After studying this course, Student should be able to:

1. Describe the skills that are involved in computational thinking
2. Demonstrate the concepts of Boolean Logic and Software Development.
3. Analyze the concepts of algorithmic thinking as modeling and abstraction as encapsulation.
4. Illustrate the distinctive nature of data organization, White box and Black box testing.
5. Student will be aware of a range of applications of computational thinking in different disciplines, Authentication and authorization.

UNIT I:
Introduction: Computers, Computational Thinking, Abacus to Machine, The First Software, The First Modern Computer, Moore's Law, **Real-World Information Becomes Computable Data,** Information and Data, Converting Information into Data, Data Capacity, Data Compression

UNIT II:
Logic: Boolean Logic, Applications of Propositional Logic, **Solving Problems,** Logical Reasoning, Decomposition: Software Design, Decomposition: Other Uses, Abstraction: Class Diagrams, Abstraction: Use Case Diagrams

UNIT III:
Algorithmic Thinking: Algorithms, Software and Programming, Languages, Actions, **Modeling Solutions:** Activity Diagrams, Selection in Activity Diagrams, Repetition in Activity Diagrams, Control Abstraction in Activity Diagrams, States and State Diagrams, Behavior in State Diagrams,

UNIT IV:
Data Organization: Names, Lists, Graphs, Hierarchies, **Algorithmic Thinking:** Von Neumann Architecture, Spreadsheets, Text Processing, Patterns, Computer Errors, Software Correctness, Verification, Software Testing, White Box Testing, Black Box Testing with Equivalence Partitioning, Boundary Value Analysis

UNIT V:
Concurrent Activity: Parallelism or Concurrency, Scheduling, Sorting Networks, **Information Security:** Security, Foundations, Common Forms of Cybercrime, Secure- Step 1: Authenticate, Secure- Step 2: Authorization, All a Matter of Risk

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Text Book:

1. David Riley, Kenny A. Hunt, Computational Thinking for the Modern Problem Solver, 2014.
2. G Venkatesh, Madhavan Mukund, Computational Thinking: A Primer for Programmers and Data Scientists, 2021.

Reference Books:

1. Paolo Ferragina, Fabrizio Luccio, Computational Thinking: First Algorithms, then coding, Springer, 2018.
2. Karl Beecher, computational thinking: A beginner's guide to problem-solving and programming, 2017.

NPTEL Link: Physics through Computational Thinking:
https://onlinecourses.nptel.ac.in/noc22_ph12/preview

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PART B	Minor Course	L	T	P	C
		3	0	2	4
OBJECT ORIENTED PROGRAMMING THROUGH JAVA					

Course Objectives:
The learning objectives of this course are:
- To identify Java language components and how they work together in applications
- To learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
- To learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications
- Practice programming in the Java
- Gain knowledge of object-oriented paradigm in the Java programming language

Course Outcomes:
By the end of the course, the student will be
- Evaluate default value of all primitive data type, Operations, Expressions, Control- flow, Strings
- Determine Class, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
- Illustrating simple inheritance, multi-level inheritance, Exception handling mechanism
- Construct Threads, Event Handling, implement packages, developing applets

UNIT I
Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.
Data Types, Variables, and Operators :Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final, Introduction to Operators, Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.

Control Statements: Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator?:, Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.

UNIT II
Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this.
Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.

UNIT III
Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-

dimensional Arrays, Arrays of Varying Lengths, Three- dimensional Arrays, Arrays as Vectors.
Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.
Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.

UNIT IV
Packages and Java Library: Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java.lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto-unboxing, Java util Classes and Interfaces, Random Class, Time Package, Formatting for Date/Time in Java,
Exception Handling: Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions, try-with-resources, Catching Subclass Exception, Custom Exceptions, Nested try and catch Blocks, Rethrowing Exception, Throws Clause.

UNIT V
String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Methods for Comparison of Strings, Methods for Modifying Strings, Methods for Searching Strings, Data Conversion and Miscellaneous Methods, Class String Buffer, Class String Builder.

List of Experiments:

Exercise - 1 (Basics)
a) Write a JAVA program to display default value of all primitive data type of JAVA
b) Write a java program that display the roots of a quadratic equation $ax^2+bx=0$. Calculate the discriminate D and basing on value of D, describe the nature of root.

Exercise - 2 (Operations, Expressions, Control-flow, Strings)
a) Write a JAVA program to search for an element in a given list of elements using binary search mechanism.
b) Write a JAVA program to sort for an element in a given list of elements using bubble sort
c) Write a JAVA program using StringBuffer to delete, remove character.

Exercise - 3 (Class, Objects)
a) Write a JAVA program to implement class mechanism. Create a class, methods and invoke them inside main method.
b) Write a JAVA program to implement constructor.

Exercise - 4 (Methods)
a) Write a JAVA program to implement constructor overloading.
b) Write a JAVA program implement method overloading.

Exercise - 5 (Inheritance)
a) Write a JAVA program to implement Single Inheritance
b) Write a JAVA program to implement multi level Inheritance



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Exercise - 6 (Inheritance - Continued)
a) Write a JAVA program give example for "super" keyword.
b) Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?

Exercise - 7 (Exception)
a) Write a JAVA program that describes exception handling mechanism
b) Write a JAVA program Illustrating Multiple catch clauses

Exercise – 8 (Runtime Polymorphism)
Write a JAVA program that implements Runtime polymorphism

Exercise – 9 (User defined Exception)
a) Write a JAVA program for creation of Illustrating throw
b) Write a JAVA program for creation of Illustrating finally

Text Books:
1) JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
2) The complete Reference Java, 8th edition, Herbert Schildt, TMH.

References Books:
1) Introduction to java programming, 7th edition by Y Daniel Liang, Pearson
2) Murach's Java Programming, Joel Murach

e-Resources:
1) https://nptel.ac.in/courses/106/105/106105191/
2) https://www.w3schools.com/java/java_data_types.asp

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

PART B	Minor Course	L	T	P	C
		3	0	2	4
DATA ANALYTICS USING PYTHON					

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

PART B	Minor Course	L	T	P	C
		4	0	0	4
ARTIFICIAL INTELLIGENCE					

Course Objectives: The student will be able to

- Know the methodology of Problem solving
- Implement basic AI algorithms
- Design and carry out an empirical evolution of different algorithms on a problem formalization

Course Outcomes (COs): At the end of the course, student will be able to

- Understand the fundamental concepts in Artificial Intelligence
- Analyze the applications of search strategies and problem reductions
- Apply the mathematical logic concepts.
- Develop the Knowledge representations in Artificial Intelligence.
- Explain the Fuzzy logic systems.

UNIT I:

Introduction to artificial intelligence: Introduction ,history, intelligent systems, foundations of AI, applications, tic-tac-tie game playing, development of AI languages, current trends in AI.

UNIT II:

Problem solving: state-space search and control strategies: Introduction, general problem solving, characteristics of problem

Search Strategies: exhaustive searches, heuristic search techniques, iterative-deepening A*, constraint satisfaction

UNIT III:

Logic concepts: Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, predicate logic

UNIT IV:

Knowledge representation: Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR

Advanced knowledge representation techniques: Introduction, conceptual dependency theory, script structure.

UNIT V:

Expert system and applications: Introduction phases in building expert systems, expert system versus traditional systems, rule-based expert systems blackboard systems truth maintenance systems, application of expert systems, list of shells and tools.

Text Books:

1. Artificial Intelligence, Saroj Kaushik, CENGAGE Learning,
2. Artificial intelligence, A modern Approach , 2nd ed, Stuart Russel, Peter Norvig, PEA
3. Artificial Intelligence, Rich, Kevin Knight, Shiv Shankar B Nair, 3rd ed, TMH
4. Introduction to Artificial Intelligence, Patterson, PHI

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Reference Books:

1. Artificial intelligence, structures and Strategies for Complex problem solving, -George F Lugar, 5th ed, PEA
2. Introduction to Artificial Intelligence, Ertel, Wolf Gang, Springer
3. Artificial Intelligence, A new Synthesis, Nils J Nilsson, Elsevier

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

PART B	Minor Course	L	T	P	C
		3	0	2	4
UNIX AND SHELL PROGRAMMING					

Course Objectives:
Understating the shell commands, shell programming, system calls of files and processes, signals, inter-process communication concepts and programming, TCP and UDP.

Course Outcomes: After finishing this course student will be able to:

- Gain good knowledge on Unix commands and awareness of shell programming
- Know about different system calls for files and directories
- Ability to know the working of processes and signals
- Application of client server program for IPC
- Knowledge about socket programming

UNIT-I:
Introduction, Architecture of unix, Responsibilities of shell, unix file system, vi editor. **Unix commands**: Some Basic Commands, file utilities, process utilities, text processing utilities, network utilities, disk utilities, backup utilities , Security by file permissions.

UNIT-II:
Shell Programming: shell variables, The Export command, The Profile File a Script Run During starting, The First Shell Script, The read command, Positional Parameters, The $? Variable , Knowing the exit Status- More about the Set Command, The Exit command, Branching Control Structures, Loop Control Structures, The Continue and Break Statement- The Expr Command, Performing Integer Arithmetic- Real Arithmetic in Shell Programs- The here Document(<<), The Sleep Command, Debugging Scripts, The Script command, The Eval command, The Exec Command, Sample programs.

UNIT-III:
Files - Introduction, file descriptors, open, creat, read, write, close, lseek, dup2, file status information-stat family, file and record locking- fcntl function, file permissions - chmod, fchmod, file ownership-chown, lchown, links-soft and hard links-symlink, link, unlink.

UNIT IV:
Directories-Creating, removing and changing Directories-mkdir, rmdir, chdir, obtaining current working directory-getcwd, Directory contents, Scanning Directories-opendir, readdir, closedir, rewinddir functions.

UNIT V:
Process Control: process identifiers, fork function, vfork function, exit function, wait and waitpid functions, exec functions, user identification. **Signals**: signal handling using signal function, kill and raise, alarm, pause, abort and sleep functions.

List of Experiments:

1)a) Study of Unix/Linux general purpose utility command list: man,who,cat, cd, cp, ps, ls, mv, rm, mkdir, rmdir, echo, more, date, time, kill, history, chmod, chown, finger, pwd, cal, logout, shutdown.
b) Study of vi editor
c) Study of Bash shell, Bourne shell and C shell in Unix/Linux operating system
d) Study of Unix/Linux file system (tree structure)

e)Study of .bashrc, /etc/bashrc and Environment variables.

2)Write a C program that makes a copy of a file using standard I/O, and system calls
3)Write a C program to emulate the UNIX ls –l command.
4)Write a C program that illustrates how to execute two commands concurrently with a command pipe. Ex: - ls –l | sort

5) Implementation of fork (), wait (), exec() andexit (), System calls

Text Books:

4. Unix the ultimate guide, 3rd edition, Sumitabha Das, TMH.
5. Advanced programming in the Unix environment by W. Richard Stevens.
6. Unix network programming by W. Richard Stevens.

Reference Books:

1. Introduction to Unix and shell programming, Venkateshmurhty
2. Unix and shell programming by B.M. Harwani, OXFORD university press.

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

PART B	Minor Course	L	T	P	C
		4	0	0	4
CLOUD COMPUTING					

Course Objectives:

- To explain the evolving computer model caned cloud computing.
- To introduce the various levels of services that can be achieved by cloud.
- To describe the security aspects in cloud.
- To motivate students to do programming and experiment with the various cloud computing environments.

Course Outcomes: At the end of the course, student will be able to

- Illustrate the key dimensions of the challenge of Cloud Computing
- Classify the Levels of Virtualization and mechanism of tools.
- Analyze Cloud infrastructure including Google Cloud and Amazon Cloud.
- Create Combinatorial Auctions for cloud resource and design scheduling algorithms for computing cloud
- Assess control storage systems and cloud security, the risks involved its impact and develop cloud application

UNIT I:
Systems Modeling, Clustering and Virtualization: Scalable Computing over the Internet-The Age of Internet Computing, Scalable computing over the internet, Technologies for Network Based Systems, System models for Distributed and Cloud Computing, , Performance, Security and Energy Efficiency

UNIT II:
Virtual Machines and Virtualization of Clusters and Data Centers: Implementation Levels of Virtualization, Virtualization Structures/ Tools and Mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data-Center Automation.

UNIT III:
Cloud Platform Architecture: Cloud Computing and Service Models, Public Cloud Platforms, Service Oriented Architecture, Programming on Amazon AWS and Microsoft Azure

UNIT IV:
Cloud Resource Management and Scheduling: Policies and Mechanisms for Resource Management, Applications of Control Theory to Task Scheduling on a Cloud, Stability of a Two Level Resource Allocation Architecture, Feedback Control Based on Dynamic Thresholds. Coordination of Specialized Autonomic Performance Managers, Resource Bundling, Scheduling Algorithms for Computing Clouds-Fair Queuing, Start Time Fair Queuing.

UNIT V:
Storage Systems: Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system.

Text Books:

3. Distributed and Cloud Computing, Kai Hwang, Geoffry C. Fox, Jack J. Dongarra MK Elsevier.
4. Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier.

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Reference Books:

4. Cloud Computing, A Hands on approach, ArshadeepBahga, Vijay Madisetti, University Press
5. Cloud Computing, A Practical Approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH
6. Mastering Cloud Computing, Foundations and Application Programming, Raj Kumar Buyya, Christen vecctiola, S Tammaraiselvi, TMH



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Suggested Courses for Honors Program

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year - II Semester	Honors Course	L	T	P	C
		4	0	0	4
MATHEMATICS FOR MACHINE LEARNING (AI & ML)					

Course Objectives:
The main objectives of this course is to make student understand and apply the basic mathematical concepts that are essential for machine learning algorithms

Course Outcomes:
By the end of the course, the student will be able to
- understand the basic notions of machine learning and of the related basic mathematical tools;
- comprehend the basic concepts and techniques of convex optimization
- have a good knowledge of the statistical and computational properties of some well known machine learning algorithms;
- implement machine learning algorithms on synthetic and real data sets using mathematical concepts like linear algebra, probability and calculus

UNIT-I
Linear Algebra: Systems of Linear Equations, Matrices, Solving Systems of Linear Equations, Vector Spaces, Linear Independence, Basis and Rank, Linear Mappings, Affine Spaces

UNIT-II
Analytic Geometry: Norms, Inner Products, Lengths and Distances, Angles and Orthogonality, Orthonormal Basis, Orthogonal Complement, Inner Product of Functions, Orthogonal Projections, Rotations

UNIT-III
Matrix Decompositions: Determinant and Trace, Eigenvalues and Eigenvectors, Cholesky Decomposition, Eigendecomposition and Diagonalization, Singular Value Decomposition, Matrix Approximation, Matrix Phylogeny

UNIT-IV
Vector Calculus : Differentiation of Univariate Functions, Partial Differentiation and Gradients, Gradients of Vector-Valued Functions, Gradients of Matrices, Useful Identities for Computing Gradients, Backpropagation and Automatic Differentiation, Higher-Order Derivatives, Linearization and Multivariate Taylor Series

UNIT-V
Probability and Distributions: Construction of a Probability Space, Discrete and Continuous Probabilities, Sum Rule, Product Rule, and Bayes' Theorem, Summary Statistics and Independence, Gaussian Distribution, Conjugacy and the Exponential Family, Change of Variables/Inverse Transform
Continuous Optimization: Optimization Using Gradient Descent, Constrained Optimization and Lagrange Multipliers, Convex Optimization

Text Books:
1. "Mathematics for Machine Learning", Marc Peter Deisenroth, A. Aldo Faisal and Cheng Soon Ong, Cambridge University Press.
2. The Elements of Statistical Learning: Data Mining, Inference, and Prediction, 2nd Edition, Trevor Hastie, Robert Tibshirani, Jerome Friedman, Springer 2017.

Reference Books:

1. Machine Learning: An Applied Mathematics Introduction, Paul Wilmott, Panda Ohana Publishing 2019.

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

	Honors Course	L	T	P	C
		4	0	0	4
TEXT MINING AND TIME SERIES ANALYSIS (AI & ML)					

Course Objectives: This course will cover the major techniques for mining and analyzing text data to discover interesting patterns, extract useful knowledge, and support decision making, with an emphasis on statistical approaches that can be generally applied to arbitrary text data in any natural language with no or minimum human effort. Develop the skills needed to do empirical research in fields operating with time series data sets. The course aims to provide students with techniques and receipts for estimation and assessment of quality of economic models with time series data.

Course Outcomes:
After completing the course Student will be able to:

- Student will be aware of fundamental concepts of text mining, unsupervised information extraction.
- Student will be aware of text clustering algorithms like feature selection, distance-based clustering and latent semantic indexing.
- Student will be aware of Text classification algorithm and text mining techniques.
- Student should aware of all the characteristics of time series and measures of dependencies.
- Student will be able to understand the ARIMA Models.

UNIT I:
Introduction to Text Mining: Introduction, Algorithms for Text Mining, Information Extraction from Text: Introduction, Named Entity Recognition, Relation Extraction, Unsupervised Information Extraction. Text Summarization Techniques: Extractive Summarization, Topic Representation Approaches, Influence of Context, Indicator Representation and Machine Learning for Summarization.

UNIT II:
Text Clustering Algorithms: Introduction, Feature Selection and Transformation Methods for Text Clustering, Distance-Based Clustering Algorithms, Word and Phrase-based Clustering, Probabilistic Document Clustering and Topic Modelling. Dimensionality Reduction and Topic Modelling: Latent Semantic Indexing, Topic Models and Dimension Reduction.

UNIT III:
Text Classification Algorithms: Introduction, Feature Selection for Text Classification, Decision Tree Classifiers, Rule-based Classifier, Probabilistic and Naïve Bayes Classifiers, Linear Classifier, Proximity-based Classifier, Meta-Algorithms for Text Classification, Probabilistic Models for Text Mining: Mixture models, Stochastic Processes in Bayesian Nonparametric Models, Graphical Models.

UNIT IV:
Characteristics of Time Series: Introduction, Nature of Time Series Data, Time Series Statistical Models, Measures of Dependence: Autocorrelation and Cross-Correlation, Stationary Time Series, Time Series Regression and Exploratory Data Analysis: Classical Regression, Exploratory Data Analysis, Smoothing.

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UNIT V:

ARIMA Models: Introduction, Autoregressive Moving Average Models, Difference Equations, Autocorrelation and Partial Autocorrelation, Building ARIMA Models, Multiplicative Seasonal ARIMA Models, Spectral Analysis and Filtering: Cyclical Behaviour and Periodicity, Spectral Density, Periodogram and Discrete Fourier Transform, Nonparametric and Parametric Spectral Estimation, Linear Filters, Dynamic Fourier Analysis and Wavelets.

Text Books:

1. Charu C. Aggarwal, Chengxing Zhai, "Mining Text Data", Kluver Academic Publishers, Springer, 2012.
2. Robert H. Shumway and David S. Stoffer, "Time Series Analysis and Its Applications with R Examples", Springer, 2016.

Reference Books:

1. James D. Hamilton, Time Series Analysis, Princeton University Press, 2004.
2. Avishek Pal and PKS Prakash, Practical Time Series Analysis, Birmingham - Mumbai, 2017.
3. Box, G.E.P., G.M. Jenkins and G.C. Reinsel. n Time Series Analysis, Forecasting, and Control, 3rd ed. Englewood Cliffs, NJ: Prentice Hall, 1994.
4. Chan, N.H. Time Series: Applications to Finance. 2002, New York: Wiley.
5. Fuller, W.A. Introduction to Statistical Time Series, 2nd ed. New York: Wiley, 1996.

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

	Honors Course	L	T	P	C
		4	0	0	4
NATURAL LANGUAGE PROCESSING (AI & ML)					

Course Objectives:

- This course introduces the fundamental concepts and techniques of natural language processing (NLP).
- Students will gain an in-depth understanding of the computational properties of natural languages and the commonly used algorithms for processing linguistic information.
- The course examines NLP models and algorithms using both the traditional symbolic and the more recent statistical approaches.
- Enable students to be capable to describe the application based on natural language processing and to show the points of syntactic, semantic and pragmatic processing.

Course Outcomes: After completion of this course

- Demonstrate a given text with basic Language features
- To design an innovative application using NLP components
- Explain a rule based system to tackle morphology/syntax of a language
- To design a tag set to be used for statistical processing for real-time applications
- To compare and contrast the use of different statistical approaches for different types of NLP applications.

UNIT I:

Introduction : Origins and challenges of NLP, Language Modeling: Grammar-based LM, Statistical LM, Regular Expressions, Finite-State Automata, English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance.

UNIT II:

Word Level Analysis: Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging, Hidden Markov and Maximum Entropy models.

UNIT III:

Syntactic Analysis : Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar, Dependency Grammar, Syntactic Parsing, Ambiguity, Dynamic Programming parsing, Shallow parsing, Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs, Feature structures, Unification of feature structures

UNIT IV:

Semantics And Pragmatics: Requirements for representation, First-Order Logic, Description Logics, Syntax-Driven Semantic analysis, Semantic attachments, Word Senses, Relations between Senses, Thematic Roles, selectional restrictions, Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods, Word Similarity using Thesaurus and Distributional methods.

UNIT V:

Discourse Analysis And Lexical Resources : Discourse segmentation, Coherence, Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm, Coreference Resolution, Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).



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Text Books:

1. Daniel Jurafsky, James H. Martin, Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.
2. Steven Bird, Ewan Klein and Edward Loper, Natural Language Processing with Python, First Edition, OReilly Media, 2009.

Reference Books:

1. Breck Baldwin, Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015.
2. Richard M Reese, Natural Language Processing with Java, OReilly Media, 2015.
3. Nitin Indurkhya and Fred J. Damerau, Handbook of Natural Language Processing, Second, Chapman and Hall/CRC Press, 2010. Edition
4. Tanveer Siddiqui, U.S. Tiwary, Natural Language Processing and Information Retrieval, Oxford University Press, 2008.

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	Honors Course	L	T	P	C
		4	0	0	4
REINFORCEMENT LEARNING (AI & ML)					

Course Objectives:

By the end of the class students should be able to:

- Define the key features of reinforcement learning that distinguishes it from AI and non-interactive machine learning.
- Given an application problem (e.g. from computer vision, robotics, etc), decide if it should be formulated as a RL problem; if yes be able to define it formally (in terms of the state space, action space, dynamics and reward model), state what algorithm (from class) is best suited for addressing it and justify your answer.

Course Outcomes:

By the end of this course, students should be able to do the following:

1. Learn how to define RL problems like Tic-Tac-Toe, Multi-arm.
2. Student will be able to understand the finite markov decision processes.
3. Student will be to Understand Monte Carlo Methods and how it is work with tabular methods to solve classical control problems
4. Student should aware of Eligibility Traces and Understand how to find with approximate solutions.
5. Explore imitation learning tasks and solutions
6. Recognize current advanced techniques and applications in RL

UNIT I:

Reinforcement Learning Problem: Introduction, Elements of Reinforcement Learning, Limitations and Scope, Tic-Tac-Toe, Multi-arm Bandits: *n*-Armed Bandit Problem, Action-Value Methods, Incremental Implementation, Tracking Nonstationary Problem, Optimistic Initial Values, Upper-Confidence-Bound Action Selection, Gradient Bandit, Associative Search.

UNIT II:

Finite Markov Decision Processes: Agent-Environment Interface, Markov Property, Markov Decision Processes, Value Functions, Optimal Value Functions, Optimality and Approximation, Dynamic Programming: Policy- Evaluation, Improvement, Iteration, Value Iteration, Asynchronous Dynamic Programming, Generalized Policy Iteration, Efficiency of Dynamic Programming.

UNIT III:

Monte Carlo Methods: Monte Carlo- Prediction, Estimation of Action Values, Control, Control without Exploring Start, Temporal- Difference learning: TD Prediction, Advantages of TD Prediction Methods, Optimality of TD(0), Sarsa: On-Policy TD Control, Q-Learning, Games, Afterstates.

UNIT IV:

Eligibility Traces: *n*-Step TD Prediction, Forward and Backward View of TD(λ), Equivalences of Forward and Backward Views, saras(λ), Watkin's Q(λ), Off-policy Eligibility Traces using Important Sampling, Variable λ.

UNIT V:

Planning and Learning with Tabular Methods: Models and Planning, Integrating Planning, Acting and Learning, Prioritized Sweeping, Full vs. Sample Backups, Trajectory Sampling, Heuristic Search, Monte Carlo Tree Search.



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Text Book:

1. Rich S. Sutton, Andrew G. Barto, Reinforcement Learning: An Introduction, Second Edition, MIT Press, 2015.
2. Boris Belousov, Hany Abdulsamad, Pascal Klink, Simone parisi, Reinforcement Learning Algorithms: Analysis and Applications, 1st Edition, Springer, 2021.

Reference Books:

1. Phil Winder, Reinforcement Learning: Industrial Applications of Intelligent Agent, 1st Edition, O'Reilly, 2020.
2. Kyriakos G. Vamvoudakis, Yan Wan, Frank, L. Lewis, Derya Cansever, Handbook of Reinforcement Learning and Control, 1st Edition, Springer, 2021.

NPTEL Link: Reinforcement Learning: https://onlinecourses.nptel.ac.in/noc22_cs34/preview

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year - II Semester	Honors Course	L	T	P	C
		4	0	0	4
INTERNET OF THINGS (Systems Engineering)					

Course Objectives:
The main objectives of this course are

- Vision and Introduction to Internet of Things (IoT).
- Understand IoT Market perspective.
- Data and Knowledge Management and use of Devices in IoT Technology.
- Understand State of the Art – IoT Architecture.
- Understand Real World IoT Design Constraints, Industrial Automation and Commercial.

Course Outcomes (COs):
At the end of the course, student will be able to

- Explain in a concise manner how the general Internet as well as Internet of Things work.
- Understand constraints and opportunities of wireless and mobile networks for Internet of Things.
- Use basic sensing and measurement and tools to determine the real-time performance of network of devices.
- Develop prototype models for various applications using IoT technology.

UNIT I:
The Internet of Things: An Overview of Internet of things, Internet of Things Technology, behind IoTs Sources of the IoTs, M2M Communication, Examples of IoTs, Design Principles For Connected Devices Internet Connectivity Principles, Internet connectivity, Application Layer Protocols: HTTP, HTTPS, FTP, Telnet.

UNIT II:
Business Models for Business Processes in the Internet of Things ,IoT/M2M systems LAYERS AND designs standardizations ,Modified OSI Stack for the IoT/M2M Systems, ETSI M2M domains and High-level capabilities ,Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability

UNIT III:
Design Principles for the Web Connectivity for connected-Devices, Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected-Devices.

UNIT IV:
Data Acquiring, Organizing and Analytics in IoT/M2M, Applications /Services /Business Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in the Internet Of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.

UNIT V:
Data Collection, Storage and Computing Using a Cloud Platform for IoT/M2M Applications/Services, Data Collection, Storage and Computing Using cloud platform Everything as a service and Cloud Service Models, IOT cloud-based services using the Xively (Pachube/COSM), Nimbits and other platforms Sensor, Participatory Sensing, Actuator, Radio Frequency Identification, and Wireless, Sensor Network Technology, Sensors Technology, Sensing the World.

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Text Books:

1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education
2. Internet of Things, A.Bahgya and V.Madisetti, Univesity Press,2015

Reference Books:

1. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley
2. Getting Started with the Internet of Things, CunoPfister , Oreilly

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

	Honors Course	L	T	P	C
		4	0	0	4
DATA COMMUNICATIONS AND INFORMATION CODING THEORY (Systems Engineering)					

Course Objective:
The objective of this course is to introduce the basic concepts of information theory and coding, including information, source coding, channel model, channel capacity, channel coding and so on.

Course Outcomes:
The students at the end of the course will be able to:

- Understand and explain the basic concepts of information theory, source coding, channel and channel capacity, channel coding and relation among them.
- Describe the real life applications based on the fundamental theory.
- Calculate entropy, channel capacity, bit error rate, code rate, steady-state probability and so on.
- Implement the encoder and decoder of one block code or convolutional code using any program language

UNIT I:
Overview; Basic Concepts - Entropy and Mutual information; Lossless Source Coding – Source entropy rate; Kraft inequality; Huffman code; Asymptotic equipartition property; Universal coding; Noisy Channel Coding - Channel capacity

UNIT II:
Random channel codes; Noisy channel coding theorem for discrete memory-less channels; Typical sequences; Error exponents; Feedback; Continuous and Gaussian channels; Lossy Source Coding - Rate-Distortion functions; Random source codes; Joint source-channel coding and the separation theorem.

UNIT III:
Source coding- Text, Audio and Speech: Adaptive Huffman Coding, Arithmetic Coding, LZW algorithm – Audio: Perceptual coding, Masking techniques, Psychoacoustic model, MEG Audio layers I,II,III, Dolby AC3 - Speech: Channel Vocoder, Linear Predictive Coding

UNIT IV:
Source coding- Image and Video: Image and Video Formats – GIF, TIFF, SIF, CIF, QCIF – Image compression: READ, JPEG – Video Compression: Principles-I,B,P frames, Motion estimation, Motion compensation, H.261, MPEG standard

UNIT V:
Error control coding- Block codes: Definitions and Principles: Hamming weight, Hamming distance, Minimum distance decoding - Single parity codes, Hamming codes, Repetition codes - Linear block codes, Cyclic codes - Syndrome calculation, Encoder and decoder – CRC Error control coding

Text books:

1. Mark Kelbert(Author), Yuri Suhov, Information Theory and Coding by Example, Cambridge University Press,2013

Reference books:

1. Simon Haykin and Michael Moher, Communication Systems, 5th Edition, Wiley, 2010
2. T.M. & Thomas, J.A. (2006). Elements of information theory. New York: Wiley.
3. Ad´amek, Foundations of coding, Wiley Interscience, 1991.
4. T. M. Cover and J. A. Thomas, Elements of information theory, Wiley, 1991.

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

	Honors Course	L	T	P	C
		4	0	0	4
SERVICE ORIENTED ARCHITECTURES (Systems Engineering)					

Course Objectives:

- To gain understanding of the basic principles of service orientation
- To learn service oriented analysis techniques
- To learn technology underlying the service design
- To learn the concepts such as SOAP, Registering and Discovering Services.

Course Outcomes: At the end of this course, students are expected to gain the following learning:

1. Get the foundations and concepts of service based computing
2. Advocate the importance and means of technology alignment with business
3. Understanding the basic operational model of web services,
4. Gain the knowledge of key technologies in the service oriented computing arena
5. Apply and practice the learning through a real or illustrative project/case study.

UNIT I

Software Architecture: Need for Software Architecture**,** Objectives of Software Architecture, Types of Information Technology (IT) Architecture, Architectural Patterns and Styles

Architecting Process for Software Applications: Architectural Considerations, Architecting Process for Software Applications, Level 0: High-Level Architecture, Level 1: Solution Architecture Detailed Design

UNIT II

SOA and MSA Basics: Service Orientation in Daily Life, Evolution of SOA and MSA Service-oriented Architecture and Microservices architecture –Drivers for SOA, Dimensions of SOA, Conceptual Modelof SOA, Standards And Guidelines for SOA, Emergence of MSA

Service-Oriented Architecture: Considerations for Enterprise-wide SOA, Strawman Architecture for Enterprise-wide SOA, Enterprise SOA Reference Architecture, Object-oriented Analysis and Design (OOAD) Process,Service-oriented Analysis and Design (SOAD) Process

UNIT III

Service-Oriented Applications: Considerations for Service-oriented Applications, Patterns for SOA, Pattern-based Architecture for Service-oriented Applications**,** Composite Applications, Composite Application Programming Model

Service-Oriented Analysis and Design: Need for Models, Principles of Service Design Non-functional Properties for Services, Design of Activity Services (or Business Services) Design of Data Services, Design of Client Services, Design of Business Process Services

UNIT IV

Microservices Architecture:

Trend in SOA – Microservices Architecture (MSA): Services Model for Cloud and Mobile Solutions, API Adoption on the Rise, Challenges and Takeways from SOA Implementations Architecture Trend – Microservices Architecture, Microservices Architecture in Action

Cloud and MSA: Cloud Services, Hybrid Cloud Services, Considerations for Hybrid Cloud Services, Cloud Services and MSA, MSA for SMAC Solutions

UNIT V

Mobile and MSA: Mobile Technologies, Types of Mobile Applications, MSA for mobile solutions Case Study: SOA – Loan Management System (LMS) PoC, MSA – APIary PoC

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Text Book:

1. Shankar Kambhampaty, Service - Oriented Architecture & Microservices Architecture, 3ed: For Enterprise, Cloud, Big Data and Mobile , ISBN: 9788126564064,Wiley.
2. Mark Richards, Microservices vs Service-Oriented Architecture, O'Reilly Media, Inc., 2016.

Reference Books:

1. Thomas Erl, Services-Oriented Architecture: Concepts, Technology and Design, Prentice Hall, 2005.
2. Guido Schmutz, Peter Welkenbach, Daniel Liebhart, Service-Oriented Architecture: An Integration Blueprint, Packt Publisher, 2010.

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

	Honors Course	L	T	P	C
		4	0	0	4
DESIGN OF SECURE PROTOCOLS (Systems Engineering)					

Course Objectives:
The main objective of this course is that to explore various protocols and design of various protocols with deeper security.

Course Outcomes:
By the end of the course Student will

- Get the exposure to various protocols.
- Gain knowledge on various secure mechanisms through set of protocols.
- Efficiently design new set of protocols.
- Learn Security issues and overcome means with protocols.

UNIT – I:
OSI:ISO Layer Protocols: Application Layer Protocols, TCP/IP, HTTP, SHTTP, LDAP, MIME, POP & POP3, RMON, SNTP, SNMP. Presentation Layer Protocols, Light Weight Presentation Protocol Session layer protocols.

UNIT – II:
RPC protocols, transport layer protocols, ITOT, RDP, RUDP, TALI, TCP/UDP, compressed TCP. Network layer Protocols, routing protocols, border gateway protocol-exterior gateway protocol, internet protocol IPv4, IPv6, Internet Message Control Protocol, IRDP Transport Layer Security, TSL, SSL, DTLS

UNIT – III :
Data Link layer Protocol, ARP, In ARP, IPCP, IPv6CP, RARP, SLIP .Wide Area and Network Protocols, ATM protocols, Broadband Protocols, Point to Point Protocols, Other WAN Protocols, security issues.

UNIT – IV:
Local Area Network and LAN Protocols, ETHERNET Protocols, VLAN protocols, Wireless LAN Protocols, Metropolitan Area Network Protocol, Storage Area Network and SAN

UNIT – V :
Protocols, FDMA, WIFI and WIMAX Protocols, security issues. Mobile IP, Mobile Support Protocol for IPv4 and IPv6, Resource Reservation Protocol. Multicasting Protocol, VGMP, IGMP, MSDP .Network Security and Technologies and Protocols, AAA Protocols, Tunneling Protocols, Secured Routing Protocols, GRE- Generic Routing Encapsulation, IPSEC– Security.

Text Books:
1. Jawin: "Networks Protocols Handbook", 3rd Edition, Jawin Technologies Inc., 2005.
2. Bruce Potter and Bob Fleck : "802.11 Security", 1st Edition, O'Reilly Publications, 2002.

Reference Books:
1. Ralph Oppliger :"SSL and TSL: Theory and Practice", 1st Edition, Arttech House, 2009.
2. Lawrence Harte: "Introduction to CDMA- Network services Technologies and Operations", 1st Edition, Althos Publishing, 2004.
3. Lawrence Harte: "Introduction to WIMAX", 1st Edition, Althos Publishing, 2005

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

	Honors Course	L	T	P	C
		4	0	0	4
NETWORK CODING (Systems Engineering)					

Course Objectives:

- Students will gain the understanding of core network programming by using sockets and transport layer protocols like TCP and UDP
- Students will gain the understanding of inter process communication and implementation of different forms of IPC in client-server environment
- Students will get an exposure to various application layer protocols which are designed using sockets and transport layer protocols

Course Outcomes:

By the end of the course, the student will be able to

- Explain the client-server paradigm and socket structures.
- Describe the basic concepts of TCP sockets and TCP echo client-server programs.
- Discuss the UDP sockets and UDP echo client-server programs.
- Explain Socket options and ability to understand IPC
- Apply the applications of sockets and demonstrate skill to design simple applications like FTP, TELNET etc.

UNIT-I:

Introduction to Network Programming: OSI model, transport layer protocols: TCP, UDP and SCTP, network architecture: client-server and peer-to-peer systems, Sockets-socket Address structures: IPv4, IPv6 and Generic-value result arguments, Byte ordering functions, Byte manipulation functions, Address conversion functions

UNIT-II:

TCP: introduction to TCP, TCP connection establishment and termination TIME_WAIT State. Elementary TCP sockets, Socket, connect, bind, listen, accept, fork, exec function, concurrent servers, Close function, read and write functions

UNIT-III:

TCP echo client server program, getsockname and getpeername functions I/O multiplexing: I/O models, Select function, TCP echo server using select function, shutdown function, Poll function

UNIT-IV:

UDP: Introduction to UDP, difference between TCP and UDP, recvfrom( ) and sendto( ) functions, UDP echo client server program, UDP echo client server using select function. Socket Options: IPv4 socket options, IPv6 socket options

UNIT-V:

Socket Options: Generic socket options, TCP socket options. IPC: Introduction to IPC, forms of IPC, UNIX kernel support for pipes, FIFO, message queues, semaphores and shared memory Network programming concepts Implementation: FTP, ping, arp, SMTP, TELNET



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Text Books:

1. Unix Network programming, the socket networking API, W.Richard Stevens, bill fenner, Andrew m.rudoff ,PHI.

References Books:

1. Advanced programming in the UNIX environment, W.Richard Stevens, pearson education

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year - II Semester	Honors Course	L	T	P	C
		4	0	0	4
PRINCIPLES OF CYBER SECURITY (Information Security)					

Course Objectives:
- To learn threats and risks within context of the cyber security architecture.
- Student should learn and Identify security tools and hardening techniques.
- To learn types of incidents including categories, responses and timelines for response.

Course Outcomes: At the end of the course, student will be able to
- Apply cyber security architecture principles.
- Demonstrate the risk management processes and practices.
- Appraise cyber security incidents to apply appropriate response
- Distinguish system and application security threats and vulnerabilities.
- Identify security tools and hardening techniques

UNIT–I:
Introduction to Cyber Security-Cyber security objectives, roles, differences between information security and cyber security, Cyber security principles-confidentiality, integrity, availability, authentication and non repudiation

UNIT–II:
Information Security within Lifecycle Management-Lifecycle management landscape, Security architecture processes, Security architecture tools, Intermediate lifecycle management concepts, **Risks & Vulnerabilities**-Basics of risk management, Operational threat environments, Classes of attacks

UNIT–III:
Incident Response-Incident categories, Incident response, Incident recovery, **Operational security protection**-Digital and data assets, ports and protocols, Protection technologies, Identity and access Management, configuration management

UNIT–IV:
Threat Detection and Evaluation Monitoring-Vulnerability management, Security logs and alerts, Monitoring tools and appliances, **Analysis**-Network traffic analysis, packet capture and analysis

UNIT–V:
Introduction to backdoor System and security-Introduction to metasploit, backdoor, demilitarized zone (DMZ), Digital signature, Brief study on Harding of operating system.

Text Books:
1. NASSCOM: Security Analyst Student Hand Book, Dec 2015
2. Information Security Management Principles, Updated Edition, David Alexander, Amanda Finch, David Sutton, BCS publishers, June 2013

Reference Books:
1. Cyber Security Fundamentals-Cyber Security, Network Security and Data Governance Security, 2nd Edition, ISACA Publishers, 2019

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

	Honors Course	L	T	P	C
		4	0	0	4
COMPUTATIONAL NUMBER THEORY (Information Security)					

Course Objectives: This course will focus on designing efficient algorithms (and providing complexity analysis) for the most important problems from number theory, with major applications in coding theory and cryptography.

Course Outcomes:
Upon completing the course the student will be able to

- understand with basics of number theory and its applications.
- demonstrate the arithmetic of finite fields, polynomials.
- analyze the elliptic curves, testing and factorization.
- Student will be able to solve the discrete logarithms and large sparse linear systems.
- Student will be able to apply the skills for writing programs of cryptography algorithms.

UNIT I:
Arithmetic of Integers: Basic Arithmetic Operations, GCD, Congruences and Modular Arithmetic, Linear Congruences, Polynomial Congruences, Quadratic Congruences, Multiplicative Orders, Continued Fractions, Prime Number Theorem and Riemann Hypothesis, Running Times of Arithmetic Algorithms.

UNIT II:
Arithmetic of Finite Fields: Existence and Uniqueness of Finite Fields, Representation of Finite Fields, Implementation of Finite Field Arithmetic, Arithmetic of Polynomials: polynomials over Finite Fields, Finding Roots of Polynomials over Finite Fields, Factoring Polynomials over Finite Fields, Properties of Polynomials with Integer Coefficients, Factoring Polynomials with Integer Coefficients.

UNIT III:
Arithmetic of Elliptic Curves: Elliptic Curve, Elliptic-Curve Group, Elliptic Curve over Finite Fields, Pairing on Elliptic Curves, Elliptic-Curve Point Counting, Primality Testing: Introduction, Probabilistic Primality Testing, Deterministic Primality Testing, Primality Testing for Number of Special Forms.

UNIT IV:
Integer Factorization: Trial Division, Pollard's Rho Method, Pollard's *p-1* Method, Dixon's Method, CFRAC Method, Quadratic Sieve Method, Cubic Sieve Method, Elliptic Curve Method, Number-Field Sieve Method, Discrete Logarithms: Square-Root Methods, Algorithms: Prime Fields, Fields of Characteristic Two, General Extension Fields, Elliptic Curves(ECDLP).

UNIT V:
Large Sparse Linear Systems: Structured Gaussian Elimination, Lanczos Method, Wiedemann Method, Block Metods

Text Books:
1. Abhijit Das, Computational Number Theory, CRC Hall, 1st Edition, 2013.
2. T. H. Cormen, C. E. Leiserson, R. Rivest and C. Stein, Introduction to Algorithms, Prentice Hall India, 2nd Edition, 2002.

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Reference Books:

1. Victor Shoup, A Computational Introduction to Number Theory and Algebra, 2nd Edition, Cambridge Iniversity Press, 2008.
2. R. Lidl and H. Niederreiter, Introduction to finite fields and their applications, Cambridge University Press, 2021.
3. M. Mignotte, Mathematics for computer algebra, Springer-Verlag, 1992.



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	Honors Course	L	T	P	C
		4	0	0	4
CRYPTANALYSIS (Information Security)					

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	Honors Course	L	T	P	C
		4	0	0	4
ELLIPTIC CURVE CRYPTOGRAPHY (Information Security)					



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		L	T	P	C
	Honors Course	**4**	**0**	**0**	**4**

INTRODUCTION TO QUANTUM COMPUTING AND QUANTUM CRYPTOGRAPHY
(Information Security)

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	Honors Course	L	T	P	C
		4	0	0	4
PUBLIC KEY INFRASTRUCTURE AND TRUST MANAGEMENT (Information Security)					

Course objectives:
The course is designed to train the graduates in depth understanding of Public Key Cryptography, Public key Infrastructure, security credentials and design new or modify existing cryptographic techniques.

Course Outcomes:
Graduates after completing the course shall gain:

- In depth understanding of Public key cryptography and Infrastructure.
- Ability to design and analyze Public Key cryptographic techniques.
- Ability to solve network security issues in real time applications.
- Ability to take up doctoral level research work in security.

UNIT I:
Public key infrastructure: components and architecture. PKI interoperability, deployment and assessment PKI data structures – certificates, validation, revocation, authentication, cross-certification. Repository, Certification Authority (CA) and Registration Authority (RA), trusted third party, digital certificates.

UNIT II:
PKI Services: Authentication, Integrity and Confidentiality, Mechanisms, Secure Communication, Secure Time Stamping, Non-Repudiation, Privilege Management, Certificate policies, Certificate Authority, Registration Authority.

UNIT III:
Key and Certificate Management: Key/Certificate Life Cycle Management, Certificate Revocation: Periodic Public Mechanisms, performance, Scalability and Timeliness, Multiple Key pairs, Key Pair Uses, Real-World Difficulties, Independent Certificate Management.

UNIT IV:
Trust Models: Strict Hierarchy of Certification Authorities, Distributed Trust Architecture, Web Model, User-Centric Trust, Cross-Certification, Entity Naming, Certificate Path processing, PKI Information Dissemination: Repositories and Techniques, private Dissemination, Public and Repositories, In-Band Protocol Exchange.

UNIT V:
PKI Standards: Introduction, Major Standards Activities, X.509, PKIX, X.500, LDAP, ISO TC68, ANSI X9f, S/MIME, IPsec, TLS, SPKI, OpenPGP, EDIFACT.

Text Books:

1. Carlisle Adams, Steve Lloyd, Understanding Public-Key Infrastructure: Concepts, Standards, and Deployment Considerations, Sams, 1999.
2. John R. Vacca, Public Key Infrastructure, Building Trusted Applications and Web Services, Auerbach Publications, 2004.

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Reference Books:

1. Messaoud Benantar, Introduction to the Public Key Infrastructure for the Internet, Pearson Education, Prentice Hall, 2011.
2. Ashutosh Saxena, Public Key Infrastructure, Tata McGraw Hill.

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	Honors Course	L	T	P	C
		4	0	0	4
INFORMATION SECURITY ANALYSIS AND AUDIT (Information Security)					

Course Objectives:
- Understanding and knowledge of Security Auditing, and introduce the Threats and defense in the systems.
- Acquiring the knowledge on Evidence collection and evaluation techniques.

Course Outcomes:
At the end of the course, student will be able to
- Illustrate the fundamental concepts of information security and systems auditing
- Analyze the latest trend of computer security threats and defense
- Identify security weaknesses in information systems, and rectify them with appropriate security mechanisms
- Explain the security controls in the aspects of physical, logical and operational security control and case studies
- Evaluate the security of information systems

UNIT–I:
Overview of Information System Auditing- Effect of Computers on Internal Controls, Effects of Computers on Auditing, Foundations of information Systems Auditing, Conducting an Information Systems Audit.

UNIT–II:
The management Control Framework-I- Introduction, Evaluating the planning Function, Leading Function, Controlling Function, Systems Development Management Controls, Approaches to Auditing Systems Development, Normative Models of the Systems Development Process, Evaluating the Major phases in the Systems Development Process, Programming Management Controls, Data Resource Management Controls.

UNIT–III:
The Management Control Framework-II- Security Management Controls, Operations management Controls Quality assurance Management Controls, Case Studies.

UNIT–IV:
Evidence Collection- Audit Software, Code Review, Test Data, and Code Comparison, Concurrent Auditing techniques, Interviews, Questionnaires, and Control Flowcharts. Performance Management tools- Case Studies.

UNIT–V:
Evidence Evaluation- Evaluating Asset Safeguarding and Data Integrity, Evaluating System, Effectiveness, Evaluating System Efficiency, Information Systems Audit and Management: Managing the Information Systems Audit Function.

Text Book:
1. Information Systems Control and Audit, 1st Edition, Ron Weber, Pearson Education, 2013

Reference Book:
1. Information System Audit and Assurance, D P Dube, TMH, New Delhi, 2008

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	Honors Course	L	T	P	C
		4	0	0	4
CLOUD AND IOT SECURITY (Information Security)					

Course Outcomes: At the end of the course, student will be able to

- Discuss about Security Requirements in IoT Architecture
- Explain Random number generation
- Demonstrate Authorization with Publish / Subscribe schemes
- Identify Lightweight and robust schemes for Privacy protection
- Explain about IoT cloud security architecture

UNIT I:

Introduction: Securing Internet of Things: Security Requirements in IoT Architecture, Security in Enabling Technologies, Security Concerns in IoT Applications. Security Architecture in the Internet of Things, Security Requirements in IoT, Insufficient Authentication /Authorization, Insecure Access Control, Threats to Access Control, Privacy, and Availability, Attacks Specific to IoT. Vulnerabilities, Secrecy and Secret-Key Capacity, Authentication/Authorization for Smart Devices, Transport Encryption, Attack, Fault trees

UNIT II:

Cryptographic Fundamentals for IoT: Cryptographic primitives and its role in IoT, Encryption and Decryption, Hashes, Digital Signatures, Random number generation, Cipher suites, key management fundamentals, cryptographic controls built into IoT messaging and communication protocols.

UNIT III:

Identity & Access Management Solutions for IoT: Identity lifecycle, authentication credentials, IoT IAM infrastructure, Authorization with Publish / Subscribe schemes and access control

UNIT IV:

Privacy Preservation and Trust Models for IoT: Concerns in data dissemination, Lightweight and robust schemes for Privacy protection, Trust and Trust models for IoT, self-organizing Things, Preventing unauthorized access.

UNIT V:

Cloud Security for IoT: Cloud services and IoT, offerings related to IoT from cloud service providers, Cloud IoT security controls, enterprise IoT cloud security architecture, New directions in cloud enabled IoT computing

Text Books:

1. Practical Internet of Things Security (Kindle Edition) by Bria Russell, Drew VanDuren

References Books:

1. Securing the Internet of Things, Elsevier
2. Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations

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	Honors Course	L	T	P	C
		4	0	0	4
WEB SECURITY (Information Security)					

Course Objectives:
- Underlying security principles of the web
- Overview of concrete threats against web applications
- Insights into common attacks and countermeasures
- Current best practices for secure web applications

Course Outcomes: At the end of the course, student will be able to
- Demonstrate security concepts, security professional roles, and security resources in the context of systems and security development life cycle
- Justify applicable laws, legal issues and ethical issues regarding computer crime
- Explain the business need for security, threats, attacks, top ten security vulnerabilities, and secure software development
- Apply information security policies, standards and practices, the information security blueprint
- Analyze and describe security requirements for typical web application scenario

UNIT–I:
Introduction-A web security forensic lesson, Web languages, Introduction to different web attacks, Overview of N-tier web applications, Web Servers-Apache, IIS.

UNIT-II:
Securing the Communication Channel- Understanding the dangers of an insecure communication channel. Practical advice on deploying HTTPS, and dealing with the impact on your application, Insights into the latest evolutions for HTTPS deployments.

UNIT–III:
Web Hacking Basics- HTTP & HTTPS URL, Web under the Cover Overview of Java security Reading the HTML source, Applet Security Servlets Security Symmetric and Asymmetric Encryptions, Network security Basics, Firewalls & IDS.

UNIT–IV:
Securely Handling Untrusted Data-Investigation of injection attacks over time, Understanding the cause behind both server-side and client-side injection attacks, Execution of common injection attacks, and implementation of various defenses.

UNIT–V:
Preventing Unauthorized Access-Understanding the interplay between authentication, authorization and session management. Practical ways to secure the authentication process prevent authorization bypasses and harden session management mechanisms, Securing Large Applications, Cyber Graffiti.

Text Books:
1. Web Hacking: Attacks and Defense, Latest Edition , McClure, Stuart, Saumil Shah, and Shreeraj Shah, Addison Wesley, 2003
2. Professional Java Security, 1.3 Edition, Garms, Jess and Daniel Somerfield, Wrox, 2001

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	Honors Course	L	T	P	C
		4	0	0	4
BLOCK CHAIN ARCHITECTURE DESIGN AND USE CASES (Information Security)					

Course Objectives:
By the end of the course, students will be able to
- Understand how block chain systems (mainly Bit coin and Ethereum) work and to securelyinteract with them,
- Design, build, and deploy smart contracts and distributed applications,
- Integrate ideas from block chain technology into their own projects.

Course Outcomes:
At the end of the course, student will be able to
- Demonstrate the foundation of the Block chain technology and understand the processes inpayment and funding.
- Identify the risks involved in building Block chain applications.
- Review of legal implications using smart contracts.
- Choose the present landscape of Blockchain implementations and Understand Crypto currencymarkets
- Examine how to profit from trading crypto currencies.

UNIT I
Introduction, Scenarios, Challenges Articulated, Blockchain, Blockchain Characteristics, Opportunities Using Blockchain, History of Blockchain.
Evolution of Blockchain : Evolution of Computer Applications, Centralized Applications, Decentralized Applications, Stages in Blockchain Evolution, Consortia, Forks, Public Blockchain Environments, Type of Players in Blockchain Ecosystem, Players in Market.

UNIT II
Blockchain Concepts: Introduction, Changing of Blocks, Hashing, Merkle-Tree, Consensus, Mining and Finalizing Blocks, Currency aka tokens, security on blockchain, data storage on blockchain, wallets, coding on blockchain: smart contracts, peer-to-peer network, types of blockchain nodes, risk associated with blockchain solutions, life cycle of blockchain transaction.

UNIT III
Architecting Blockchain solutions: Introduction, Obstacles for Use of Blockchain, Blockchain Relevance Evaluation Framework, Blockchain Solutions Reference Architecture, Types of Blockchain Applications. Cryptographic Tokens, Typical Solution Architecture for Enterprise Use Cases, Types of Blockchain Solutions, Architecture Considerations, Architecture with Blockchain Platforms, Approach for Designing Blockchain Applications.

UNIT IV
Ethereum Blockchain Implementation: Introduction, Tuna Fish Tracking Use Case, Ethereum Ecosystem, Ethereum Development, Ethereum Tool Stack, Ethereum Virtual Machine, Smart Contract Programming, Integrated Development Environment, Truffle Framework, Ganache, Unit Testing, Ethereum Accounts, MyEtherWallet, Ethereum Networks/Environments, Infura, Etherscan, Ethereum Clients, Decentralized Application, Metamask, Tuna Fish Use Case Implementation, OpenZeppelin Contracts

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UNIT V

Hyperledger Blockchain Implementation, Introduction, Use Case – Car Ownership Tracking, Hyperledger Fabric, Hyperledger Fabric Transaction Flow, FabCar Use Case Implementation, Invoking Chaincode Functions Using Client Application.

Advanced Concepts in Blockchain: Introduction, InterPlanetary File System (IPFS), Zero-Knowledge Proofs, Oracles, Self-Sovereign Identity, Blockchain with IoT and AI/ML Quantum Computing and Blockchain, Initial Coin Offering, Blockchain Cloud Offerings, Blockchain and its Future Potential.

Text Books:

1) Ambadas, Arshad Sarfarz Ariff, Sham "Blockchain for Enterprise Application Developers", Wiley
2) Andreas M. Antonpoulos, "Mastering Bitcoin: Programming the Open Blockchain" , O'Reilly

Reference Books:

1) Blockchain: A Practical Guide to Developing Business, Law, and Technology Solutions, Joseph Bambara, Paul R. Allen, Mc Graw Hill.
2) Blockchain: Blueprint for a New Economy, Melanie Swan, O'Reilly

e-Resources:

1) https://github.com/blockchainedindia/resources

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II Year - II Semester	Honors Course	L	T	P	C
		4	0	0	4
DATA VISUALIZATION (Data Science)					

Course Objectives:
The main objective of this course is to make it easier to identify patterns, trends and outliers in large data sets

Course Outcomes:
On completion of this course, the student will be able to

- Identify and recognize visual perception and representation of data.
- Illustrate about projections of different views of objects.
- Apply various Interaction and visualization techniques.
- Analyze various groups for visualization.
- Evaluate visualizations

UNIT-I:
Introduction to Data Visualizations and Perception: Introduction of visual perception, visual representation of data, Gestalt principles, Information overload.

UNIT-II :
Visual Representations: Creating visual representations, visualization reference model, visual mapping, visual analytics, Design of visualization applications.

UNIT-III :
Classification of Visualization Systems: Classification of visualization systems, Interaction and visualization techniques misleading, Visualization of one, two and multi-dimensional data, text and text documents.

UNIT-IV :
Visualization of Groups: Visualization of groups, trees, graphs, clusters, networks, software, Metaphorical visualization. Various visualization techniques, data structures used in data visualization.

UNIT-V :
Visualization of Volumetric Data And Evaluation of Visualizations: Visualization of volumetric data, vector fields, processes and simulations, Visualization of maps, geographic information, GIS systems, collaborative visualizations, evaluating visualizations

Text Books:

1. Ward, Grinstein, Keim, Interactive Data Visualization: Foundations, Techniques, and Applications. Natick, 2nd edition,A K Peters, Ltd 2015.

Reference Books:

1. Tamara Munzner,Visualization Analysis & Design ,1st edition,AK Peters Visualization Series 2014
2. Scott Murray,Interactive Data Visualization for the Web ,2nd Edition, 2017

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

	Honors Course	L	T	P	C
		4	0	0	4
STATISTICAL FOUNDATIONS FOR DATA SCIENCE (Data Science)					

Course Objectives:
The course will introduce the fundamental concepts of probability and statistics required for a program in data science

Course outcomes:
By the end of the course, the student will be able to

- Use the statistical concepts in the field of data science.
- Employ the techniques and methods related to the area of data science in variety of applications.
- Apply logical thinking to understand and solve the problem in context.
- Explore statistical learning methods and their application to modern problems in science, industry, and society.
- Build analytics pipelines for regression problems and classification problems

UNIT I:
Basics of Data Science: Introduction; Typology of problems; Importance of linear algebra, statistics and optimization from a data science perspective; Structured thinking for solving data science problems.

UNIT II:
Probability, Statistics and Random Processes: Probability theory and axioms; Random variables; Probability distributions and density functions (univariate and multivariate); Expectations and moments; Covariance and correlation; Statistics and sampling distributions; Hypothesis testing of means, proportions, variances and correlations; Confidence (statistical) intervals; Correlation functions; White-noise process

UNIT III:
Probabilistic formulations of prediction problems: Plug-in estimators, empirical risk minimization, Linear threshold functions, perceptron algorithm, Risk bounds, Concentration inequalities, Uniform convergence, Rademacher averages; combinatorial dimensions, Convex surrogate losses for classification, Linear regression, Regularization and linear model selection, Feature Selection Methods, Cross Validation methods.

UNIT IV:
Game-theoretic formulations of prediction problems, High Dimensional methods, Lasso, Ridge Regression, Dimensionality Reduction, Minimax strategies for log loss, linear loss, and quadratic loss, Universal portfolios, Online convex optimization.

UNIT V:
Neural networks: Stochastic gradient methods, Combinatorial dimensions and Rademacher averages, Hardness results for learning, Efficient learning algorithms.

Text Books:

1. Bendat, J. S. and A. G. Piersol. Random Data: Analysis and Measurement Procedures. 4th Edition. John Wiley & Sons, Inc., NY, USA, 2010
2. Montgomery, D. C. and G. C. Runger. Applied Statistics and Probability for Engineers. 5th Edition. John Wiley & Sons, Inc., NY, USA, 2011.

3. James, G., Witten, D., Hastie, T., Tibshirani, R. An Introduction to Statistical Learning with Applications in R, Springer, 2013.

Reference Books:

1. Hastie, T., Tibshirani, R. and Friedman, J. The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Second Edition, Springer, 2009.

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

	Honors Course	L	T	P	C
		4	0	0	4
MINING MASSIVE DATA SETS (Data Science)					

Course Objective: The course will discuss data mining and machine learning algorithms for analyzing very large amounts of data. The emphasis will be on MapReduce and Spark as tools for creating parallel algorithms that can process very large amounts of data.

Course Outcomes:
Upon completion of this course, the student will be able to:
1. Discuss research directions in Mining Massive Datasets, such as similarity search, streaming data, clustering, and graph mining.
2. Analyze policy, focusing on methods for mining massive datasets and potential policy and management applications, by synthesizing and summarizing the current state of the art, and facilitating discussion by posing questions, preliminary conclusions, and ideas to explore.
3. Develop a research project relevant to Mining Massive Datasets and produce a report describing the project's background, methods, results, and conclusions.
4. Knowledge of basic computer science principles and skills, at a level sufficient to write a reasonably non-trivial computer program.
5. Good knowledge of Java and Python will be extremely helpful since most assignments will require the use of Spark

UNIT I:
Data Mining: Data Mining, Statistical Limits on Data Mining, MapReduce: Distributed File Systems, MapReduce, Algorithms Using MapReduce, Extensions to MapReduce.

UNIT II:
Finding Similar Items: Applications of Near-Neighbor Search, Shingling of Documents, Distance Measures, Theory of Locality-Senstive Functions, Applications of LSH Hashing.

UNIT III:
Mining Data Streams: Stream Data Model, Sampling Data in Streams, Filtering Streams, Link Analysis: PageRank, Efficient Computational of PageRank, Link Spam, Hubs and Authorities.

UNIT IV:
Frequent Itemsets: Market-Based Model, Market Based and A-Priori Algorithm, Limited- Pass Algorithms, Clustering: Introduction, Hierarchical Clustering and K-means Algorithm, CURE Algorithm.

UNIT V:
Dimensionality Reduction: Eigenvalues and Eigenvectors, Principal-Component Analysis, CUR Decomposition, Large-Scale Machine Learning: Machine Learning Model, Perceptrons, SVM's, Nearest Neighbors.

Text Books:
1. Jure Leskovec, Anand Rajaraman, Jeffery D. ULLman, Mining of Massive Datasets, Cambridge University Press, 2014.
2. Pattern Recognition and Machine Learning. Christopher Bishop. Springer-Verlag New York. 2006.



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Reference Books:

1. Machine Learning: A Probabilistic Perspective. Kevin Murphy. MIT Press. 2012
2. The Elements of Statistical Learning: Data Mining, Inference, and Prediction. Trevor Hastie, Robert Tibshirani, Jerome Friedman. Springer. 2013

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

	Honors Course	L	T	P	C
		4	0	0	4
MEDICAL IMAGE DATA PROCESSING (Data Science)					

Course Objectives:
The course will provide the participants with an up-to-date background in current state-of-the-art in medical imaging and medical image analysis. The aim of the course is to show how to extract, model, and analyze information from medical data and applications in order to help diagnosis, treatment and monitoring of diseases through computer science.

Course Outcomes: At the End of the Course:
1. Student will be able to explain the basic concepts of Medical Imaging Technologies, Systems and Formation Principles.
2. Student will be able to analyze the Medical Image Storage and Processing.
3. Student will be able to visualize the MRI, NMR and Artifacts.
4. Student should expertise the Segmentation and Classification techniques on Medical Image Data.
5. Student will be able to analyze the Nuclear Imaging like PET, SPECT and 3D Images.

UNIT I:
Introduction: Introduction to Medical Imaging Technology, Systems, and Modalities. Brief History, Importance, Applications, Trends, Challenges. Medical Image Formation Principles: X-Ray physics, X-Ray generation, Attenuation, Scattering, Dose Basic Principles of CT, Reconstruction Methods, Artifacts, CT hardware.

UNIT II:
Storage and Processing: Medical Image Storage, Archiving and Communication Systems and Formats Picture archiving and communication system (PACS); Formats: DICOM Radiology Information Systems (RIS) and Hospital Information Systems (HIS). Medical Image Processing, Enhancement, Filtering Basic image processing algorithms Thresholding, contrast enhancement, SNR characteristics; filtering; histogram modeling.

UNIT III:
Visualization: Medical Image Visualization Fundamentals of Visualization, Surface and Volume Rendering/Visualization, Animation, Interaction. Magnetic Resonance Imaging (MRI) Mathematics of MR, Spin Physics, NMR Spectroscopy, Imaging Principles and Hardware, Image Artifacts.

UNIT IV:
Segmentation And Classification: Medical Image Segmentation, Histogram-Based Methods, Region Growing and Watersheds, Markov Random Field Models, Active Contours, Model-Based Segmentation. Multi-Scale Segmentation, Semi-Automated Methods, Clustering-Based Methods, Classification-Based Methods, Atlas-Guided Approaches, Multi-Model Segmentation. Medical Image Registration Intensity-Based Methods, Cost Functions, Optimization Techniques.

UNIT V:
Nuclear Imaging: PET and SPECT Ultrasound Imaging Methods, Mathematical Principles, Resolution, Noise Effect, 3D Imaging, Positron Emission Tomography, Single Photon Emission Tomography, Ultrasound Imaging, Applications. Medical Image Search and Retrieval Current Technology in Medical Image Search, Content-Based Image Retrieval, New Trends: Ontologies, Applications, Other Applications Of Medical Imaging Validation, Image Guided Surgery, Image Guided Therapy, Computer Aided Diagnosis/Diagnostic Support Systems.

Text Books:

1. Paul Suetens, "Fundamentals of Medical Imaging", Second Edition, Cambridge University Press, 2009.
2. J. Michael Fitzpatrick and Milan Sonka, "Handbook of Medical Imaging, Volume 2. Medical Image Processing and Analysis", SPIE Publications, 2009.

Reference Books:

1. Kayvan Najarian and Robert Splinter, "Biomedical Signal and Image Processing", Second Edition, CRC Press, 2005.
2. Geoff Dougherty, "Digital Image Processing for Medical Applications", First Edition, Cambridge University Press, 2009.
3. Jerry L. Prince and Jonathan Links, "Medical Imaging Signals and Systems", First Edition 1, Prentice Hall, 2005.
4. John L. Semmlow, "Biosignal and Medical Image Processing", Second Edition, CRC Press, 2008.

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DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

COURSE STRUCTURE AND SYLLABUS

For UG – R20

B. Tech - COMPUTER SCIENCE AND ENGINEERING with Specialization

Common to

(i) **CSE (ARTIFICIAL INTELLIGENCE and MACHINE LEARNING)-Branch Code:42**

(ii) **ARTIFICIAL INTELLIGENCE and MACHINE LEARNING - Branch Code: 61**

(Applicable for batches admitted from 2020-2021)

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COURSE STRUCTURE

I Year – I SEMESTER						
S. No	**Course Code**	**Courses**	**L**	**T**	**P**	**Credits**
1	HS1101	Communicative English	3	0	0	3
2	BS1101	Mathematics – I	3	0	0	3
3	BS1102	Applied Chemistry	3	0	0	3
4	ES1101	Programming for Problem Solving using C	3	0	0	3
5	ES1102	Computer Engineering Workshop	1	0	4	3
6	HS1102	English Communication Skills Laboratory	0	0	3	1.5
7	BS1103	Applied Chemistry Lab	0	0	3	1.5
8	ES1103	Programming for Problem Solving using C Lab	0	0	3	1.5
9	MC1101	Environmental Science*	2	0	0	0
Total Credits						**19.5**

I Year – II SEMESTER						
S. No	**Course Code**	**Courses**	**L**	**T**	**P**	**Credits**
1	BS1201	Mathematics – II	3	0	0	3
2	BS1202	Applied Physics	3	0	0	3
3	ES1201	Digital Logic Design	3	0	0	3
4	ES1202	Python Programming	3	0	0	3
5	CS1201	Data Structures	3	0	0	3
6	BS1203	Applied Physics Lab	0	0	3	1.5
7	ES1203	Python Programming Lab	0	0	3	1.5
8	CS1202	Data Structures Lab	0	0	3	1.5
9	MC1201	Constitution of India *	2	0	0	0
Total Credits						**19.5**

*Internal Evaluation

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II Year – I SEMESTER						
S. No	**Course Code**	**Courses**	**L**	**T**	**P**	**Credits**
1	BS	Mathematics III	3	0	0	3
2	CS	Mathematical Foundations of Computer Science	3	0	0	3
3	CS	Introduction to Artificial Intelligence and Machine Learning	3	0	0	3
4	CS	Object Oriented Programming with Java	3	0	0	3
5	CS	Database Management Systems	3	0	0	3
6	CS	Introduction to Artificial Intelligence and Machine Learning Lab	0	0	3	1.5
7	CS	Object Oriented Programming with Java Lab	0	0	3	1.5
8	CS	Database Management Systems Lab	0	0	3	1.5
9	SO	Mobile App Development	0	0	4	2
10	MC	Essence of Indian Traditional Knowledge	2	0	0	0
Total Credits						**21.5**

II Year – II SEMESTER						
S. No	**Course Code**	**Courses**	**L**	**T**	**P**	**Credits**
1	BS	Probability and Statistics	3	0	0	3
2	CS	Computer Organization	3	0	0	3
3	CS	Data Warehousing and Mining	3	0	0	3
4	ES	Formal Languages and Automata Theory	3	0	0	3
5	HS	Managerial Economics and Financial Accountancy	3	0	0	3
6	CS	R Programming Lab	0	0	3	1.5
7	CS	Data Mining using Python Lab	0	0	3	1.5
8	ES	Web Application Development Lab	0	0	3	1.5
9	SO	Natural Language Processing with Python	0	0	4	2
Total Credits						**21.5**
10	Minor	Introduction to Artificial Intelligence and Machine Learning [$]	3	0	2	**4**

$- Integrated Course

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III B. Tech – I Semester						
S.No	**Course Code**	**Courses**	**Hours per week**			**Credits**
			L	**T**	**P**	**C**
1	PC	Compiler Design	3	0	0	3
2	PC	Operating Systems	3	0	0	3
3	PC	Machine Learning	3	0	0	3
4	Open Elective/Job Oriented	**Open Elective-I** Open Electives offered by other departments/ Optimization in Operations Research(Job oriented course)	3	0	0	3
5	PE	**Professional Elective-I** 1. Software Engineering 2. Computer Vision 3. Data Visualization 4. DevOps 5. Machine Learning for Engineering and Science Applications (NPTEL) (https://nptel.ac.in/courses/106106198)	3	0	0	3
6	PC	Operating Systems & Compiler Design Lab	0	0	3	1.5
7	PC	Machine Learning Lab	0	0	3	1.5
8	SO	**Skill Oriented Course - III** Continuous Integration and Continuous Delivery using DevOps	0	0	4	2
9	MC	Employability Skills-I	2	0	0	0
10	PR	**Summer Internship 2 Months (Mandatory) after second year(to be evaluated during V semester**	0	0	0	1.5
Total credits						**21.5**
11	Minor	Machine Learning$^{\$}$	3	0	2	**4**

$- Integrated Course

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III B. Tech – II Semester						
S.No	**Course Code**	**Courses**	**Hours per week**			**Credits**
			L	**T**	**P**	**C**
1	PC	Computer Networks	3	0	0	3
2	PC	Deep Learning	3	0	0	3
3	PC	Design and Analysis of Algorithms	3	0	0	3
4	PE	**Professional Elective-II** 1. Software Project Management 2. Distributed Systems 3. Internet of Things 4. Network Programming	3	0	0	3
5	Open Elective/Job Oriented	**Open Elective-II** Open Electives offered by other departments/ MEAN Stack Development (Job Oriented Course)	3	0	0	3
6	PC	Computer Networks Lab	0	0	3	1.5
7	PC	Algorithms for Efficient Coding Lab	0	0	3	1.5
8	PC	Deep Learning with Tensorflow	0	0	3	1.5
9	SO	**Skill Oriented Course - IV** MEAN Stack Technologies-Module I-HTML 5, JavaScript, Node.js, Express.js and TypeScipt **OR** Big Data : Apache Spark	0	0	4	2
10	MC	Employability skills-II	2	0	0	0
Total credits						**21.5**
Industrial/Research Internship(Mandatory) 2 Months during summer vacation						
11	Minor	Deep Learning$^{\$}$	3	0	2	**4**
Minor courses through SWAYAM			0	0	0	**2**



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IV B. Tech –I Semester (Tentative)						
S.No	**Course Code**	**Course Title**	**Hours per week**			**Credits**
			L	**T**	**P**	**C**
1	PE	**Professional Elective-III** 1.Reinforcement Learning 2.Soft Computing 3. Cryptography and Network Security 4. Block Chain Technologies 5. Speech Processing	3	0	0	3
2	PE	**Professional Elective-IV** 1. Robotic Process Automation 2. Cloud Computing 3. Big Data Analytics 4. NOSQL Databases 5. Video Analytics	3	0	0	3
3	PE	**Professional Elective-V** 1. Social Network Analysis 2. Recommender Systems 3. AI Chatbots 4. Object Oriented Analysis and Design 5. Semantic Web	3	0	0	3
4	Open Elective /Job Oriented	**Open Elective-III** Open Electives offered by other departments/API and Microservices (Job Oriented Course)	3	0	0	3
5	Open Elective /Job Oriented	**Open Elective-IV** Open Electives offered by other departments/Secure Coding Techniques (Job Oriented Course)	3	0	0	3
6	HS	Universal Human Values 2: Understanding Harmony	3	0	0	3
7	SO	1.Machine Learning with Go (Infosys Spring Board) **OR** 2.MEAN Stack Technologies-Module II-Angular JS and MongoDB	0	0	4	2
8	PR	**Industrial/Research Internship 2 months (Mandatory) after third year (to be evaluated during VII semester**	0	0	0	3
Total credits						**23**
9	Minor	Reinforcement Learning	4	0	0	4
Minor courses through SWAYAM			0	0	0	2

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IV B. Tech –II Semester						
S.No	**Course Code**	**Course Title**	**Hours per week**			**Credits**
			L	**T**	**P**	**C**
1	Project	Major Project Work, Seminar, Internship	-	-	-	12
Total credits						**12**

SUGGESTED COURSES MINOR ENGINEERING IN B.TECH.CSE- AI

Eligibility for Minor in CSE-AI: -

Note:

1. TWO, NPTEL courses of EIGHT week duration covering a total of 4 credits (offered by CSE Department only), Student can register at any time after the completion of II B.Tech. I Sem.

S.No.	Subject Title	Credits
1	Introduction to Artificial Intelligence and Machine Learning	4
2	Machine Learning	4
3	Deep Learning	4
4	Reinforcement Learning	4
5	MOOCS Courses ** 1. Introduction to Soft Computing(NPTEL) (https://nptel.ac.in/courses/106105173) 2. Digital Speech Processing (NPTEL) (https://nptel.ac.in/courses/117105145) 3. Cloud Computing (NPTEL) (https://nptel.ac.in/courses/106105167) 4. Practical Machine Learning with Tensorflow (NPTEL) (https://nptel.ac.in/courses/106106213)	4
	Total	**20**

**Choose 02 MOOCS courses @ 2credits each from SWAYAM/NPTEL

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I Year - I Semester		L	T	P	C
		3	0	0	3
COMMUNICATIVE ENGLISH (HS1101)					

Introduction
The course is designed to train students in receptive (listening and reading) as well as productive and interactive (speaking and writing) skills by incorporating a comprehensive, coherent and integrated approach that improves the learners' ability to effectively use English language in academic/ workplace contexts. The shift is from *learning about the language* to *using the language*. On successful completion of the compulsory English language course/s in B.Tech., learners would be confident of appearing for international language qualification/proficiency tests such as IELTS, TOEFL, or BEC, besides being able to express themselves clearly in speech and competently handle the writing tasks and verbal ability component of campus placement tests. Activity based teaching-learning methods would be adopted to ensure that learners would engage in actual use of language both in the classroom and laboratory sessions.

Course Objectives
- ➢ Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- ➢ Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- ➢ Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- ➢ Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- ➢ Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Learning Outcomes
At the end of the module, the learners will be able to
- ➢ understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information
- ➢ ask and answer general questions on familiar topics and introduce oneself/others
- ➢ employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information
- ➢ recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs
- ➢ form sentences using proper grammatical structures and correct word forms

Unit 1:
Lesson-1: A Drawer full of happiness from "**Infotech English**", Maruthi Publications
Lesson-2: Deliverance by Premchand from "**The Individual Society",**Pearson Publications. (Non-detailed)

Listening: Listening to short audio texts and identifying the topic. Listening to prose, prose and conversation.
Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests. Self introductions and introducing others.
Reading: Skimming text to get the main idea. Scanning to look for specific pieces of information.

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Reading for Writing: Paragraph writing (specific topics) using suitable cohesive devices; linkers, sign posts and transition signals; mechanics of writing - punctuation, capital letters.
Vocabulary: Technical vocabulary from across technical branches (20) GRE Vocabulary (20) (Antonyms and Synonyms, Word applications) Verbal reasoning and sequencing of words.
Grammar: Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countables and uncountables; singular and plural basic sentence structures; simple question form - wh-questions; word order in sentences.
Pronunciation: Vowels, Consonants, Plural markers and their realizations

Unit 2:
Lesson-1: Nehru's letter to his daughter Indira on her birthday from "**Infotech English**", Maruthi Publications
Lesson-2: Bosom Friend by Hira Bansode from "**The Individual Society",** Pearson Publications.(Non-detailed)
Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts, both in speaking and writing.
Speaking: Discussion in pairs/ small groups on specific topics followed by short structured talks. Functional English: Greetings and leave takings.**Reading**: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions.
Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary Analogies (20 words) (Antonyms and Synonyms, Word applications)

Grammar: Use of articles and zero article; prepositions.
Pronunciation: Past tense markers, word stress-di-syllabic words
Unit 3:
Lesson-1: Stephen Hawking-Positivity 'Benchmark' from "**Infotech English**", Maruthi Publications
Lesson-2: Shakespeare's Sister by Virginia Woolf from "**The Individual Society",** Pearson Publications.(Non-detailed**)**
Listening: Listening for global comprehension and summarizing what is listened to, both in speaking and writing.
Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed.Functional English:Complaining and Apologizing.
Reading: Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension.Critical reading.

Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. Letter writing-types, format and principles of letter writing.E-mail etiquette, Writing CV's.
Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Association, sequencing of words

Grammar: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.
Pronunciation: word stress-poly-syllabic words.

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Unit 4:

Lesson-1: Liking a Tree, Unbowed: Wangari Maathai-biography from "**Infotech English**", Maruthi Publications
Lesson-2: Telephone Conversation-Wole Soyinka from "**The Individual Society",** Pearson Publications**.**(Non-detailed)
Listening: Making predictions while listening to conversations/ transactional dialogues without video (only audio); listening to audio-visual texts.

Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.Functional English: Permissions, Requesting, Inviting.

Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicative process or display complicated data.
Reading for Writing: Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables.Writing SOP, writing for media.
Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Cloze Encounters.
Grammar: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms
Pronunciation: Contrastive Stress

Unit 5:
Lesson-1: Stay Hungry-Stay foolish from "**Infotech English**", Maruthi Publications
Lesson-2: Still I Rise by Maya Angelou from "**The Individual Society",** Pearson Publications.(Non-detailed)
Listening: Identifying key terms, understanding concepts and interpreting the concepts both in speaking and writing.
Speaking: Formal oral presentations on topics from academic contexts - without the use of PPT slides.Functional English: Suggesting/Opinion giving.
Reading: Reading for comprehension. RAP StrategyIntensive reading and Extensive reading techniques.
Reading for Writing: Writing academic proposals- writing research articles: format and style.
Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Coherence, matching emotions.

Grammar: Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)
Pronunciation: Stress in compound words
Prescribed text books for theory for Semester-I:
1. "**Infotech English**", Maruthi Publications. (Detailed)
2."**The Individual Society",** Pearson Publications.(Non-detailed)
Prescribed text book for Laboratory for Semesters-I & II:
1. "**Infotech English**", Maruthi Publications. (with Compact Disc)

Reference Books:

- Bailey, Stephen. *Academic writing: A handbook for international students*. Routledge, 2014.
- Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking.* Heinley ELT; 2nd Edition, 2018.
- Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
- Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012.

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I Year - I Semester		L	T	P	C
		3	0	0	3
MATHEMATICS-I (BS1101) **(Common to all Branch's for I Year B. Tech)**					

Course Objectives:

- To familiarize a variety of well-known sequences and series, with a developing intuition about the behaviour of new ones.
- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

Course Outcomes: At the end of the course, the student will be able to

- utilize mean value theorems to real life problems (L3)
- solve the differential equations related to various engineering fields (L3)
- familiarize with functions of several variables which is useful in optimization (L3)
- apply double integration techniques in evaluating areas bounded by region (L3)
- students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional and 3-dimensional coordinate systems(L5)

UNIT – I: Sequences, Series and Mean value theorems: (10hrs)

Sequences and Series: Convergences and divergence – Ratio test – Comparison tests – Integral test – Cauchy's root test – Alternate series– Leibnitz's rule.

Mean Value Theorems (without proofs): Rolle's Theorem – Lagrange's mean value theorem – Cauchy's mean value theorem – Taylor's and Maclaurin's theorems with remainders, Problems and applications on the above theorem.

UNIT – II: Differential equations of first order and first degree: (10hrs)

Linear differential equations– Bernoulli's equations –Exact equations and equations reducible to exact form.

Applications: Newton's Law of cooling– Law of natural growth and decay– Orthogonal trajectories– Electrical circuits.

UNIT – III: Linear differential equations of higher order: (10hrs)

Homogeneous and Non-homogeneousdifferential equations of higher order with constant coefficients – with non-homogeneous term of the type e^{ax}, sin ax, cos ax, polynomials in x^n, $e^{ax}V(x)$ and $x^nV(x)$ – Method of Variation of parameters, Cauchy and Legendre's linear equations.

Applications: LCR circuit, Simple Harmonic motion.

UNIT – IV: Partial differentiation: (10hrs)

Introduction – Homogeneous function – Euler's theorem– Total derivative– Chain rule– Jacobian – Functional dependence –Taylor's and MacLaurin's series expansion of functions of two variables.

Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method.

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UNIT – V: Multiple integrals: **(8 hrs)**

Double and Triple integrals – Change of order of integration in double integrals – Change of variables to polar, cylindrical and spherical coordinates.
Applications: Finding Areas and Volumes.

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers.
2. B. V. Ramana,Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:

1. Erwin Kreyszig,Advanced Engineering Mathematics, 10th Edition, Wiley-India.
2. Joel Hass, Christopher Heil and Maurice D. Weir, Thomas calculus, 14thEdition, Pearson.
3. Lawrence Turyn,Advanced Engineering Mathematics, CRC Press, 2013.
4. Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford University Press.

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KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

I Year - I Semester		L	T	P	C
		3	0	0	3
APPLIED CHEMISTRY (BS1102)					

Course Objectives

- Importance of usage of plastics in household appliances and composites (FRP) in aerospace and automotive industries.
- Outline the basics for the construction of electrochemical cells, batteries and fuel cells. Understand the mechanism of corrosion and how it can be prevented.
- Explain the preparation of semiconductors and nanomaterials, engineering applications of nanomaterials, superconductors and liquid crystals.
- Recall the increase in demand for power and hence alternative sources of power are studied due to depleting sources of fossil fuels. Advanced instrumental techniques are introduced.
- Outlinethe basics of computational chemistry and molecular switches

UNIT I: POLYMER TECHNOLOGY **8 hrs**

Polymerisation:- Introduction, methods of polymerization (emulsion and suspension), mechanical properties.

Plastics: Compounding, fabrication (compression, injection, blown film and extrusion), preparation, properties and applications (PVC, polycarbonates and Bakelite), mention some examples of plastic materials used in electronic gadgets, recycling of e-plastic waste (waste to wealth).

Elastomers:- Introduction, preparation, properties and applications (Buna S, thiokol and polyurethanes).

Composite materials: Fiber reinforced plastics, conducting polymers, biodegradable polymers, biopolymers, biomedical polymers.

Course Outcomes: At the end of this unit, the students will be able to

- Analyze the different types of composite plastic materials and interpret the mechanism of conduction in conducting polymers.

UNIT II: ELECTROCHEMICAL CELLS AND CORROSION **10 hrs**

Single electrode potential, electrochemical series and uses of series, standard hydrogen electrode, calomel electrode, construction of glass electrode, batteries (Dry cell, Li ion battery and zinc air cells), fuel cells (H_2-O_2, CH_3OH-O_2, phosphoric acid and molten carbonate).

Corrosion:-Definition, theories of corrosion (chemical and electrochemical), galvanic corrosion, differential aeration corrosion, stress corrosion, galvanic series, factors influencing rate of corrosion, corrosion control (proper designing and cathodic protection), Protective coatings (surface preparation, cathodic coatings, anodic coatings, electroplating and electroless plating [nickel]), Paints (constituents, functions and special paints).

Course Outcomes: At the end of this unit, the students will be able to

- Utilize the theory of construction of electrodes, batteries and fuel cells in redesigning new engineering products and categorize the reasons for corrosion and study methods to control corrosion.

UNIT III: MATERIAL CHEMISTRY **10 hrs**

Part I: Non-elemental semiconducting materials:- Stoichiometric, controlled valency&chalcogen photo/semiconductors-preparation of semiconductors (distillation, zone refining, Czochralski crystal pulling, epitaxy, diffusion, ion implantation) - Semiconductor devices (p-n junction diode as rectifier, junction transistor).

Insulators &magnetic materials: electrical insulators-ferro and ferri magnetism-Hall effect and its applications.

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Part II: Nano materials:- Introduction, sol-gel method, characterization by (Brunauer Emmet Teller [BET]), (scanning electron microscopy [SEM]) and (transmission electron microscopy [TEM]), applications of graphene and fullerenes, carbon nanotubes (types, preparation and applications)
Liquid crystals:- Introduction-types-applications.
Super conductors:-Type –I, Type II-characteristics and applications
Course Outcomes: At the end of this unit, the students will be able to

- Synthesize nanomaterials for modern advances of engineering technology.
- Summarize the preparation of semiconductors; analyze the applications of liquid crystals and superconductors.

UNIT IV: SPECTROSCOPIC TECHNIQUES &NON-CONVENTIONAL ENERGY SOURCES 10 hrs
Part A: **SPECTROSCOPIC TECHNIQUES**
Electromagnetic spectrum-UV (laws of absorption, instrumentation, theory of electronic spectroscopy, Frank-condon principle, chromophores and auxochromes, intensity shifts, applications), FT-IR [instrumentation and differentiation of sp, sp^2, sp^3 and IR stretching of functional groups (alcohols, carbonyls, amines) applications], magnetic resonance imaging and CT scan (procedure & applications).
Part B*:* NON-CONVENTIONAL ENERGY SOURCES
Design, working, schematic diagram, advantages and disadvantages of photovoltaic cell, hydropower, geothermal power, tidal and wave power, ocean thermal energy conversion.
Course Outcomes: At the end of this unit, the students will be able to

- Analyze the principles of different analytical instruments and their applications.
- Design models for energy by different natural sources.

UNIT V: ADVANCED CONCEPTS/TOPICS IN CHEMISTRY 8 hrs
Computational chemistry: Introduction to computational chemistry, molecular modelling and docking studies
Molecular switches: characteristics of molecular motors and machines, Rotaxanes and Catenanes as artificial molecular machines, prototypes – linear motions in rotaxanes, an acid-base controlled molecular shuttle, a molecular elevator, an autonomous light-powered molecular motor
Course Outcomes: At the end of this unit, the students will be able to

- Obtain the knowledge of computational chemistry and molecular machines

Text Books:

1. P.C. Jain and M. Jain “Engineering Chemistry”, 15/e, DhanpatRai& Sons, Delhi, (Latest edition).
2. ShikhaAgarwal, “Engineering Chemistry”, Cambridge University Press, New Delhi, (2019).
3. S.S. Dara, “A Textbook of Engineering Chemistry”, S.Chand& Co, (2010).
4. ShashiChawla, “Engineering Chemistry”, DhanpatRaiPublicating Co. (Latest edition).

Reference Books:

1. K. SeshaMaheshwaramma and MridulaChugh, “Engineering Chemistry”, Pearson India Edn.
2. O.G. Palana, “Engineering Chemistry”, Tata McGraw Hill Education Private Limited, (2009).
3. CNR Rao and JM Honig (Eds) “Preparation and characterization of materials” Academic press, New York (latest edition)
4. B. S. Murthy, P. Shankar and others, “Textbook of Nanoscience and Nanotechnology”, University press (latest edition)

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I Year - I Semester		L	T	P	C
		3	0	0	3
PROGRAMMING FOR PROBLEM SOLVING USING C (ES1101)					

Course Objectives:

The objectives of Programming for Problem Solving Using C are

- To learn about the computer systems, computing environments, developing of a computer program and Structure of a C Program
- To gain knowledge of the operators, selection, control statements and repetition in C
- To learn about the design concepts of arrays, strings, enumerated structure and union types. To learn about their usage.
- To assimilate about pointers, dynamic memory allocation and know the significance of Preprocessor.
- To assimilate about File I/O and significance of functions

Course Outcomes:

Upon the completion of the course the student will learn

- To write algorithms and to draw flowcharts for solving problems
- To convert flowcharts/algorithms to C Programs, compile and debug programs
- To use different operators, data types and write programs that use two-way/ multi-way selection
- To select the best loop construct for a given problem
- To design and implement programs to analyze the different pointer applications
- To decompose a problem into functions and to develop modular reusable code
- To apply File I/O operations

UNIT I

Introduction to Computers: Creating and running Programs, Computer Numbering System, Storing Integers, Storing Real Numbers

Introduction to the C Language: Background, C Programs, Identifiers, Types, Variable, Constants, Input/output, Programming Examples, Scope, Storage Classes and Type Qualifiers.

Structure of a C Program: Expressions Precedence and Associativity, Side Effects, Evaluating Expressions, Type Conversion Statements, Simple Programs, Command Line Arguments.

UNIT II

Bitwise Operators: Exact Size Integer Types, Logical Bitwise Operators, Shift Operators.

Selection & Making Decisions: Logical Data and Operators, Two Way Selection, Multiway Selection, More Standard Functions.

Repetition: Concept of Loop, Pretest and Post-test Loops, Initialization and Updating, Event and Counter Controlled Loops, Loops in C, Other Statements Related to Looping, Looping Applications, Programming Examples.

UNIT III

Arrays: Concepts, Using Array in C, Array Application, Two Dimensional Arrays, Multidimensional Arrays, Programming Example – Calculate Averages

Strings: String Concepts, C String, String Input / Output Functions, Arrays of Strings, String Manipulation Functions String/ Data Conversion, A Programming Example – Morse Code

Enumerated, Structure, and Union: The Type Definition (Type def), Enumerated Types, Structure, Unions, and Programming Application.

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UNIT IV

Pointers: Introduction, Pointers to pointers, Compatibility, L value and R value
Pointer Applications: Arrays, and Pointers, Pointer Arithmetic and Arrays, Memory Allocation Function, Array of Pointers, Programming Application.
Processor Commands: Processor Commands.

UNIT V

Functions: Designing, Structured Programs, Function in C, User Defined Functions, Inter-Function Communication, Standard Functions, Passing Array to Functions, Passing Pointers to Functions, Recursion
Text Input / Output: Files, Streams, Standard Library Input / Output Functions, Formatting Input / Output Functions, Character Input / Output Functions
Binary Input / Output: Text versus Binary Streams, Standard Library, Functions for Files, Converting File Type.

Text Books:

1) Programming for Problem Solving, Behrouz A. Forouzan, Richard F.Gilberg, CENGAGE.
2) The C Programming Language, Brian W.Kernighan, Dennis M. Ritchie, 2e, Pearson.

Reference Books:

1) Computer Fundamentals and Programming, Sumithabha Das, McGraw Hill.
2) Programming in C, Ashok N. Kamthane, AmitKamthane, Pearson.
3) Computer Fundamentals and Programming in C, PradipDey, ManasGhosh, OXFORD.

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I Year - I Semester		L	T	P	C
		1	0	4	3
COMPUTER ENGINEERING WORKSHOP (ES1102)					

Course Objectives:
The objective of this course is to

- Explain the internal parts of a computer, peripherals, I/O ports, connecting cables
- Demonstrate basic command line interface commands on Linux
- Teach the usage of Internet for productivity and self paced lifelong learning
- Describe about Compression, Multimedia and Antivirus tools
- Demonstrate Office Tools such as Word processors, Spreadsheets and Presentation tools

Course Outcomes:
Students should be able to:

- Assemble and disassemble components of a PC
- Construct a fully functional virtual machine, Summarize various Linux operating system commands,
- Recognize characters & extract text from scanned images, Create audio files and podcasts

Computer Hardware:

Experiment 1: Identification of peripherals of a PC, Laptop, Server and Smart Phones: Prepare a report containing the block diagram along with the configuration of each component and its functionality, Input/ Output devices, I/O ports and interfaces, main memory, cache memory and secondary storage technologies, digital storage basics, networking components and speeds.

Operating Systems:

Experiment 2: Virtual Machine setup:
- Setting up and configuring a new Virtual Machine
- Setting up and configuring an existing Virtual Machine
- Exporting and packaging an existing Virtual Machine into a portable format

Experiment 3: Operating System installation:
- Installing an Operating System such as Linux on Computer hardware.

Experiment 4: Linux Operating System commands:
- General command syntax
- Basic *help* commands
- Basic File system commands
- Date and Time
- Basic Filters and Text processing
- Basic File compression commands
- Miscellaneous: apt-get, vi editor

Networking and Internet:

Experiment 5: Networking Commands:
- ping, ssh, ifconfig, scp, netstat, ipstat, nslookup, traceroute, telnet, host, ftp, arp, wget,route

Experiment 6: Internet Services:
- Web Browser usage and advanced settings like LAN, proxy, content, privacy, security, cookies, extensions/ plugins
- Antivirus installation, configuring a firewall, blocking pop-ups
- Email creation and usage, Creating a Digital Profile on LinkedIn

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Productivity Tools:

Experiment 7: Basic HTML tags,Introduction to HTML5 and its tags, Introduction to CSS3 and its properties. Preparation of a simple website/ homepage,
Assignment: Develop your home page using HTML Consisting of your photo, name, address and education details as a table and your skill set as a list.
Features to be covered:- Layouts, Inserting text objects, Editing text objects, Inserting Tables, Working with menu objects, Inserting pages, Hyper linking, Renaming, deleting, modifying pages, etc.,

Internet of Things (IoT): IoT fundamentals, applications, protocols, communication models, architecture, IoT devices

Office Tools:
Experiment 8: Demonstration and Practice on Text Editors like Notepad++, Sublime Text, Atom, Brackets, Visual code, etc

Experiment 9: Demonstration and practice on Microsoft Word, Power Point, Microsoft Excel

Experiment 10: Demonstration and practice on LaTeX and produce professional pdf documents.

Text Books:

1) Computer Fundamentals, Anita Goel, Pearson Education, 2017
2) PC Hardware Trouble Shooting Made Easy, TMH

References Books:

1) Essential Computer and IT Fundamentals for Engineering and Science Students, Dr.N.B.Vekateswarlu, S.Chand

e-Resources:

1) https://explorersposts.grc.nasa.gov/post631/2006-2007/computer_basics/ComputerPorts.doc

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I Year - I Semester		L	T	P	C
		0	0	3	1.5
ENGLISH COMMUNICATION SKILLS LABORATORY (HS1102)					

TOPICS

UNIT I:
Vowels, Consonants, Pronunciation, Phonetic Transcription, Common Errors in Pronunciation,

UNIT II:
Word stress-di-syllabic words, poly-syllabic words, weak and strong forms, contrastive stress (Homographs)

UNIT III:
Stress in compound words,rhythm, intonation,accent neutralisation.

UNIT IV:
Listening to short audio texts and identifying the context and specific pieces of information toanswer a series of questions in speaking.

UNIT V:
Newspapers reading;Understanding and identifying key terms and structures useful for writing reports.

Prescribed text book: "**Infotech English**", Maruthi Publications.

References:
1. Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL.
2. English Pronunciation in use- Mark Hancock, Cambridge University Press.
3. English Phonetics and Phonology-Peter Roach, Cambridge University Press.
4. English Pronunciation in use- Mark Hewings, Cambridge University Press.
5. English Pronunciation Dictionary- Daniel Jones, Cambridge University Press.
6. English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications.

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DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

I Year - I Semester		L	T	P	C
		0	0	3	1.5
APPLIED CHEMISTRY LAB (BS1103)					

Introduction to Chemistry laboratory – Molarity, normality, primary, secondary standard solutions, volumetric titrations, quantitative analysis

1. Determination of HCl using standard Na_2CO_3 solution.
2. Determination of alkalinity of a sample containing Na_2CO_3 and NaOH.
3. Determination of Mn^{+2} using standard oxalic acid solution.
4. Determination of ferrous iron using standard $K_2Cr_2O_7$ solution.
5. Determination of Cu^{+2} using standard hypo solution.
6. Determination of temporary and permanent hardness of water using standard EDTA solution.
7. Determination of Fe^{+3} by a colorimetric method.
8. Determination of the concentration of acetic acid using sodium hydroxide (pH-metry method).
9. Determination of iso-electric point of amino acids using pH-metry method/conductometric method.
10. Determination of the concentration of strong acid vs strong base (by conductometric method).
11. Determination of strong acid vs strong base (by potentiometric method).
12. Determination of Mg^{+2} presentin an antacid.
13. Determination of $CaCO_3$ present in an egg shell.
14. Estimation of Vitamin C.
15. Determination of phosphoric content in soft drinks.
16. Adsorption of acetic acid by charcoal.
17. Preparation of nylon-6, 6 and Bakelite (demonstration only).

Of the above experiments at-least 10 assessment experiments should be completed in a semester.

Outcomes: The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

Reference Books

1. A Textbook of Quantitative Analysis, Arthur J. Vogel.

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I Year - I Semester		L	T	P	C
		0	0	3	1.5
PROGRAMMING FOR PROBLEM SOLVING USING C LAB (ES1103)					

Course Objectives:

- Apply the principles of C language in problem solving.
- To design flowcharts, algorithms and knowing how to debug programs.
- To design & develop of C programs using arrays, strings pointers & functions.
- To review the file operations, preprocessor commands.

Course Outcomes:

By the end of the Lab, the student

- Gains Knowledge on various concepts of a C language.
- Able to draw flowcharts and write algorithms.
- Able design and development of C problem solving skills.
- Able to design and develop modular programming skills.
- Able to trace and debug a program

Exercise 1:

1. Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five characters.
2. Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5 inches.
3. Write a C program to display multiple variables.

Exercise 2:

1. Write a C program to calculate the distance between the two points.
2. Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".

Exercise 3:

1. Write a C program to convert a string to a long integer.
2. Write a program in C which is a Menu-Driven Program to compute the area of the various geometrical shape.
3. Write a C program to calculate the factorial of a given number.

Exercise 4:

1. Write a program in C to display the n terms of even natural number and their sum.
2. Write a program in C to display the n terms of harmonic series and their sum. 1 + 1/2 + 1/3 + 1/4 + 1/5 ... 1/n terms.
3. Write a C program to check whether a given number is an Armstrong number or not.

Exercise 5:

1. Write a program in C to print all unique elements in an array.
2. Write a program in C to separate odd and even integers in separate arrays.
3. Write a program in C to sort elements of array in ascending order.

Exercise 6:

1. Write a program in C for multiplication of two square Matrices.
2. Write a program in C to find transpose of a given matrix.

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Exercise 7:
1. Write a program in C to search an element in a row wise and column wise sorted matrix.
2. Write a program in C to print individual characters of string in reverse order.

Exercise 8:
1. Write a program in C to compare two strings without using string library functions.
2. Write a program in C to copy one string to another string.

Exercise 9:
1. Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
2. Write a program in C to demonstrate how to handle the pointers in the program.

Exercise 10:
1. Write a program in C to demonstrate the use of & (address of) and *(value at address) operator.
2. Write a program in C to add two numbers using pointers.

Exercise 11:
1. Write a program in C to add numbers using call by reference.
2. Write a program in C to find the largest element using Dynamic Memory Allocation.

Exercise 12:
1. Write a program in C to swap elements using call by reference.
2. Write a program in C to count the number of vowels and consonants in a string using a pointer.

Exercise 13:
1. Write a program in C to show how a function returning pointer.
2. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc( ) function.

Exercise 14:
1. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc( ) function. Understand the difference between the above two programs
2. Write a program in C to convert decimal number to binary number using the function.

Exercise 15:
1. Write a program in C to check whether a number is a prime number or not using the function.
2. Write a program in C to get the largest element of an array using the function.

Exercise 16:
1. Write a program in C to append multiple lines at the end of a text file.
2. Write a program in C to copy a file in another name.
3. Write a program in C to remove a file from the disk.

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I Year - I Semester		L	T	P	C
		2	0	0	0
ENVIRONMENTAL SCIENCE (MC1101)					

Course Objectives:

The objectives of the course are to impart:

- Overall understanding of the natural resources.
- Basic understanding of the ecosystem and its diversity.
- Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.
- An understanding of the environmental impact of developmental activities.
- Awareness on the social issues, environmental legislation and global treaties.

UNIT I

Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance – Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects. Role of information technology in environment and human health.

Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem; Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

UNIT II

Natural Resources: Natural resources and associated problems.

Forest resources: Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people.

Water resources: Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems.

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.

Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.

Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.

Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification; Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.

UNIT III

Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity-classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-sports of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts. - Endangered and endemic species of India – Conservation of biodiversity: conservation of biodiversity.

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UNIT IV

Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his well being.

Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.

UNIT V

Social Issues and the Environment: Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act - Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Public awareness.

Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Green business and Green politics.

The student should Visit an Industry / Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.

Text Books:

1) Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada
2) Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.
3) Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

Reference Books:

1) Text Book of Environmental Studies, Deeshita Dave & P. UdayaBhaskar, Cengage Learning.
2) A Textbook of Environmental Studies, ShaashiChawla, TMH, New Delhi
3) Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi
4) Perspectives in Environment Studies, AnubhaKaushik, C P Kaushik, New Age International Publishers, 2014

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DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

I Year - II Semester		L	T	P	C
		3	0	0	3
MATHEMATICS - II (BS1201)					

Course Objectives:

- To instruct the concept of Matrices in solving linear algebraic equations
- To elucidate the different numerical methods to solve nonlinear algebraic equations
- To disseminate the use of different numerical techniques for carrying out numerical integration.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

Course Outcomes: At the end of the course, the student will be able to

- develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6)
- solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel (L3)
- evaluate the approximate roots of polynomial and transcendental equations by different algorithms (L5)
- apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals (L3)
- apply numerical integral techniques to different Engineering problems (L3)
- apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations (L3)

UNIT – I: Solving systems of linear equations, Eigen values and Eigen vectors: (10hrs)
Rank of a matrix by echelon form and normal form – Solving system of homogeneous and non-homogeneous linear equations – Gauss Eliminationmethod– Eigenvalues and Eigen vectors and properties (article-2.14 in text book-1).

Unit – II: Cayley–Hamilton theorem and Quadratic forms: (10hrs)
Cayley-Hamilton theorem (without proof) – Applications – Finding the inverse and power of a matrix by Cayley-Hamilton theorem – Reduction to Diagonal form – Quadratic forms and nature of the quadratic forms – Reduction of quadratic form to canonical forms by orthogonal transformation.Singular values of a matrix, singular value decomposition (text book-3).

UNIT – III: Iterative methods: (8 hrs)
Introduction– Bisection method–Secant method – Method of false position– Iteration method – Newton-Raphson method (One variable and simultaneous Equations) – Jacobi and Gauss-Seidel methods for solving system of equations numerically.

UNIT – IV: Interpolation: (10 hrs)
Introduction– Errors in polynomial interpolation – Finite differences– Forward differences– Backward differences –Central differences – Relations between operators – Newton's forward and backward formulae for interpolation – Interpolation with unequal intervals – Lagrange's interpolation formula– Newton's divide difference formula.

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UNIT – V: Numerical differentiation and integration, Solution of ordinary differential equations with initial conditions: (10 hrs)

Numerical differentiation using interpolating polynomial – Trapezoidal rule– Simpson's $1/3^{rd}$ and $3/8^{th}$ rule– Solution of initial value problems by Taylor's series– Picard's method of successive approximations– Euler's method –Runge-Kutta method (second and fourth order).

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 44^{th} Edition, Khanna Publishers.
2. B. V. Ramana,Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.
3. David Poole, Linear Algebra- A modern introduction, 4^{th} Edition, Cengage.

Reference Books:

1. Steven C. Chapra, Applied Numerical Methods with MATLAB for Engineering and Science,Tata Mc. Graw Hill Education.
2. M. K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publications.
3. Lawrence Turyn,Advanced Engineering Mathematics, CRC Press.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

I Year - II Semester		L	T	P	C
		3	0	0	3
APPLIED PHYSICS (BS1202) **(For All Circuital Branches like ECE, EEE, CSE etc)**					

Course Objectives:

1. Bridging the gap between the physics in school at 10+2 level and UG level engineering courses.
2. To identify the importance of the optical phenomenon i.e. interference, diffraction and polarization related to its Engineering applications
3. Understand the mechanism of emission of light, utilization of lasers as coherent light sources for low and high energy applications, study of propagation of light through optical fibers and their implications in optical communications.
4. Enlightenment of the concepts of Quantum Mechanics and to provide fundamentals of deBroglie matter waves, quantum mechanical wave equation and its application, the importance of free electron theory for metals and band theory for crystalline solids. Metals- Semiconductors-Insulators concepts utilization of transport phenomenon of charge carriers in semiconductors.
5. To explain the significant concepts of dielectric and magnetic materials that leads to potential applications in the emerging micro devices.
6. To Understand the physics of Semiconductors and their working mechanism. To give an impetus on the subtle mechanism of superconductors using the concept of BCS theory and their fascinating applications.

Course Outcomes:

1. Explain the need of coherent sources and the conditions for sustained interference (L2). Identify the applications of interference in engineering (L3). Analyze the differences between interference and diffraction with applications (L4). Illustrate the concept of polarization of light and its applications (L2). Classify ordinary refracted light and extraordinary refracted rays by their states of polarization (L2)
2. Explain various types of emission of radiation (L2). Identify the role of laser in engineering applications (L3). Describe the construction and working principles of various types of lasers (L1). Explain the working principle of optical fibers (L2). Classify optical fibers based on refractive index profile and mode of propagation (L2). Identify the applications of optical fibers in medical, communication and other fields (L2). Apply the fiber optic concepts in various fields (L3).
3. Describe the dual nature of matter (L1). Explain the significance of wave function (L2). Identify the role of Schrodinger's time independent wave equation in studying particle in one-dimensional infinite potential well (L3). Identify the role of classical and quantum free electron theory in the study of electrical conductivity (L3). Classify the energy bands of solids (L2).
4. Explain the concept of dielectric constant and polarization in dielectric materials (L2). Summarize various types of polarization of dielectrics (L2). Interpret Lorentz field and Claussius-Mosotti relation in dielectrics (L2). Classify the magnetic materials based on susceptibility and their temperature dependence (L2). Explain the applications of dielectric and magnetic materials (L2). Apply the concept of magnetism to magnetic devices (L3)

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5. Outline the properties of charge carriers in semiconductors (L2). Identify the type of semiconductor using Hall effect (L2). Identify applications of semiconductors in electronic devices (L2). Classify superconductors based on Meissner's effect (L2). Explain Meissner's effect, BCS theory & Josephson effect in superconductors (L2).

Unit-I: Wave Optics **12hrs**

Interference: Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Colors in thin films- Newton's Rings- Determination of wavelength and refractive index.

Diffraction: Introduction - Fresnel and Fraunhofer diffraction - Fraunhofer diffraction due to single slit, double slit - N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating(Qualitative).

Polarization: Introduction-Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol's Prism -Half wave and Quarter wave plates.

Unit Outcomes:
The students will be able to

- **Explain** the need of coherent sources and the conditions for sustained interference (L2)
- **Identify** engineering applications of interference (L3)
- **Analyze** the differences between interference and diffraction with applications (L4)
- **Illustrate** the concept of polarization of light and its applications (L2)
- **Classify** ordinary polarized light and extraordinary polarized light (L2)

Unit-II: Lasers and Fiber optics **8hrs**

Lasers: Introduction – Characteristics of laser – Spontaneous and Stimulated emissions of radiation – Einstein's coefficients – Population inversion – Lasing action - Pumping mechanisms – Ruby laser – He-Ne laser - Applications of lasers.

Fiber optics: Introduction –Principle of optical fiber- Acceptance Angle - Numerical Aperture - Classification of optical fibers based on refractive index profile and modes – Propagation of electromagnetic wave through optical fibers - Applications.

Unit Outcomes:
The students will be able to

- **Understand** the basic concepts of LASER light Sources (L2)
- **Apply** the concepts to learn the types of lasers (L3)
- **Identifies** the Engineering applications of lasers (L2)
- **Explain** the working principle of optical fibers (L2)
- **Classify** optical fibers based on refractive index profile and mode of propagation (L2)
- **Identify** the applications of optical fibers in various fields (L2)

Unit III: Quantum Mechanics, Free Electron Theory and Band theory **10hrs**

Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory– Equation for electrical conductivity based on quantum free electron theory-



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Fermi-Dirac distribution- Density of states (3D) - Fermi energy.
Band theory of Solids: Bloch's Theorem (Qualitative) - Kronig - Penney model (Qualitative)-
E vs K diagram - v vs K diagram - effective mass of electron – Classification of crystalline solids–concept of hole.

Unit Outcomes:
The students will be able to

- **Explain** the concept of dual nature of matter (L2)
- **Understand** the significance of wave function (L2)
- **Interpret** the concepts of classical and quantum free electron theories (L2)
- **Explain** the importance of K-P model
- **Classify** the materials based on band theory (L2)
- **Apply** the concept of effective mass of electron (L3)

Unit-IV: Dielectric and Magnetic Materials **8hrs**

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility and Dielectric constant - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field- Clausius-Mossotti equation- Piezoelectricity.
Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability - Origin of permanent magnetic moment - Classification of magnetic materials: Dia, para, Ferro, antiferro&Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials- Eddy currents- Engineering applications.

Unit Outcomes: ***The students will be able to***

- **Explain** the concept of dielectric constant and polarization in dielectric materials (L2)
- **Summarize** various types of polarization of dielectrics (L2)
- **Interpret** Lorentz field and Claussius- Mosotti relation in dielectrics(L2)
- **Classify** the magnetic materials based on susceptibility and their temperature dependence (L2)
- **Explain** the applications of dielectric and magnetic materials (L2)
- **Apply** the concept of magnetism to magnetic data storage devices (L3)

Unit – V: Semiconductors and Superconductors **10hrs**

Semiconductors: Introduction- Intrinsic semiconductors – Density of charge carriers – Electrical conductivity – Fermi level – extrinsic semiconductors – density of charge carriers – dependence of Fermi energy on carrier concentration and temperature - Drift and diffusion currents – Einstein's equation- Hall effect – Hall coefficient –Applications of Hall effect.
Superconductors: Introduction – Properties of superconductors – Meissner effect – Type I and Type II superconductors – BCS theory (Qualitative) – Josephson effects (AC and DC) – SQUIDs
– High T_c superconductors – Applications of superconductors.

Unit Outcomes:
The students will be able to

- **Classify** the energy bands of semiconductors (L2)
- **Interpret** the direct and indirect band gap semiconductors (L2)
- **Identify** the type of semiconductor using Hall effect (L2)
- **Identify** applications of semiconductors in electronic devices (L2)
- **Classify** superconductors based on Meissner's effect (L2)
- **Explain** Meissner's effect, BCS theory & Josephson effect in superconductors (L2)

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Text books:

1. M.N.Avadhanulu, P.G.Kshirsagar& TVS Arun Murthy" A Text book of Engineering Physics"- S.Chand Publications, 11th Edition 2019.
2. Engineering Physics" by D.K.Bhattacharya and PoonamTandon, Oxford press (2015).
3. Applied Physics by P.K.Palanisamy SciTech publications.

Reference Books:

1. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons
2. Engineering Physics by M.R.Srinivasan, New Age international publishers (2009).
3. Shatendra Sharma, Jyotsna Sharma, " Engineering Physics", Pearson Education, 2018
4. Engineering Physics - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press
5. Semiconductor physics and devices- Basic principle – Donald A, Neamen, McGraw Hill
6. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning

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I Year - II Semester		L	T	P	C
		3	0	0	3
DIGITAL LOGIC DESIGN (ES1201)					

Course objectives:

- To study the basic philosophy underlying the various number systems, negative number representation, binary arithmetic, theory of Boolean algebra and map method for minimization of switching functions.
- To introduce the basic tools for design of combinational and sequential digital logic.
- To learn simple digital circuits in preparation for computer engineering.

Course outcomes:

A student who successfully fulfills the course requirements will have demonstrated:

- An ability to define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.
- An ability to understand the different switching algebra theorems and apply them for logic functions.
- An ability to define the Karnaugh map for a few variables and perform an algorithmic reduction of logic functions.
- Students will be able to design various logic gates starting from simple ordinary gates to complex programmable logic devices & arrays.
- Students will be able to design various sequential circuits starting from flip-flop to registers and counters.

UNIT I: Digital Systems and Binary Numbers
Digital Systems, Binary Numbers, Octal and Hexadecimal Numbers, Complements of Numbers, Signed Binary Numbers, Arithmetic addition and subtraction, 4-bit codes: BCD, EXCESS 3, alphanumeric codes, 9's complement, 2421, etc..

UNIT II: Concept of Boolean algebra
Basic Theorems and Properties of Boolean algebra, Boolean Functions, Canonical and Standard Forms, Minterms and Maxterms.
Gate level Minimization
Map Method, Three-Variable K-Map, Four Variable K-Maps. Products of Sum Simplification, Sum of Products Simplification, Don't – Care Conditions, NAND and NOR Implementation, ExclusiveOR Function.

UNIT III: Combinational Logic
Introduction, Analysis Procedure, Binary Adder–Subtractor, Binary Multiplier, Decoders, Encoders, Multiplexers, Demultiplexers, Priority Encoder, Code Converters, Magnitude Comparator, HDL Models of Combinational Circuits.
Realization of Switching Functions Using PROM, PAL and PLA.

UNIT IV: Synchronous Sequential Logic
Introduction to Sequential Circuits, Storage Elements: Latches, Flip-Flops, RS- Latch Using NAND and NOR Gates, Truth Tables. RS, JK, T and D Flip Flops, Truth and Excitation Tables, Conversion of Flip Flops.

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UNIT V: Registers and Counters
Registers, Shift Registers, Ripple Counters, Synchronous Counters, Ring Counter, Johnson Counter.

Text Books:

1) Digital Design, 5/e, M.Morris Mano, Michael D Ciletti, PEA.
2) Fundamentals of Logic Design, 5/e, Roth, Cengage.

Reference Books:

1) Digital Logic and Computer Design, M.Morris Mano, PEA.
2) Digital Logic Design, Leach, Malvino, Saha, TMH.
3) Modern Digital Electronics, R.P. Jain, TMH.

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I Year – II Semester		L	T	P	C
		3	0	0	3
PYTHON PROGRAMMING (ES1202)					

Course Objectives:

The Objectives of Python Programming are

- To learn about Python programming language syntax, semantics, and the runtime environment
- To be familiarized with universal computer programming concepts like data types, containers
- To be familiarized with general computer programming concepts like conditional execution, loops & functions
- To be familiarized with general coding techniques and object-oriented programming

Course Outcomes:

- Develop essential programming skills in computer programming concepts like data types, containers
- Apply the basics of programming in the Python language
- Solve coding tasks related conditional execution, loops
- Solve coding tasks related to the fundamental notions and techniques used in object-oriented programming

UNIT I

Introduction: Introduction to Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, Operators. Type conversions, Expressions, More about Data Output.

Data Types, and Expression: Strings Assignment, and Comment, Numeric Data Types and Character Sets, Using functions and Modules.

Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables. Repetition Structures: Introduction, while loop, for loop, Calculating a Running Total, Input Validation Loops, Nested Loops.

UNIT II

Control Statement: Definite iteration for Loop Formatting Text for output, Selection if and if else Statement, Conditional Iteration The While Loop

Strings and Text Files: Accessing Character and Substring in Strings, Data Encryption, Strings and Number Systems, String Methods Text Files.

UNIT III

List and Dictionaries: Lists, Defining Simple Functions, Dictionaries

Design with Function**:** Functions as Abstraction Mechanisms, Problem Solving with Top Down Design, Design with Recursive Functions, Case Study Gathering Information from a File System, Managing a Program's Namespace, Higher Order Function.

Modules: Modules, Standard Modules, Packages.

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UNIT IV

File Operations: Reading config files in python, Writing log files in python, Understanding read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines(), Manipulating file pointer using seek, Programming using file operations
Object Oriented Programming**:** Concept of class, object and instances, Constructor, class attributes and destructors, Real time use of class in live projects, Inheritance , overlapping and overloading operators, Adding and retrieving dynamic attributes of classes, Programming using Oops support
Design with Classes: Objects and Classes, Data modeling Examples, Case Study An ATM, Structuring Classes with Inheritance and Polymorphism

UNIT V

Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defined Exceptions, Defining Clean-up Actions, Redefined Clean-up Actions.
Graphical User Interfaces: The Behavior of Terminal Based Programs and GUI -Based, Programs, Coding Simple GUI-Based Programs, Other Useful GUI Resources.
Programming**:** Introduction to Programming Concepts with Scratch.

Text Books

1) Fundamentals of Python First Programs, Kenneth. A. Lambert, Cengage.
2) Python Programming: A Modern Approach, VamsiKurama, Pearson.

Reference Books:

1) Introduction to Python Programming, Gowrishankar.S, Veena A, CRC Press.
2) Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

e-Resources:
https://www.tutorialspoint.com/python3/python_tutorial.pdf

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I Year – II Semester		L	T	P	C
		3	0	0	3
DATA STRUCTURES (CS1201)					

Course Objectives:

The objective of the course is to

- Introduce the fundamental concept of data structures and abstract data types
- Emphasize the importance of data structures in developing and implementing efficient algorithms
- Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms

Course Outcomes:

After completing this course a student will be able to:

- Summarize the properties, interfaces, and behaviors of basic abstract data types
- Discuss the computational efficiency of the principal algorithms for sorting & searching
- Use arrays, records, linked structures, stacks, queues, trees, and Graphs in writing programs
- Demonstrate different methods for traversing trees

UNIT I

Data Structures - Definition, Classification of Data Structures, Operations on Data Structures, Abstract Data Type (ADT), Preliminaries of algorithms. Time and Space complexity.
Searching - Linear search, Binary search, Fibonacci search.
Sorting- Insertion sort, Selection sort, Exchange (Bubble sort, quick sort), distribution (radix sort), merging (Merge sort) algorithms.

UNIT II

Linked List: Introduction, Single linked list, Representation of Linked list in memory, Operations on Single Linked list-Insertion, Deletion, Search and Traversal ,Reversing Single Linked list, Applications on Single Linked list- Polynomial Expression Representation ,Addition and Multiplication, Sparse Matrix Representation using Linked List, Advantages and Disadvantages of Single Linked list, Double Linked list-Insertion, Deletion, Circular Linked list-Insertion, Deletion.

UNIT III

Queues: Introduction to Queues, Representation of Queues-using Arrays and using Linked list, Implementation of Queues-using Arrays and using Linked list, Application of Queues-Circular Queues, Dequeues, Priority Queues, Multiple Queues.
Stacks: Introduction to Stacks, Array Representation of Stacks, Operations on Stacks, Linked list Representation of Stacks, Operations on Linked Stack, Applications-Reversing list, Factorial Calculation, Infix to Postfix Conversion, Evaluating Postfix Expressions.

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UNIT IV

Trees: Basic Terminology in Trees, Binary Trees-Properties, Representation of Binary Trees using Arrays and Linked lists. Binary Search Trees- Basic Concepts, BST Operations: Insertion, Deletion, Tree Traversals, Applications-Expression Trees, Heap Sort, Balanced Binary Trees-AVL Trees, Insertion, Deletion and Rotations.

UNIT V

Graphs: Basic Concepts, Representations of Graphs-Adjacency Matrix and using Linked list, Graph Traversals (BFT & DFT), Applications- Minimum Spanning Tree Using Prims &Kruskals Algorithm, Dijkstra's shortest path, Transitive closure, Warshall's Algorithm.

Text Books:

1) Data Structures Using C. 2nd Edition.ReemaThareja, Oxford.
2) Data Structures and algorithm analysis in C, 2nded, Mark Allen Weiss.

Reference Books:

1) Fundamentals of Data Structures in C, 2nd Edition, Horowitz, Sahni, Universities Press.
2) Data Structures: A PseudoCode Approach, 2/e, Richard F.Gilberg, Behrouz A. Forouzon, Cengage.
3) Data Structures with C, Seymour Lipschutz TMH

e-Resources:

1) http://algs4.cs.princeton.edu/home/
2) https://faculty.washington.edu/jstraub/dsa/Master_2_7a.pdf

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I Year - II Semester		L	T	P	C
		0	0	3	1.5
APPLIED PHYSICS LAB (BS1203) **(For All Circuital Branches like CSE, ECE, EEE etc.)**					

(Any 10 of the following listed experiments)

List of Applied Physics Experiments

1. Determination of thickness of thin object by wedge method.
2. Determination of radius of curvature of a given plano convex lens by Newton's rings.
3. Determination of wavelengths of different spectral linesinmercury spectrum using diffraction grating in normal incidence configuration.
4. Determination of dispersive power of the prism.
5. Determination of dielectric constant using charging and discharging method.
6. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
7. Determination of numerical aperture and acceptance angle of an optical fiber.
8. Determination of wavelength of Laser light using diffraction grating.
9. Estimation of Planck's constant using photoelectric effect.
10. Determination of the resistivity of semiconductor by four probe method.
11. To determine the energy gap of a semiconductor using p-n junction diode.
12. Magnetic field along the axis of a current carrying circular coil by Stewart&Gee's Method
13. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall Effect.
14. Measurement of resistance of a semiconductor with varying temperature.
15. Resistivity of a Superconductor using four probe method &Meissner effect.

References:

1. S. Balasubramanian, M.N. Srinivasan "A Text Book of Practical Physics"- S Chand Publishers, 2017.

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I Year – II Semester		L	T	P	C
		0	0	3	1.5
PYTHON PROGRAMMING LAB (ES1203)					

Course Objectives:

The aim of Python Programming Lab is

- To acquire programming skills in core Python.
- To acquire Object Oriented Skills in Python
- To develop the skill of designing Graphical user Interfaces in Python
- To develop the ability to write database applications in Python

Course Outcomes:

By the end of this lab, the student is able to

- Write, Test and Debug Python Programs
- Use Conditionals and Loops for Python Programs
- Use functions and represent Compound data using Lists, Tuples and Dictionaries
- Use various applications using python

1) Write a program that asks the user for a weight in kilograms and converts it to pounds. There are 2.2 pounds in a kilogram.
2) Write a program that asks the user to enter three numbers (use three separate input statements). Create variables called total and average that hold the sum and average of the three numbers and print out the values of total and average.
3) Write a program that uses a *for* loop to print the numbers 8, 11, 14, 17, 20, . . . , 83, 86, 89.
4) Write a program that asks the user for their name and how many times to print it. The program should print out the user's name the specified number of times.
5) Use a *for*loop to print a triangle like the one below. Allow the user to specify how high the triangle should be.

```
*
**
***
****
```

6) Generate a random number between 1 and 10. Ask the user to guess the number and print a message based on whether they get it right or not.
7) Write a program that asks the user for two numbers and prints *Close* if the numbers are within .001 of each other and Not close otherwise.
8) Write a program that asks the user to enter a word and prints out whether that word contains any vowels.
9) Write a program that asks the user to enter two strings of the same length. The program should then check to see if the strings are of the same length. If they are not, the program should print an appropriate message and exit. If they are of the same length, the program should alternate the characters of the two strings. For example, if the user enters *abcde*and*ABCDE* the program should print out *AaBbCcDdEe*.
10) Write a program that asks the user for a large integer and inserts commas into it according to the standard American convention for commas in large numbers. For instance, if the user enters 1000000, the output should be 1,000,000.



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11) In algebraic expressions, the symbol for multiplication is often left out, as in 3x+4y or 3(x+5). Computers prefer those expressions to include the multiplication symbol, like 3*x+4*y or 3*(x+5). Write a program that asks the user for an algebraic expression and then inserts multiplication symbols where appropriate.
12) Write a program that generates a list of 20 random numbers between 1 and 100.
    (a) Print the list.
    (b) Print the average of the elements in the list.
    (c) Print the largest and smallest values in the list.
    (d) Print the second largest and second smallest entries in the list
    (e) Print how many even numbers are in the list.
13) Write a program that asks the user for an integer and creates a list that consists of the factors of that integer.
14) Write a program that generates 100 random integers that are either 0 or 1. Then find the longest run of zeros, the largest number of zeros in a row. For instance, the longest run of zeros in [1,0,1,1,0,0,0,0,1,0,0] is 4.
15) Write a program that removes any repeated items from a list so that each item appears at most once. For instance, the list [1,1,2,3,4,3,0,0] would become [1,2,3,4,0].
16) Write a program that asks the user to enter a length in feet. The program should then give the user the option to convert from feet into inches, yards, miles, millimeters, centimeters, meters, or kilometers. Say if the user enters a 1, then the program converts to inches, if they enter a 2, then the program converts to yards, etc. While this can be done with if statements,it is much shorter with lists and it is also easier to add new conversions if you use lists.
17) Write a function called *sum_digits*that is given an integer num and returns the sum of the digits of num.
18) Write a function called *first_diff*that is given two strings and returns the first location in which the strings differ. If the strings are identical, it should return -1.
19) Write a function called *number_of_factors*that takes an integer and returns how many factors the number has.
20) Write a function called *is_sorted*that is given a list and returns True if the list is sorted and False otherwise.
21) Write a function called root that is given a number x and an integer n and returns $x^{1/n}$. In the function definition, set the default value of n to 2.
22) Write a function called primes that is given a number n and returns a list of the first n primes. Let the default value of n be 100.
23) Write a function called merge that takes two already sorted lists of possibly different lengths, and merges them into a single sorted list.
    (a) Do this using the sort method. (b) Do this without using the sort method.
24) Write a program that asks the user for a word and finds all the smaller words that can be made from the letters of that word. The number of occurrences of a letter in a smaller word can't exceed the number of occurrences of the letter in the user's word.
25) Write a program that reads a file consisting of email addresses, each on its own line. Your program should print out a string consisting of those email addresses separated by semicolons.
26) Write a program that reads a list of temperatures from a file called *temps.txt*, converts those temperatures to Fahrenheit, and writes the results to a file called ftemps.txt.



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27) Write a class called Product. The class should have fields called name, amount, and price, holding the product's name, the number of items of that product in stock, and the regular price of the product. There should be a method *get_price*that receives the number of items to be bought and returns a the cost of buying that many items, where the regular price is charged for orders of less than 10 items, a 10% discount is applied for orders of between 10 and 99 items, and a 20% discount is applied for orders of 100 or more items. There should also be a method called *make_purchase*that receives the number of items to be bought and decreases amount by that much.
28) Write a class called Time whose only field is a time in seconds. It should have a method called *convert_to_minutes*that returns a string of minutes and seconds formatted as in the following example: if seconds is 230, the method should return '5:50'. It should also have a method called *convert_to_hours*that returns a string of hours, minutes, and seconds formatted analogously to the previous method.
29) Write a class called Converter. The user will pass a length and a unit when declaring an object from the class—for example, c = Converter(9,'inches'). The possible units are inches, feet, yards, miles, kilometers, meters, centimeters, and millimeters. For each of these units there should be a method that returns the length converted into those units. For example, using the Converter object created above, the user could call c.feet() and should get 0.75 as the result.
30) Write a Python class to implement pow(x, n).
31) Write a Python class to reverse a string word by word.
32) Write a program that opens a file dialog that allows you to select a text file. The program then displays the contents of the file in a textbox.
33) Write a program to demonstrate Try/except/else.

Write a program to demonstrate try/finally and with/as.

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DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

I Year – II Semester		L	T	P	C
		0	0	3	1.5
DATA STRUCTURES LAB (CS1202)					

Course Objectives:
The objective of this lab is to
- Demonstrate the different data structures implementation.

Course Outcomes:
By the end of this lab the student is able to
- Use basic data structures such as arrays and linked list.
- Programs to demonstrate fundamental algorithmic problems including Tree Traversals, Graph traversals, and shortest paths.
- Use various searching and sorting algorithms.

Exercise -1 (Searching)
Write C program that use both recursive and non recursive functions to perform Linear search for a Key value in a given list.
b) Write C program that use both recursive and non recursive functions to perform Binary search for a Key value in a given list.

Exercise – 2 (Sorting-I)
a) Write C program that implement Bubble sort, to sort a given list of integers in ascending order
b) Write C program that implement Quick sort, to sort a given list of integers in ascending order
c) Write C program that implement Insertion sort, to sort a given list of integers in ascending order

Exercise -3 (Sorting-II)
a) Write C program that implement radix sort, to sort a given list of integers in ascending order
b) Write C program that implement merge sort, to sort a given list of integers in ascending order

Exercise -4 (Singly Linked List)
a) Write a C program that uses functions to create a singly linked list
b) Write a C program that uses functions to perform insertion operation on a singly linked list
c) Write a C program that uses functions to perform deletion operation on a singly linked list
d) Write a C program to reverse elements of a single linked list.

Exercise -5(Queue)
a) Write C program that implement Queue (its operations) using arrays.
b) Write C program that implement Queue (its operations) using linked lists

Exercise -6 (Stack)
a) Write C program that implement stack (its operations) using arrays
b) Write C program that implement stack (its operations) using Linked list
c) Write a C program that uses Stack operations to evaluate postfix expression

Exercise -7 (Binary Search Tree)
a) Write a C program to Create a BST
b) Write a C program to insert a node into a BST.
c) Write a C program to delete a node from a BST.
d) Write a recursive C program for traversing a binary tree in preorder, inorder and postorder.

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I Year – II Semester		L	T	P	C
		2	0	0	0
CONSTITUTION OF INDIA (MC1201)					

Course Objectives:

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
- To understand the central and state relation financial and administrative

Course Outcomes:

At the end of the course, the student will be able to have a clear knowledge on the following:

- Understand historical background of the constitution making and its importance for building a democratic India.
- Understand the functioning of three wings of the government ie., executive, legislative and judiciary.
- Understand the value of the fundamental rights and duties for becoming good citizen of India.
- Analyze the decentralization of power between central, state and local self-government.
- Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.
    1. Know the sources, features and principles of Indian Constitution.
    2. Learn about Union Government, State government and its administration.
    3. Get acquainted with Local administration and Pachayati Raj.
    4. Be aware of basic concepts and developments of Human Rights.
    5. Gain knowledge on roles and functioning of Election Commission

UNIT I

Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

Learning outcomes: After completion of this unit student will

- Understand the concept of Indian constitution
- Apply the knowledge on directive principle of state policy
- Analyze the History, features of Indian constitution
- Evaluate Preamble Fundamental Rights and Duties

UNIT II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre-State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, LokSabha, RajyaSabha, The Supreme Court and High Court: Powers and Functions;

Learning outcomes: After completion of this unit student will

- Understand the structure of Indian government
- Differentiate between the state and central government
- Explain the role of President and Prime Minister

- Know the Structure of supreme court and High courtUNIT III

State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

Learning outcomes: After completion of this unit student will

- Understand the structure of state government
- Analyze the role Governor and Chief Minister
- Explain the role of state Secretariat
- Differentiate between structure and functions of state secretariat

UNIT IV

A.Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation PachayatiRaj: Functions PRI: ZilaPanchayat, Elected officials and their roles, CEO ZilaPanchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy

Learning outcomes:-After completion of this unit student will

- Understand the local Administration
- Compare and contrast district administration role and importance
- Analyze the role of Myer and elected representatives of Municipalities
- Evaluate Zillapanchayat block level organisation

UNIT V

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women

Learning outcomes: After completion of this unit student will

- Know the role of Election Commission apply knowledge
- Contrast and compare the role of Chief Election commissioner and Commissiononerate
- Analyze role of state election commission
- Evaluate various commissions of viz SC/ST/OBC and women

References:

1) Durga Das Basu, Introduction to the Constitution of India, Prentice Hall of India Pvt. Ltd.
2) SubashKashyap, Indian Constitution, National Book Trust
3) J.A. Siwach, Dynamics of Indian Government & Politics
4) D.C. Gupta, Indian Government and Politics
5) H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6) J.C. Johari, Indian Government andPolitics Hans
7) J. Raj IndianGovernment and Politics
8) M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi
9) Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

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e-Resources:

1) nptel.ac.in/courses/109104074/8
2) nptel.ac.in/courses/109104045/
3) nptel.ac.in/courses/101104065/
4) www.hss.iitb.ac.in/en/lecture-details
5) www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

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II Year -I Semester		L	T	P	C
		3	0	0	3
MATHEMATICS - III					

Course Objectives:

- To familiarize the techniques in partial differential equations
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.

Course Outcomes:

At the end of the course, the student will be able to

- Interpret the physical meaning of different operators such as gradient, curl and divergence (L5)
- Estimate the work done against a field, circulation and flux using vector calculus (L5)
- Apply the Laplace transform for solving differential equations (L3)
- Find or compute the Fourier series of periodic signals (L3)
- Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms (L3)
- Identify solution methods for partial differential equations that model physical processes (L3)

UNIT I: Vector calculus: (10 hrs)

Vector Differentiation: Gradient – Directional derivative – Divergence – Curl – Scalar Potential.
Vector Integration: Line integral – Work done – Area – Surface and volume integrals – Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof).

UNIT II: Laplace Transforms: (10 hrs)

Laplace transforms of standard functions – Shifting theorems – Transforms of derivatives and integrals – Unit step function – Dirac's delta function – Inverse Laplace transforms – Convolution theorem (without proof).
Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.

UNIT III: Fourier series and Fourier Transforms: (10 hrs)

Fourier Series: Introduction – Periodic functions – Fourier series of periodic function –Dirichlet's conditions – Even and odd functions – Change of interval – Half-range sine and cosine series.
Fourier Transforms: Fourier integral theorem (without proof) – Fourier sine and cosine integrals – Sine and cosine transforms – Properties – inverse transforms – Finite Fourier transforms.

UNIT IV: PDEof first order: (8 hrs)

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.

UNIT V: Second order PDE and Applications: (10 hrs)

Second order PDE: Solutions of linear partial differential equations with constant coefficients – RHS term of the type $e^{ax+by}, \sin(ax+by), \cos(ax+by), x^m y^n$.

Applications of PDE: Method of separation of Variables – Solution of One dimensional Wave, Heat and two-dimensional Laplace equation.

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Text Books:

1) B. S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2) B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:

1) Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India.
2) Dean. G. Duffy, Advanced Engineering Mathematics with MATLAB, 3rd Edition, CRC Press.
3) Peter O' Neil, Advanced Engineering Mathematics, Cengage.
4) Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford University Press.

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II Year – I Semester		L	T	P	C
		3	0	0	3
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE					

Course Objectives:
This course is designed to:

- To introduce the students to the topics and techniques of discrete methods and combinatorial reasoning
- To introduce a wide variety of applications. The algorithmic approach to the solution of problems is fundamental in discrete mathematics, and this approach reinforces the close ties between this discipline and the area of computer science

Course Outcomes:
At the end of the course student will be able to

- Demonstrate skills in solving mathematical problems
- Comprehend mathematical principles and logic
- Demonstrate knowledge of mathematical modeling and proficiency in using mathematical software
- Manipulate and analyze data numerically and/or graphically using appropriate Software
- Communicate effectively mathematical ideas/results verbally or in writing

UNIT I
Mathematical Logic: Propositional Calculus: Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Normal Forms, Theory of Inference for Statement Calculus, Consistency of Premises, Indirect Method of Proof, Predicate Calculus:Predicates, Predicative Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus.

UNIT II
Set Theory: Sets: Operations on Sets, Principle of Inclusion-Exclusion, Relations: Properties, Operations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering, Hassie Diagrams, Functions: Bijective, Composition, Inverse, Permutation, and Recursive Functions, Lattice and its Properties, Algebraic Structures: Algebraic Systems, Properties, Semi Groups and Monoids, Group, Subgroup and Abelian Group, Homomorphism, Isomorphism.

UNIT III
Combinatorics: Basis of Counting, Permutations, Permutations with Repetitions, Circular and Restricted Permutations, Combinations, Restricted Combinations, Binomial and Multinomial Coefficients and Theorems, Number Theory: Properties of Integers, Division Theorem, Greatest Common Divisor, Euclidean Algorithm, Least Common Multiple, Testing for Prime Numbers, The Fundamental Theorem of Arithmetic, Modular Arithmetic, Fermat's and Euler's Theorems

UNIT IV
Recurrence Relations: Generating Functions, Function of Sequences, Partial Fractions, Calculating Coefficient of Generating Functions, Recurrence Relations, Formulation as Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations

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UNIT V

Graph Theory: Basic Concepts, Graph Theory and its Applications, Sub graphs, Graph Representations: Adjacency and Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Bipartite and Planar Graphs, Euler's Theorem, Graph Colouring and Covering, Chromatic Number, Spanning Trees, Prim's and Kruskal's Algorithms, BFS and DFS Spanning Trees.

Text Books:

1) Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill.
2) Elements of Discrete Mathematics-A Computer Oriented Approach, C. L. Liu and D. P. Mohapatra, 3rd Edition, Tata McGraw Hill.

Reference Books:

1) Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel and T. P. Baker, 2nd Edition, Prentice Hall of India.
2) Discrete Mathematical Structures, Bernand Kolman, Robert C. Busby and Sharon Cutler Ross, PHI.
3) Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7th Edition, Tata McGraw Hill.

e-Resources:

1) https://nptel.ac.in/courses/106/106/106106094/

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II Year – I Semester		L	T	P	C
		3	0	0	3
INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING					

Course Objectives:

- To provide a strong foundation of fundamental concepts in Artificial Intelligence.
- To provide a basic exposition to the goals and methods of Artificial Intelligence.
- To provide fundamentals of machine learning

Course Outcomes:

Upon successful completion of the course, the student will be able to:

- Enumerate the history and foundations of Artificial Intelligence
- Apply the basic principles of AI in problem solving
- Choose the appropriate representation of Knowledge
- Enumerate the Perspectives and Issues in Machine Learning
- Identify issues in Decision Tree Learning

UNIT I

Introduction: What Is AI?, The Foundations of Artificial Intelligence, The History of Artificial Intelligence, The State of the Art, Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

UNIT II

Problem Solving: Problem-Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies, Informed (Heuristic) Search Strategies, Local Search Algorithms and Optimization Problems, Searching with Nondeterministic Actions.

UNIT III

Knowledge Representation: Knowledge-Based Agents, Logic, Propositional Logic: A Very Simple Logic, Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects, Reasoning Systems for Categories, The Internet Shopping World.

UNIT IV

Introduction to Machine Learning: Well-Posed Learning Problem, Designing a Learning system, Perspectives and Issues in Machine Learning.

Concept Learning and The General-to-Specific Ordering: Introduction, A Concept Learning Task, Concept Learning as Search, FIND-S: Finding a Maximally Specific Hypothesis, Version Spaces and the Candidate Elimination Algorithm, Remarks on Version spaces and Candidate-Elimination, Inductive Bias

UNIT V

Decision Tree Learning: Introduction, Decision Tree Representation, Appropriate Problems for Decision Tree Learning, The Basic Decision Tree Learning Algorithm, Hypothesis Space Search in Decision Tree Learning, Inductive Bias in Decision Tree Learning, Issues in Decision Tree Learning.

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Text Books:

1) Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach" , 3rd Edition, Pearson
2) Tom M. Mitchell, *Machine Learning*, McGraw Hill Edition, 2013

Reference Books:

1) Saroj Kaushik, "Artificial Intelligence", Cengage Learning India, 2011
2) Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill
3) David Poole and Alan Mackworth, "Artificial Intelligence: Foundations for Computational Agents", Cambridge University Press 2010.
4) Trivedi, M.C., "A Classical Approach to Artifical Intelligence", Khanna Publishing House, Delhi.
5) Christopher Bishop, Pattern Recognition and Machine Learning (PRML) , Springer, 2007.
6) ShaiShalev-Shwartz and Shai Ben-David, Understanding Machine Learning: From Theory to Algorithms (UML) , Cambridge University Press, 2014.

Web Resources:

1) https://nptel.ac.in/courses/106105077
2) https://nptel.ac.in/courses/106106126
3) https://aima.cs.berkeley.edu
4) https://ai.berkeley,edu/project_overview.html
5) http://www.zuj.edu.jo/download/machine-learning-tom-mitchell-pdf/
6) http://www.ntu.edu.sg/home/egbhuang/pdf/ieee-is-elm.pdf
7) https://swayam.gov.in/nd1_noc20_cs73/preview

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DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

II Year – I Semester		L	T	P	C
		3	0	0	3
OBJECT ORIENTED PROGRAMMING WITH JAVA					

Course Objectives:
The learning objectives of this course are:

- To identify Java language components and how they work together in applications
- To learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
- To learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications
- To understand how to design applications with threads in Java
- To understand how to use Java APIs for program development

Course Outcomes:
By the end of the course, the student will be

- Able to realize the concept of Object Oriented Programming & Java Programming Constructs
- Able to describe the basic concepts of Java such as operators, classes, objects, inheritance, packages, Enumeration and various keywords
- Apply the concept of exception handling and Input/ Output operations
- Able to design the applications of Java & Java applet
- Able to Analyze & Design the concept of Event Handling and Abstract Window Toolkit

UNIT I
Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.
Data Types, Variables, and Operators :Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final, Introduction to Operators, Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.
Control Statements:Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator?:, Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.

UNIT II
Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this.
Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.

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UNIT III

Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.
Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.
Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.

UNIT IV

Packages and Java Library: Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java.lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto-unboxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java.time.Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.
Exception Handling: Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions, try-with-resources, Catching Subclass Exception, Custom Exceptions, Nested try and catch Blocks, Rethrowing Exception, Throws Clause.

UNIT V

String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Methods for Comparison of Strings, Methods for Modifying Strings, Methods for Searching Strings, Data Conversion and Miscellaneous Methods, Class String Buffer, Class String Builder.
Multithreaded Programming: Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread- Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter-thread Communication - Suspending, Resuming, and Stopping of Threads.
Java Database Connectivity: Introduction, JDBC Architecture, Installing MySQL and MySQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, ResultSet Interface, Creating JDBC Application, JDBC Batch Processing, JDBC Transaction Management

Text Books:

1) JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
2) The complete Reference Java, 8th edition, Herbert Schildt, TMH.

References Books:

1) Introduction to java programming, 7th edition by Y Daniel Liang, Pearson
2) Murach's Java Programming, Joel Murach

e-Resources:

1) https://nptel.ac.in/courses/106/105/106105191/
2) https://www.w3schools.com/java/java_data_types.asp

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DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

II Year – I Semester		L	T	P	C
		3	0	0	3
DATABASE MANAGEMENT SYSTEMS					

Course Objectives:

- To introduce about database management systems
- To give a good formal foundation on the relational model of data and usage of Relational Algebra
- To introduce the concepts of basic SQL as a universal Database language
- To demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization
- To provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques

Course Outcomes:

By the end of the course, the student will be able to

- Describe a relational database and object-oriented database
- Create, maintain and manipulate a relational database using SQL
- Describe ER model and normalization for database design
- Examine issues in data storage and query processing and can formulate appropriate solutions
- Outline the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage

UNIT I

Introduction: Database system, Characteristics (Database Vs File System), Database Users(Actors on Scene, Workers behind the scene), Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.

UNIT II

Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance BASIC SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update), basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions (Date and Time, Numeric, String conversion).

UNIT III

Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams. SQL: Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non-updatable), relational set operations.

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UNIT IV

Schema Refinement (Normalization):Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency(1NF, 2NF and 3 NF), concept of surrogate key, Boyce-codd normal form(BCNF), Lossless join and dependency preserving decomposition, Fourth normal form(4NF), Fifth Normal Form (5NF).

UNIT V

Transaction Concept: Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm.
Indexing Techniques: B+ Trees: Search, Insert, Delete algorithms, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes , Index data Structures, Hash Based Indexing: Tree base Indexing ,Comparison of File Organizations, Indexes and Performance Tuning

Text Books:

1) Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke, TMH
2) Database System Concepts,5/e, Silberschatz, Korth, TMH

Reference Books:

1) Introduction to Database Systems, 8/e C J Date, PEA.
2) Database Management System, 6/e Ramez Elmasri, Shamkant B. Navathe, PEA
3) Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

e-Resources:

1) https://nptel.ac.in/courses/106/105/106105175/
2) https://www.geeksforgeeks.org/introduction-to-nosql/

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DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

II Year – I Semester		L	T	P	C
		0	0	3	1.5
INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING LAB					

Course Objectives:

- To provide a strong foundation of fundamental concepts in Artificial Intelligence.
- To provide a basic exposition to the goals and methods of Artificial Intelligence.
- To apply the techniques in applications which involve perception, reasoning and learning.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

- Apply the basic principles of AI in problem solving using LISP/PROLOG
- Implement different algorithms using LISP/PROLOG
- Develop an Expert System using JESS/PROLOG

List of Experiments (Artificial Intelligence)

1. Implementation of DFS for water jug problem using LISP/PROLOG
2. Implementation of BFS for tic-tac-toe problem using LISP/PROLOG/Java
3. Implementation of TSP using heuristic approach using Java/LISP/Prolog
4. Implementation of Simulated Annealing Algorithm using LISP/PROLOG
5. Implementation of Hill-climbing to solve 8- Puzzle Problem
6. Implementation of Monkey Banana Problem using LISP/PROLOG

List of Experiments (Machine Learning)

Python Libraries required: Sklearn

Note: Standard datasets can be downloaded from UCI Machine Learning Repository (https://archive.ics.uci.edu/ml/datasets.php**)**

1. Implement and demonstrate FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .csv file.
2. For a given set of training data examples stored in a .csv file, implement and demonstrate the candidate elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
3. Write a program to demonstrate the working of the decision tree classifier. Use appropriate dataset for building the decision tree and apply this knowledge to classify a new sample.
4. Write a program to demonstrate the working of Decision tree regressor. Use appropriate dataset for decision tree regressor.
5. Write a program to demonstrate the working of Random Forest classifier. Use appropriate dataset for Random Forest Classifier.
6. Write a program to demonstrate the working of Logistic Regression classifier. Use appropriate dataset for Logistic Regression.

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II Year – I Semester		L	T	P	C
		0	0	3	1.5
OBJECT ORIENTED PROGRAMMING WITH JAVA LAB					

Course Objectives:
The aim of this lab is to

- Practice programming in the Java
- Gain knowledge of object-oriented paradigm in the Java programming language
- Learn use of Java in a variety of technologies and on different platforms

Course Outcomes:
By the end of the course student will be able to write java program for

- Evaluate default value of all primitive data type, Operations, Expressions, Control-flow, Strings
- Determine Class, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
- Illustrating simple inheritance, multi-level inheritance, Exception handling mechanism
- Construct Threads, Event Handling, implement packages, developing applets

Exercise - 1 (Basics)
a) Write a JAVA program to display default value of all primitive data type of JAVA
b) Write a java program that display the roots of a quadratic equation $ax^2+bx=0$. Calculate the discriminate D and basing on value of D, describe the nature of root.
c) Five Bikers Compete in a race such that they drive at a constant speed which may or may not be the same as the other. To qualify the race, the speed of a racer must be more than the average speed of all 5 racers. Take as input the speed of each racer and print back the speed of qualifying racers.

Exercise - 2 (Operations, Expressions, Control-flow, Strings)
a) Write a JAVA program to search for an element in a given list of elements using binary search mechanism.
b) Write a JAVA program to sort for an element in a given list of elements using bubble sort
c) Write a JAVA program to sort for an element in a given list of elements using merge sort.
d) Write a JAVA program using StringBuffer to delete, remove character.

Exercise - 3 (Class, Objects)
a) Write a JAVA program to implement class mechanism. Create a class, methods and invoke them inside main method.
b) Write a JAVA program to implement constructor.

Exercise - 4 (Methods)
a) Write a JAVA program to implement constructor overloading.
b) Write a JAVA program implement method overloading.

Exercise - 5 (Inheritance)
a) Write a JAVA program to implement Single Inheritance
b) Write a JAVA program to implement multi level Inheritance
c) Write a java program for abstract class to find areas of different shapes

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Exercise - 6 (Inheritance - Continued)
a) Write a JAVA program give example for "super" keyword.
b) Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?

Exercise - 7 (Exception)
a) Write a JAVA program that describes exception handling mechanism
b) Write a JAVA program Illustrating Multiple catch clauses

Exercise – 8 (Runtime Polymorphism)
a) Write a JAVA program that implements Runtime polymorphism
b) Write a Case study on run time polymorphism, inheritance that implements in above problem

Exercise – 9 (User defined Exception)
a) Write a JAVA program for creation of Illustrating throw
b) Write a JAVA program for creation of Illustrating finally
c) Write a JAVA program for creation of Java Built-in Exceptions
d) d)Write a JAVA program for creation of User Defined Exception

Exercise – 10 (Threads)
a) Write a JAVA program that creates threads by extending Thread class .First thread display "Good Morning "every 1 sec, the second thread displays "Hello "every 2 seconds and the third display "Welcome" every 3 seconds ,(Repeat the same by implementing Runnable)
b) Write a program illustrating **isAlive** and **join ()**
c) Write a Program illustrating Daemon Threads.

Exercise - 11 (Threads continuity)
a) Write a JAVA program Producer Consumer Problem
b) Write a case study on thread Synchronization after solving the above producer consumer problem

Exercise – 12 (Packages)
a) Write a JAVA program illustrate class path
b) Write a case study on including in class path in your os environment of your package.
c) Write a JAVA program that import and use the defined your package in the previous Problem

Exercise - 13 (Applet)
a) Write a JAVA program to paint like paint brush in applet.
b) Write a JAVA program to display analog clock using Applet.
c) Write a JAVA program to create different shapes and fill colors using Applet.

Exercise - 14 (Event Handling)
a) Write a JAVA program that display the x and y position of the cursor movement using Mouse.
b) Write a JAVA program that identifies key-up key-down event user entering text in a Applet.

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II Year – I Semester		L	T	P	C
		0	0	3	1.5
DATABASE MANAGEMENT SYSTEMS LAB					

Course Objectives:
This Course will enable students to

- Populate and query a database using SQL DDL/DML Commands
- Declare and enforce integrity constraints on a database
- Writing Queries using advanced concepts of SQL
- Programming PL/SQL including procedures, functions, cursors and triggers

Course Outcomes:
At the end of the course the student will be able to:

- Utilize SQL to execute queries for creating database and performing data manipulation operations
- Examine integrity constraints to build efficient databases
- Apply Queries using Advanced Concepts of SQL
- Build PL/SQL programs including stored procedures, functions, cursors and triggers

List of Exercises:

1. Creation, altering and droping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
2. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example:- Select the roll number and name of the student who secured fourth rank in the class.
3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
4. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date)
5.
   i. Create a simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found)
   ii. Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
6. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.
7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE- APPLICATION ERROR.
8. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.
9. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.



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10. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
11. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers
12. Create a table and perform the search operation on table using indexing and non-indexing techniques.

Text Books/Suggested Reading:

1) Oracle: The Complete Reference by Oracle Press
2) Nilesh Shah, "Database Systems Using Oracle", PHI, 2007
3) Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007

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II Year - I Semester	Skill Oriented Course- I	L	T	P	C
		0	0	4	2
MOBILE APP DEVELOPMENT					

Course Objectives:

- To understand the components and structure of mobile application development frameworks for Android and windows OS based mobiles.
- To understand how to work with various mobile application development frameworks.
- To learn the basic and important design concepts and issues of development of mobile applications.
- To understand the capabilities and limitations of mobile devices.

Course Outcomes:

At the end of this course, students will be able to:

1. Identify various concepts of mobile programming that make it unique from programming for other platforms
2. Critique mobile applications on their design pros and cons
3. Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces,
4. Program mobile applications for the Android operating system that use basic and advanced phone features and
5. Deploy applications to the Android marketplace for distribution.

LIST OF EXPERIMENTS

1. Introduction to mobile technologies and devices , Android platform and applications overview
2. Setting Android development environments
3. Writing Android applications, Understanding anatomy of an Android application
4. Develop an application that uses GUI components, Font and Colours
5. Develop an application that uses Layout Managers and event listeners.
6. Write an application that draws basic graphical primitives on the screen.
7. Develop an application that makes use of databases.
8. Develop an application that makes use of Notification Manager
9. Implement an application that uses Multi-threading
10. Develop a native application that uses GPS location information
11. Implement an application that writes data to the SD card.
12. Implement an application that creates an alert upon receiving a message
13. Write a mobile application that makes use of RSS feed
14. Develop a mobile application to send an email.
15. Develop a Mobile application for simple needs (Mini Project)

References:

1. Android Programming unleashed , B.M. Harwani, Pearson, 2013.
2. Android Programming (Big Nerd Ranch Guide), by Bill Phillips, Chris Stewart, Brian Hardy, Kristin Marsicano, Pearson, 2016
3. Android Programming – Pushing the limits by Hellman by Erik Hellman, WILEY, 2013



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Web References:

1. The Complete Android N Developer Course –Udemy
   https://www.udemy.com/course/complete-android-n-developer-course/?altsc=428526
2. Android Development Courses on Google developers training
   https://developers.google.com/training/android/
3. Mobile Computing - Video course- NPTEL
   https://nptel.ac.in/courses/106/106/106106147/#
4. Android Tutorial – Tutorial Point https://www.tutorialspoint.com/android/index.htm

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II Year - I Semester		L	T	P	C
		2	0	0	0
ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE					

Course Objectives:

- The course aims at imparting basic principles of thought process, reasoning and inferencing. Sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature.
- Holistic life style of Yogic-science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions.
- The course focuses on introduction to Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system

Course Outcomes:

Upon successful completion of the course, the student will be able to:

- Understand the significance of Indian Traditional Knowledge
- Classify the Indian Traditional Knowledge
- Compare Modern Science with Indian Traditional Knowledge system.
- Analyze the role of Government in protecting the Traditional Knowledge
- Understand the impact of Philosophical tradition on Indian Knowledge System.

Unit I

Introduction to Traditional Knowledge: Define Traditional Knowledge- Nature and Characteristics-Scope and Importance- kinds of Traditional Knowledge- The historical impact of social change on Traditional Knowledge Systems- Value of Traditional knowledge in global economy.

Unit II

Basic structure of Indian Knowledge System: Astadash Vidya- 4 Ved - 4 Upaved (Ayurved, Dhanurved, Gandharva Ved & Sthapthya Adi), 6 vedanga (Shisha, Kalppa, Nirukha,Vykaran, Jyothisha & Chand),4 upanga (Dharmashastra, Meemamsa, purana & Tharka Shastra).

Unit III

Modern Science and Indian Knowledge System-Indigenous Knowledge, Characteristics- Yoga and Holistic Health care-cases studies.

Unit IV

Protection of Traditional Knowledge: The need for protecting traditional knowledge -Significance of Traditional knowledge Protection-Role of government to harness Traditional Knowledge.

Unit V

Impact of Traditions: Philosophical Tradition (Sarvadarshan) Nyaya, Vyshepec, Sankhya, Yog, Meemamsa, Vedantha, Chavanka, Jain & Boudh - Indian Artistic Tradition - Chitrakala, Moorthikala, Vasthukala , Sthapthya, Sangeetha, NruthyaYevamSahithya

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Reference Books :

1. Traditional Knowledge System in India, by AmitJha, 2009.
2. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, PratibhaPrakashan 2012.
3. Sivaramakrishnan (Ed.), Cultural Heritage of India-course material, BharatiyaVidya
4. Swami Jitatmanand, Holistic Science and Vedant, BharatiyaVidyaBhavan
5. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkata.
6. Pramod Chandra, India Arts, Howard Univ. Press, 1983.
7. Krishna Chaitanya, Arts of India, Abhinav Publications, 1987.

Web Resources:

1. https://www.wipo.int/wipo_magazine/en/2017/01/article_0004.html
2. http://iks.iitgn.ac.in/wp-content/uploads/2016/01/Indian-Knowledge-Systems-Kapil-Kapoor.pdf
3. https://www.wipo.int/edocs/mdocs/tk/en/wipo_grtkf_ic_21/wipo_grtkf_ic_21_ref_facilitators_text.pdf

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II Year – II Semester		L	T	P	C
		3	0	0	3
PROBABILITY AND STATISTICS					

Course Objectives:

- To familiarize the students with the foundations of probability and statistical methods
- To impart probability concepts and statistical methods in various applications Engineering

Course Outcomes:

Upon successful completion of this course, the student should be able to

- Classify the concepts of data science and its importance
- Interpret the association of characteristics and through correlation and regression tools
- Make use of the concepts of probability and their applications
- Apply discrete and continuous probability distributions
- Design the components of a classical hypothesis test
- Infer the statistical inferential methods based on small and large sampling tests

UNIT I

Descriptive statistics and methods for data science: Data science – Statistics Introduction – Population vs Sample – Collection of data – primary and secondary data – Type of variable: dependent and independent Categorical and Continuous variables – Data visualization – Measures of Central tendency – Measures of Variability (spread or variance) – Skewness Kurtosis.

UNIT II

Correlation and Curve fitting: Correlation – correlation coefficient – rank correlation – regression coefficients and properties – regression lines – Method of least squares – Straight line – parabola – Exponential – Power curves.

UNIT III

Probability and Distributions: Probability – Conditional probability and Baye's theorem – Random variables – Discrete and Continuous random variables – Distribution function – Mathematical Expectation and Variance – Binomial, Poisson, Uniform and Normal distributions.

UNIT IV

Sampling Theory: Introduction – Population and samples – Sampling distribution of Means and Variance (definition only) – Central limit theorem (without proof) – Introduction to t, χ^2 and F-distributions – Point and Interval estimations – Maximum error of estimate.

UNIT V

Tests of Hypothesis: Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors – Level of significance – One tail and two-tail tests – Tests concerning one mean and two means (Large and Small samples) – Tests on proportions.

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Text Books:

1) Miller and Freund's, Probability and Statistics for Engineers,7/e, Pearson, 2008.
2) S. C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.

Reference Books:

1) Shron L. Myers, Keying Ye, Ronald E Walpole, Probability and Statistics Engineers and the Scientists,8th Edition, Pearson 2007.
2) Jay l. Devore, Probability and Statistics for Engineering and the Sciences, 8th Edition, Cengage.
3) Sheldon M. Ross, Introduction to probability and statistics Engineers and the Scientists, 4th Edition, Academic Foundation, 2011.
4) Johannes Ledolter and Robert V. Hogg, Applied statistics for Engineers and Physical Scientists, 3rd Edition, Pearson, 2010.

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II Year – II Semester		L	T	P	C
		3	0	0	3
COMPUTER ORGANIZATION					

Course Objectives:
The course objectives of Computer Organization are to discuss and make student familiar with
- Principles and the Implementation of Computer Arithmetic
- Operation of CPUs including RTL, ALU, Instruction Cycle and Busses
- Fundamentals of different Instruction Set Architectures and their relationship to theCPU Design
- Memory System and I/O Organization
- Principles of Operation of Multiprocessor Systems and Pipelining

Course Outcomes:
By the end of the course, the student will
- Develop a detailed understanding of computer systems
- Cite different number systems, binary addition and subtraction, standard, floating-point, and micro operations
- Develop a detailed understanding of architecture and functionality of central processing unit
- Exemplify in a better way the I/O and memory organization
- Illustrate concepts of parallel processing, pipelining and inter processor communication

UNIT I
Basic Structure of Computers: Basic Organization of Computers, Historical Perspective, Bus Structures, Data Representation: Data types, Complements, Fixed Point Representation. Floating Point Representation. Other Binary Codes, Error Detection Codes.
Computer Arithmetic: Addition and Subtraction, Multiplication Algorithms, Division Algorithms.

UNIT II
Register Transfer Language and Microoperations: Register Transfer language. Register Transfer Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro Operations, Shift Micro Operations, Arithmetic Logic Shift Unit.
Basic Computer Organization and Design: Instruction Codes, Computer Register, Computer Instructions, Instruction Cycle, Memory – Reference Instructions. Input –Output and Interrupt, Complete Computer Description.

UNIT III
Central Processing Unit: General Register Organization, STACK Organization. Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer.
Microprogrammed Control: Control Memory, Address Sequencing, Micro Program example, Design of Control Unit.

UNIT IV
Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.
Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupts, Direct Memory Access.

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UNIT V

Multi Processors: Introduction, Characteristics of Multiprocessors, Interconnection Structures, Inter Processor Arbitration.
Pipeline: Parallel Processing, Pipelining, Instruction Pipeline, RISC Pipeline, Array Processor.

Text Books:

1) Computer System Architecture, M. Morris Mano, Third Edition, Pearson, 2008.
2) Computer Organization, Carl Hamacher, ZvonkoVranesic, SafwatZaky, 5/e, McGraw Hill, 2002.

Reference Books:

1) Computer Organization and Architecture, William Stallings, 6/e, Pearson, 2006.
2) Structured Computer Organization, Andrew S. Tanenbaum, 4/e, Pearson, 2005.
3) Fundamentals of Computer Organization and Design, Sivarama P. Dandamudi, Springer, 2006.

Web Resources:

1) https://nptel.ac.in/courses/106/105/106105163/
2) http://www.cuc.ucc.ie/CS1101/David%20Tarnoff.pdf

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II Year – II Semester		L	T	P	C
		3	0	0	3
DATA WAREHOUSING AND MINING					

Course Objectives:

- To understand and implement classical models and algorithms in data warehousing and data mining.
- To analyze the data, identify the problems, and choose the relevant models and algorithms to apply.
- To assess the strengths and weaknesses of various methods and algorithms and to analyze their behavior.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

- Summarize the architecture of data warehouse
- Apply different preprocessing methods, Similarity, Dissimilarity measures for any given raw data.
- Construct a decision tree and resolve the problem of model overfitting
- Compare Apriori and FP-growth association rule mining algorithms for frequent itemset generation
- Apply suitable clustering algorithm for the given data set

UNIT- I

Data Warehouse and OLAP Technology: An Overview: Data Warehouse, A Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, From Data Warehousing to Data Mining. (Han &Kamber)

UNIT- II

Data Mining: Introduction, What is Data Mining?, Motivating challenges, The origins of Data Mining, Data Mining Tasks, Types of Data, Data Quality.

Data Preprocessing: Aggregation, Sampling, Dimensionality Reduction, Feature Subset Selection, Feature creation, Discretization and Binarization, Variable Transformation, Measures of Similarity and Dissimilarity. (Tan & Vipin)

UNIT -III

Classification: Basic Concepts, General Approach to solving a classification problem, Decision Tree Induction: Working of Decision Tree, building a decision tree, methods for expressing an attribute test conditions, measures for selecting the best split, Algorithm for decision tree induction.

Model Overfitting: Due to presence of noise, due to lack of representation samples, evaluating the performance of classifier: holdout method, random sub sampling, cross-validation, bootstrap. Bayes Theorem, Naïve Bayes Classifier (Tan & Vipin)

UNIT -IV

Association Analysis: Basic Concepts and Algorithms: Problem Definition, Frequent Item Set Generation, Apriori Principle, Apriori Algorithm, Rule Generation, Compact Representation of Frequent Itemsets, FP-Growth Algorithm. (Tan & Vipin)

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UNIT -V

Cluster Analysis: Basic Concepts and Algorithms: Overview, What Is Cluster Analysis? Different Types of Clustering, Different Types of Clusters; K-means: The Basic K-means Algorithm, K-means Additional Issues, Bisecting K-means, Strengths and Weaknesses; Agglomerative Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering Algorithm DBSCAN: Traditional Density Center-Based Approach, DBSCAN Algorithm, Strengths and Weaknesses. (Tan &Vipin)

Text Books:

1. Introduction to Data Mining : Pang-Ning Tan & Michael Steinbach, Vipin Kumar, Fifth Impression, Pearson, 2015.
2. Data Mining concepts and Techniques, 3rd Edition, Jiawei Han, Michel Kamber, Elsevier, 2011

Reference Books:

1. Data Mining Techniques and Applications: An Introduction, Hongbo Du, Cengage Learning, 2010
2. Data Mining : Introductory and Advanced topics : Dunham, First Edition, Pearson, 2020
3. Data Warehousing Data Mining & OLAP, Alex Berson, Stephen Smith, TMH, 2008
4. Data Mining Techniques, Arun K Pujari, Universities Press, 2001

Web Resources:

1. NPTEL Online Course on Data Mining : https://onlinecourses.nptel.ac.in/noc18_cs14/preview

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II Year – II Semester		L	T	P	C
		3	0	0	3
FORMAL LANGUAGES AND AUTOMATA THEORY					

Course Objectives:

- To learn fundamentals of Regular and Context Free Grammars and Languages
- To understand the relation between Regular Language and Finite Automata and machines
- To learn how to design Automata's and machines as Acceptors, Verifiers and Translators
- To understand the relation between Contexts free Languages, PDA and TM
- To learn how to design PDA as acceptor and TM as Calculators

Course Outcomes:

By the end of the course students can

- Classify machines by their power to recognize languages.
- Summarize language classes & grammars relationship among them with the help of Chomsky hierarchy
- Employ finite state machines to solve problems in computing
- Illustrate deterministic and non-deterministic machines
- Quote the hierarchy of problems arising in the computer science

UNITI

Finite Automata: Need of Automata theory, Central Concepts of Automata Theory, Automation, Finite Automation, Transition Systems, Acceptance of a String, DFA, Design of DFAs, NFA, Design of NFA, Equivalence of DFA and NFA, Conversion of NFA into DFA, Finite Automata with Є-Transitions, Minimization of Finite Automata, Finite Automata with output-Mealy and Moore Machines, Applications and Limitation of Finite Automata.

UNIT II

Regular Expressions, Regular Sets, Identity Rules, Equivalence of two RE, Manipulations of REs, Finite Automata and Regular Expressions, Inter Conversion, Equivalence between FA and RE, Pumping Lemma of Regular Sets, Closure Properties of Regular Sets, Grammars, Classification of Grammars, Chomsky Hierarchy Theorem, Right and Left Linear Regular Grammars, Equivalence between RG and FA, Inter Conversion.

UNIT III

Formal Languages, Context Free Grammar, Leftmost and Rightmost Derivations, Parse Trees, Ambiguous Grammars, Simplification of Context Free Grammars-Elimination of Useless Symbols, Є-Productions and Unit Productions, Normal Forms-Chomsky Normal Form and Greibach Normal Form, Pumping Lemma, Closure Properties, Applications of Context Free Grammars.

UNIT IV

Pushdown Automata, Definition, Model, Graphical Notation, Instantaneous Description, Language Acceptance of Pushdown Automata, Design of Pushdown Automata, Deterministic and Non – Deterministic Pushdown Automata, Equivalence of Pushdown Automata and Context Free Grammars, Conversion, Two Stack Pushdown Automata, Application of Pushdown Automata.

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UNIT V

Turning Machine: Definition, Model, Representation of TMs-Instantaneous Descriptions, Transition Tables and Transition Diagrams, Language of a TM, Design of TMs, Types of TMs, Church's Thesis, Universal and Restricted TM, Decidable and Un-decidable Problems, Halting Problem of TMs, Post's Correspondence Problem, Modified PCP, Classes of P and NP, NP-Hard and NP-Complete Problems.

Text Books:

1) Introduction to Automata Theory, Languages and Computation, J. E. Hopcroft, R. Motwani and J. D. Ullman, 3rd Edition, Pearson, 2008
2) Theory of Computer Science-Automata, Languages and Computation, K. L. P. Mishra and N. Chandrasekharan, 3rd Edition, PHI, 2007

Reference Books:

1) Elements of Theory of Computation, Lewis H.P. &Papadimition C.H., Pearson /PHI
2) Theory of Computation, V. Kulkarni, Oxford University Press, 2013
3) Theory of Automata, Languages and Computation, Rajendra Kumar, McGraw Hill, 2014

e-Resources:

1) https://nptel.ac.in/courses/106/104/106104028/

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II Year – II Semester		L	T	P	C
		3	0	0	3
MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTANCY					

Course Objectives:

- The Learning objectives of this paper are to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting
- To familiarize about the Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles
- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation
- Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals

Course Outcomes:

- The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product
- The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs
- The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units
- The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis
- The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making

UNIT I

Introduction to Managerial Economics and demand Analysis: Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.

UNIT II

Theories of Production and Cost Analyses: Theories of Production function- Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs-Fixed costs, Variable Costs and Total costs –Cost –Volume-Profit analysis-Determination of Breakeven point(problems)-Managerial significance and limitations of Breakeven point.

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UNIT III

Introduction to Markets, Theories of the Firm & Pricing Policies: Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson's models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing, Business Cycles : Meaning and Features – Phases of a Business Cycle. Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and their forms.

UNIT IV

Introduction to Accounting & Financing Analysis: Introduction to Double Entry System, Journal, Ledger, Trail Balance and Preparation of Final Accounts with adjustments – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow and cash flow analysis (Problems)

UNIT V

Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods (pay back period, accounting rate of return) and modern methods(Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)

Text Books:

1) A R Aryasri, Managerial Economics and Financial Analysis, The McGraw – Hill companies.

Reference Books:

1) Varshney R.L, K.L Maheswari, Managerial Economics, S. Chand & Company Ltd.
2) JL Pappas and EF Brigham, Managerial Economics, Holt, R & W; New edition edition
3) N.P Srinivasn and M. SakthivelMurugan, Accounting for Management, S. Chand & Company Ltd.
4) MaheswariS.N,AnIntroduction to Accountancy, Vikas Publishing House Pvt Ltd
5) I.M Pandey, Financial Management , Vikas Publishing House Pvt Ltd
6) V. Maheswari, Managerial Economics, S. Chand & Company Ltd.

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II Year – II Semester		L	T	P	C
		0	0	3	1.5
R PROGRAMMING LAB					

Course Objective: In this course student will learn about the fundamentals of R programming, standard R libraries, solid understanding of R functions,write programs using the R and gain skills in R programming Language, get acquaintances with Arrays, Files, Strings, Packages, and distributions using R.

Course Outcomes: At the end of the course, the student will be able to:

1. Implement basic concepts of R programming, and its different module that includes conditional, looping, lists, Strings, Functions, Frames, Arrays, and File programming.
2. Implement the concepts of R Script to extract the data from data frames and file operations.
3. Implement the various statistical techniques using R.
4. Extend the functionality of R by using add-on packages
5. Use R Graphics and Tables to visualize results of various statistical operations on data

Lab Experiments:

Week 1:

Installing R and RStudio
Basic functionality of R, variable, data types in R

Week 2:

a) Implement R script to show the usage of various operators available in R language.
b) Implement R script to read person‘s age from keyboard and display whether he is eligiblefor voting ornot.
c) Implement R script to find biggest number between two numbers.
d) Implement R script to check the given year is leap year ornot.

Week 3:

a) Implement R Script to create a list.
b) Implement R Script to access elements in the list.
c) Implement R Script to merge two or more lists. Implement R Script to perform matrix operation

Week 4:

Implement R script to perform following operations:
a) various operations on vectors
b) Finding the sum and average of given numbers using arrays.
c) To display elements of list in reverse order.
d) Finding the minimum and maximum elements in the array.

Week 5:

a) Implement R Script to perform various operations on matrices
b) Implement R Script to extract the data from dataframes.
c) Write R script to display file contents.
d) Write R script to copy file contents from one file to another

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Week 6:

a)Write an R script to find basic descriptive statistics using summary, str, quartile function on mtcars& cars datasets.

b) Write an R script to find subset of dataset by using subset (), aggregate () functions on iris dataset

Week 7:

a)Reading different types of data sets (.txt, .csv) from Web or disk and writing in file in specific disk location.

b) Reading Excel data sheet in R.

c)Reading XML dataset in R

Week 8:

a) Implement R Script to create a Pie chart, Bar Chart, scatter plot and Histogram (Introduction to ggplot2 graphics)

b) Implement R Script to perform mean, median, mode, range, summary, variance, standard deviation operations.

Week 9:

a) Implement R Script to perform Normal, Binomial distributions.

b) Implement R Script to perform correlation, Linear and multiple regression.

Week 10:

Introduction to Non-Tabular Data Types: Time series, spatial data, Network data.
Data Transformations: Converting Numeric Variables into Factors, Date Operations, String Parsing, Geocoding

Week 11:

Introduction Dirty data problems: Missing values, data manipulation, duplicates, forms of data dates, outliers, spelling

Week 12:

Data sources: SQLite examples for relational databases, Loading SPSS and SAS files, Reading from Google Spreadsheets, API and web scraping examples

References:

1. R Cookbook Paperback – 2011 by Teetor Paul O Reilly Publications
2. Beginning R: The Statistical Programming Language by Dr. Mark Gardener, Wiley Publications
3. R Programming For Dummies by JorisMeysAndrie de Vries, Wiley Publications
4. Hands-On Programming with R by Grolemund, O Reilly Publications
5. Statistical Programming in R by KG Srinivas G.M. Siddesh, ChetanShetty&Sowmya B.J. - 2017 edition
6. R Fundamentals and Programming Techniques, ThomasLumely.
7. R for Everyone Advanced Analytics and Graphics, Jared P. Lander- Addison Wesley Series
8. The Art of R Programming, Norman Matloff, Cengage Learning
9. Maria Dolores Ugarte, Ana F.Militino, AlanT.Arnholt—Probability and Statistics with R, 2nd Edition, CRC Press,2016.

10. R-programming for Data science, Roger D.Peng.
11. An Introduction to statistical learning-with applications in R, Trevor Hastie and Rob Tibshirani.

Web Links:

1. URL: https://cran.r-project.org/doc/manuals/r-release/R-intro.pdf (Online Resources)
2. http://nptel.ac.in/courses/106104135/48
3. http://nptel.ac.in/courses/110106064/

SOFTWARE requirements:

1. The R statistical software program. Available from: https://www.r-project.org/
2. RStudio an Integrated Development Environment (IDE) for R. Available from: https://www.rstudio.com/

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II Year – II Semester		L	T	P	C
		0	0	3	1.5
DATA MINING USING PYTHON LAB					

Course Objectives:

- Practical exposure on implementation of well-known data mining algorithms
- Learning performance evaluation of data mining algorithms in a supervised and an unsupervised setting.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

- Apply preprocessing techniques on real world datasets
- Apply apriori algorithm to generate frequent itemsets.
- Apply Classification and clustering algorithms on different datasets.

Note: Use python library scikit-learn wherever necessary

1. Demonstrate the following data preprocessing tasks using python libraries.
   a) Loading the dataset
   b) Identifying the dependent and independent variables
   c) Dealing with missing data

2. Demonstrate the following data preprocessing tasks using python libraries.
   a) Dealing with categorical data
   b) Scaling the features
   c) Splitting dataset into Training and Testing Sets

3. Demonstrate the following Similarity and Dissimilarity Measures using python
   a) Pearson's Correlation
   b) Cosine Similarity
   c) Jaccard Similarity
   d) Euclidean Distance
   e) Manhattan Distance

4. Build a model using linear regression algorithm on any dataset.
5. Build a classification model using Decision Tree algorithm on iris dataset
6. Apply Naïve Bayes Classification algorithm on any dataset
7. Generate frequent itemsets using Apriori Algorithm in python and also generate association rules for any market basket data.
8. Apply K- Means clustering algorithm on any dataset.
9. Apply Hierarchical Clustering algorithm on any dataset.
10. Apply DBSCAN clustering algorithm on any dataset.



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Web Resources:

1. https://analyticsindiamag.com/data-pre-processing-in-python/
2. https://towardsdatascience.com/decision-tree-in-python-b433ae57fb93
3. https://towardsdatascience.com/calculate-similarity-the-most-relevant-metrics-in-a-nutshell-9a43564f533e
4. https://www.springboard.com/blog/data-mining-python-tutorial/
5. https://medium.com/analytics-vidhya/association-analysis-in-python-2b955d0180c
6. https://www.datacamp.com/community/tutorials/naive-bayes-scikit-learn
7. https://www.analyticsvidhya.com/blog/2019/05/beginners-guide-hierarchical-clustering/
8. https://towardsdatascience.com/dbscan-algorithm-complete-guide-and-application-with-python-scikit-learn-d690cbae4c5d

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II Year – II Semester		L	T	P	C
		0	0	3	1.5
WEB APPLICATION DEVELOPMENT LAB					

Course Objectives:

- To develop the skill in Creating dynamic web pages with servlets
- To provide knowledge in connecting java programs with database using JDBC.
- To develop the skill in server side programming using JSP, node.js, React.js
- To provide knowledge about MERN stack
- Testing the application on an Application Server.
- Debugging Web applications locally and remotely

Course Outcomes:

By the end of the course, the student will be able to

- Develop Single Page Applications
- Develop NodeJS & ReactJS Reusable Service
- Store the data in MySQL
- Get acquainted with the latest web application development trends in the IT industry

List of Experiments:

1. Authentication using Java Servlet
2. Authentication using JSP
3. Connect MySQL database using JSP
4. Design and development of Online Book Shop using JSP/Node.js & React.js
5. Design and development of Online Examination using JSP/Node.js & React.js
6. Design and development of online ticket reservation system using JSP/Node.js & React.js
7. Design and development of online library using JSP/Node.js & React.js
8. Design and development of online banking using JSP/Node.js & React.js
9. Design and development of online job portal using JSP/Node.js & React.js
10. Design and development of Online Auction using JSP/Node.js & React.js

Note: Students are encouraged to propose innovative ideas in the field of E-commerce as projects.

References

1. Jason Hunter, William Crawford , Java Servlet Programming, Second Edition, ,O'Reilly Media
2. Hans Bergsten, Java Server Pages, O'Reilly
3. http://www.oracle.com/technetwork/java/index-jsp-135475.html
4. http://www.oracle.com/technetwork/java/javaee/jsp/index.html

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II Year - II Semester	Skill Oriented Course- II	L	T	P	C
		0	0	4	2
NATURAL LANGUAGE PROCESSING WITH PYTHON					

Course Objectives: The main objective of the course is Understand the various concepts of natural language processing along with their implementation using Python

Course Outcomes:
Upon successful completion of the course, the student will be able to:

- Explore natural language processing (NLP) libraries in Python
- Learn various techniques for implementing NLP including parsing & text processing
- Understand how to use NLP for text feature engineering

Python Libraries: nltk, re,word2vec

List of Experiments

1. Demonstrate Noise Removal for any textual data and remove regular expression pattern such as hash tag from textual data.
2. Perform lemmatization and stemming using python library nltk.
3. Demonstrate object standardization such as replace social media slangs from a text.
4. Perform part of speech tagging on any textual data.
5. Implement topic modeling using Latent Dirichlet Allocation (LDA) in python.
6. Demonstrate Term Frequency – Inverse Document Frequency (TF – IDF) using python
7. Demonstrate word embeddings using word2vec.
8. Implement Text classification using naïve bayes classifier and text blob library.
9. Apply support vector machine for text classification.
10. Convert text to vectors (using term frequency) and apply cosine similarity to provide closeness among two text.
11. Case study 1: Identify the sentiment of tweets
    In this problem, you are provided with tweet data to predict sentiment on electronic products of netizens.
12. Case study 2: Detect hate speech in tweets.
    The objective of this task is to detect hate speech in tweets. For the sake of simplicity, we say a tweet contains hate speech if it has a racist or sexist sentiment associated with it. So, the task is to classify racist or sexist tweets from other tweets.

Web References:

1. https://www.analyticsvidhya.com/blog/2017/01/ultimate-guide-to-understand-implement-natural-language-processing-codes-in-python/
2. https://datahack.analyticsvidhya.com/contest/linguipedia-codefest-natural-language-processing-1/?utm_source=ultimate-guide-to-understand-implement-natural-language-processing-codes-in-python&utm_medium=blog
3. https://www.analyticsvidhya.com/blog/2018/07/hands-on-sentiment-analysis-dataset-python/

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III B Tech I Sem		L	T	P	C
		3	0	0	3
COMPILER DESIGN					

Course Objectives:
Understand the basic concept of compiler design, and its different phases which will be helpful to construct new tools like LEX, YACC, etc.

Course Outcomes: At the end of the course, student will be able to

- Demonstrate phases in the design of compiler
- Organize Syntax Analysis, Top Down and LL(1) grammars
- Design Bottom Up Parsing and Construction of LR parsers
- Analyze synthesized, inherited attributes and syntax directed translation schemes
- Determine algorithms to generate code for a target machine

UNIT I:
Lexical Analysis: Language Processors, Structure of a Compiler, Lexical Analysis, The Role of the Lexical Analyzer, Bootstrapping, Input Buffering, Specification of Tokens, Recognition of Tokens, Lexical Analyzer Generator-LEX, Finite Automata, Regular Expressions and Finite Automata, Design of a Lexical Analyzer Generator.

UNIT II:
Syntax Analysis: The Role of the Parser, Context-Free Grammars, Derivations, Parse Trees, Ambiguity, Left Recursion, Left Factoring, **Top Down Parsing:** Pre Processing Steps of Top Down Parsing, Backtracking, Recursive Descent Parsing, LL (1) Grammars, Non-recursive Predictive Parsing, Error Recovery in Predictive Parsing.

UNIT III:
Bottom Up Parsing: Introduction, Difference between LR and LL Parsers, Types of LR Parsers, Shift Reduce Parsing, SLR Parsers, Construction of SLR Parsing Tables, More Powerful LR Parses, Construction of CLR (1) and LALR Parsing Tables, Dangling Else Ambiguity, Error Recovery in LR Parsing, Handling Ambiguity Grammar with LR Parsers.

UNIT III:
Syntax Directed Translation: Syntax-Directed Definitions, Evaluation Orders for SDD's, Applications of Syntax Directed Translation, Syntax-Directed Translation Schemes, Implementing L-Attributed SDD's. **Intermediate Code Generation:** Variants of Syntax Trees, Three Address Code, Types and Declarations, Translation of Expressions, Type Checking, Control Flow, Backpatching, Intermediate Code for Procedures.

UNIT IV:
Run Time Environments: Storage Organization, Run Time Storage Allocation, Activation Records, Procedure Calls, Displays, **Code Optimization:** The Principle Sources of Optimization, Basic Blocks, Optimization of Basic Blocks, Structure Preserving Transformations, Flow Graphs, Loop Optimization, Data-Flow Analysis, Peephole Optimization**,**

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UNIT V:

Code Generation: Issues in the Design of a Code Generator, Object Code Forms, Code Generation Algorithm, Register Allocation and Assignment.

Text Books:

1. Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman, Pearson Publishers, 2007.

Reference Books:

1. Compiler Construction, Principles and Practice, Kenneth C Louden, Cengage Learning, 2006
2. Modern compiler implementation in C, Andrew W Appel, Revised edition, Cambridge University Press.
3. Optimizing Compilers for Modern Architectures, Randy Allen, Ken Kennedy, Morgan Kauffmann, 2001.
4. Levine, J.R., T. Mason and D. Brown, Lex and Yacc, edition, O'Reilly & Associates, 1990

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III B Tech I Sem		L	T	P	C
		3	0	0	3
OPERATING SYSTEMS					

Course Objectives:
The objectives of this course is to

- Introduce to the internal operation of modern operating systems
- Define, explain, processes and threads, mutual exclusion, CPU scheduling, deadlock, memory management, and file systems
- Understand File Systems in Operating System like UNIX/Linux and Windows
- Understand Input Output Management and use of Device Driver and Secondary Storage (Disk) Mechanism
- Analyze Security and Protection Mechanism in Operating System

Course Outcomes:
After learning, the course the students should be able to:

- Describe various generations of Operating System and functions of Operating System
- Describe the concept of program, process and thread and analyze various CPU Scheduling Algorithms and compare their performance
- Solve Inter Process Communication problems using Mathematical Equations by various methods
- Compare various Memory Management Schemes especially paging and Segmentation in Operating System and apply various Page Replacement Techniques
- Outline File Systems in Operating System like UNIX/Linux and Windows

UNIT I:
Operating Systems Overview: Operating system functions, Operating system structure, Operating systems operations, Computing environments, Open-Source Operating Systems.
System Structures: Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs, operating system structure, operating system debugging, System Boot.

UNIT II:
Process Concept: Process scheduling, Operations on processes, Inter-process communication, Communication in client server systems.
Multithreaded Programming: Multithreading models, Thread libraries, Threading issues. Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling, Thread scheduling.
Inter-process Communication: Race conditions, Critical Regions, Mutual exclusion with busy waiting, Sleep and wakeup, Semaphores, Mutexes, Monitors, Message passing, Barriers, Classical IPC Problems - Dining philosophers problem, Readers and writers problem.

UNIT III:
Memory-Management Strategies: Introduction, Swapping, Contiguous memory allocation, Paging, Segmentation.
Virtual Memory Management: Introduction, Demand paging, Copy on-write, Page replacement, Frame allocation, Thrashing, Memory-mapped files, Kernel memory allocation.

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UNIT IV:
Deadlocks: Resources, Conditions for resource deadlocks, Ostrich algorithm, Deadlock detection and recovery, Deadlock avoidance, Deadlock prevention.
File Systems: Files, Directories, File system implementation, management and optimization. Secondary-Storage Structure: Overview of disk structure, and attachment, Disk scheduling, RAID structure, Stable storage implementation.

UNIT V:
System Protection: Goals of protection, Principles and domain of protection, Access matrix, Access control, Revocation of access rights.
System Security: Introduction, Program threats, System and network threats, Cryptography for security, User authentication, Implementing security defenses, Firewalling to protect systems and networks, Computer security classification.
Case Studies: Linux, Microsoft Windows.

Text Books:
1. Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2013.
2. Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008. (for Interprocess Communication and File systems.)

Reference Books:
1. Dhamdhere D M, Operating Systems A Concept Based Approach, 3rd edition, Tata McGraw-Hill, 2012.
2. Stallings W, Operating Systems -Internals and Design Principles, 6th edition, Pearson Education, 2009
3. Nutt G, Operating Systems, 3rd edition, Pearson Education, 2004.

e-Resources:
1) https://nptel.ac.in/courses/106/105/106105214/

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III B Tech I Sem		L	T	P	C
		3	0	0	3
MACHINE LEARNING					

Course Objectives:

- Identify problems that are amenable to solution by ANN methods, and which ML methods may be suited to solving a given problem.
- Formalize a given problem in the language/framework of different ANN methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, as a Markov decision process, etc).

Course Outcomes: After the completion of the course, student will be able to

- Explain the fundamental usage of the concept Machine Learning system
- Demonstrate on various regression Technique
- Analyze the Ensemble Learning Methods
- Illustrate the Clustering Techniques and Dimensionality Reduction Models in Machine Learning.
- Discuss the Neural Network Models and Fundamentals concepts of Deep Learning

Unit I:

Introduction- Artificial Intelligence, Machine Learning, Deep learning, Types of Machine Learning Systems, Main Challenges of Machine Learning.

Statistical Learning: Introduction, Supervised and Unsupervised Learning, Training and Test Loss, Tradeoffs in Statistical Learning, Estimating Risk Statistics, Sampling distribution of an estimator, Empirical Risk Minimization.

Unit II:

Supervised Learning(Regression/Classification):Basic Methods: Distance based Methods, Nearest Neighbours, Decision Trees, Naive Bayes, **Linear Models:** Linear Regression, Logistic Regression, Generalized Linear Models, Support Vector Machines, **Binary Classification:** Multiclass/Structured outputs, MNIST, Ranking.

Unit III:

Ensemble Learning and Random Forests: Introduction, Voting Classifiers, Bagging and Pasting, Random Forests, Boosting, Stacking.

Support Vector Machine: Linear SVM Classification, Nonlinear SVM Classification SVM Regression, Naïve Bayes Classifiers.

Unit IV:

Unsupervised Learning Techniques: Clustering, K-Means, Limits of K-Means, Using Clustering for Image Segmentation, Using Clustering for Preprocessing, Using Clustering for Semi-Supervised Learning, DBSCAN, Gaussian Mixtures.

Dimensionality Reduction: The Curse of Dimensionality, Main Approaches for Dimensionality Reduction, PCA, Using Scikit-Learn, Randomized PCA, Kernel PCA.

Unit V:

Neural Networks and Deep Learning: Introduction to Artificial Neural Networks with Keras, Implementing MLPs with Keras, Installing TensorFlow 2, Loading and Preprocessing Data with TensorFlow.

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Text Books:

1. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 2nd Edition, O'Reilly Publications, 2019
2. Data Science and Machine Learning Mathematical and Statistical Methods,Dirk P. Kroese, Zdravko I. Botev, Thomas Taimre, Radislav Vaisman,25th November 2020

Reference Books:

1. Machine Learning Probabilistic Approach, Kevin P. Murphy, MIT Press, 2012.

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III B Tech I Sem		L	T	P	C
		3	0	0	3
OPTIMIZATION IN OPERATIONS RESEARCH (Job oriented course)					

Course Objectives:

- To define an objective function and constraint functions in terms of design variables, and then state the optimization problem.
- To state single variable and multi variable optimization problems, without and with constraints.
- To explain linear programming technique to an optimization problem, define slack and surplus variables, by using Simplex method.
- To state transportation and assignment problem as a linear programming problem to determine Simplex method.
- To study and explain nonlinear programming techniques, unconstrained or constrained, and define exterior and interior penalty functions for optimization problems.

Course Outcomes: At the end of the course, student will be able to

- State and formulate the optimization problem, without and with constraints, by using design variables from an engineering design problem.
- Apply classical optimization techniques to minimize or maximize a multi-variable objective function, without or with constraints, and arrive at an optimal solution.
- Apply and Solve transportation and assignment problem by using Linear programming Simplex method.
- Apply gradient and non-gradient methods to nonlinear optimization problems and use interior or exterior penalty functions for the constraints to derive the optimal solutions
- Formulate and apply Dynamic programming technique to inventory control, production planning, engineering design problems etc. to reach a final optimal solution from the current optimal solution.

UNIT I:

Introduction and Classical Optimization Techniques: Statement of an Optimization problem, design vector, design constraints, constraint surface, objective function, objective function surfaces, classification of Optimization problems.

Classical Optimization Techniques: Single variable Optimization, multi variable Optimization without constraints, necessary and sufficient conditions for minimum/maximum, multivariable Optimization with equality constraints. Solution by method of Lagrange multipliers, multivariable Optimization with inequality constraints, Kuhn – Tucker conditions

UNIT II: Linear Programming : Standard form of a linear programming problem, geometry of linear programming problems, definitions and theorems, solution of a system of linear simultaneous equations, pivotal reduction of a general system of equations, motivation to the simplex method, simplex algorithm, Duality in Linear Programming, Dual Simplex method.

UNIT III: Transportation Problem: Finding initial basic feasible solution by north – west corner rule, least cost method and Vogel's approximation method, testing for optimality of balanced transportation problems, Special cases in transportation problem.

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UNIT IV: Nonlinear Programming: Unconstrained cases, One – dimensional minimization methods: Classification, Fibonacci method and Quadratic interpolation method, Univariate method, Powell's method and steepest descent method.
Constrained cases– Characteristics of a constrained problem, Classification, Basic approach of Penalty Function method; Basic approaches of Interior and Exterior penalty function methods, Introduction to convex Programming Problem.

UNIT V: Dynamic Programming: Dynamic programming multistage decision processes, types, concept of sub optimization and the principle of optimality, computational procedure in dynamic programming, examples illustrating the calculus method of solution, examples illustrating the tabular method of solution.

Text Books:

1. "Engineering optimization: Theory and practice", S. S.Rao, New Age International (P) Limited, 3rd edition, 1998.
2. "Introductory Operations Research", H.S. Kasene & K.D. Kumar, Springer (India), Pvt. LTd.

Reference Books:

1. "Optimization Methods in Operations Research and systems Analysis", by K.V. Mital and C. Mohan, New Age International (P) Limited, Publishers, 3rd edition, 1996.
2. Operations Research, Dr. S.D.Sharma, Kedarnath, Ramnath & Co

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III B Tech I Sem		L	T	P	C
		3	0	0	3
SOFTWARE ENGINEERING (Professional Elective-I)					

Course Objectives:
This course is designed to:

- Give exposure to phases of Software Development, common process models including Waterfall, and the Unified Process, and hands-on experience with elements of the agile process
- Give exposure to a variety of Software Engineering practices such as requirements analysis and specification, code analysis, code debugging, testing, traceability, and version control
- Give exposure to Software Design techniques

Course Outcomes:
Students taking this subject will gain software engineering skills in the following areas:

- Ability to transform an Object-Oriented Design into high quality, executable code
- Skills to design, implement, and execute test cases at the Unit and Integration level
- Compare conventional and agile software methods

UNIT I:
The Nature of Software, The Unique Nature of WebApps, Software Engineering, The Software Process, Software Engineering Practice, Software Myths. A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Technology.

UNIT II:
Agility, Agility and the Cost of Change, Agile Process, Extreme Programming (XP), Other Agile Process Models, A Tool Set for the Agile Process, Software Engineering Knowledge, Core Principles, Principles That Guide Each Framework Activity, Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Requirements Model, Negotiating Requirements, Validating Requirements.

UNIT III:
Requirements Analysis, Scenario-Based Modeling, UML Models That Supplement the Use Case, Data Modeling Concepts, Class-Based Modeling, Requirements Modeling Strategies, Flow-Oriented Modeling, Creating a Behavioral Model, Patterns for Requirements Modelling, Requirements Modeling for WebApps.

UNIT IV:
Design within the Context of Software Engineering, The Design Process, Design Concepts, The Design Model, Software Architecture, Architectural Genres, Architectural Styles
Assessing Alternative Architectural Designs, Architectural Mapping Using Data Flow, Components, Designing Class-Based Components, Conducting Component-Level Design, Component-Level Design for WebApps, Designing Traditional Components, Component- Based Development.

UNIT V
The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, WebApp Interface Design, Design Evaluation, Elements of Software Qualtiy Assurance, SQA Tasks, Goals & Metrics, Statistical SQA, Software Reliability, A Strategic Approach to Software Testing, Strategic Issues,



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Test Strategies for Conventional Software, Test Strategies for Object-Oriented Software, Test Strategies for WebApps, Validation Testing, System Testing, The Art of Debugging, Software Testing Fundamentals, Internal and External Views of Testing, White-Box Testing, Basis Path Testing.

Text Books:

1. Software Engineering a practitioner's approach, Roger S. Pressman, Seventh Edition, McGraw Hill Higher Education.
2. Software Engineering, Ian Sommerville, Ninth Edition, Pearson.

Reference Books:

1. Software Engineering, A Precise Approach, PankajJalote, Wiley India, 2010.
2. Software Engineering, Ugrasen Suman, Cengage.

e-Resources:

1) https://nptel.ac.in/courses/106/105/106105182/

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III B Tech I Sem		L	T	P	C
		3	0	0	3
COMPUTER VISION (Professional Elective-I)					

Course Objectives:
To introduce students the fundamentals of image formation; To introduce students the major ideas, methods, and techniques of computer vision and pattern recognition; To develop an appreciation for various issues in the design of computer vision and object recognition systems; and To provide the student with programming experience from implementing computer vision and object recognition applications.

Course Outcomes: After completing the course Student will be able to:
1. Identify basic concepts, terminology, theories, models and methods in the field of computer vision,
2. Describe known principles of feature detection and matching,
3. Describe basic methods of computer vision related to image stitching, photography like high dynamic range imaging and blur removal.
4. Suggest a design of a computer vision system for a 3D Reconstruction, Albedos, image based rendering views and depths.

UNIT I:
Introduction: Image Formation: Geometric Primitives and Transformation, Photometric Image Formation, Digital Camera, Image Processing: Point Operators, Linear Filtering, More Neighborhood Operators, Fourier Transforms, Pyramids and Wavelets, Geometric Transformations, Global Optimization.

UNIT II:
Feature Detection and Matching: Points and Patches, Edges, Lines, Segmentation: Active Contours, Split and Merge, Mean Shift and Mode Finding, Normalized Cuts, Feature-Based Alignment: 2D and 3D Feature-based Alignment, Pose Estimation, Geometric Intrinsic Calibration.

UNIT III:
Structure and Motion: Triangular, Two-frame Structure from Motion, Factorization, Bundle Adjustment, Constrained Structure and Motion, Dense Motion Estimation: Translation Alignment, Parametric Motion, Spline-based Motion, Optical Flow, Layered motion

UNIT IV:
Image Stitching: Motion Models, Global Alignment, Composing, Computational Photography: Photometric Calibration, High Dynamic Range Imaging, Super-Resolution and Blur Removal, image Matting and Compositing, Texture Analysis and Synthesis.

UNIT V:
3D Reconstruction: Shape From X, Active Range Finding, Surface Representation, Point-based Representation, Volumetric Representation, Model-based Reconstruction, Recovering Texture Maps and Albedos, Image- based Rendering: View Interpolation, Layered Depth Images, Light Fields and Lumigraphs, Environment Mattes, Video-based Rendering.

Text Books:
1. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited, 2011.
2. Simon J.D Prince, Computer Vision: Models, Learning and Inference, 1st Edition, 2012.



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Reference Books:

1. Computer Vision - A modern approach, by D. Forsyth and J. Ponce, Prentice Hall Robot Vision, by B. K. P. Horn, McGraw-Hill.
2. Haralick& Shapiro, “Computer and Robot Vision”, Vol II
3. G_erardMedioni and Sing Bing Kang “Emerging topics in computer vision”92

NPTEL LINK: https://onlinecourses.nptel.ac.in/noc22_ee48/preview

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III B Tech I Sem		L	T	P	C
		3	0	0	3
DATA VISUALIZATION (Professional Elective-I)					

Course Outcomes:
Upon completion of this course, the students will be able to

- Understand basics of Data Visualization
- Implement visualization of distributions
- Write programs on visualization of time series, proportions & associations
- Apply visualization on Trends and uncertainty
- Explain principles of proportions

UNIT I:
INTRODUCTION TO VISUALIZATION: Visualizing Data-Mapping Data onto Aesthetics, Aesthetics and Types of Data, Scales Map Data Values onto Aesthetics, Coordinate Systems and Axes- Cartesian Coordinates, Nonlinear Axes, Coordinate Systems with Curved Axes, Color Scales-Color as a Tool to Distinguish, Color to Represent Data Values, Color as a Tool to Highlight, Directory of Visualizations-Amounts, Distributions, Proportions, x–y relationships, Geospatial Data

UNIT II:
VISUALIZING DISTRIBUTIONS: Visualizing Amounts-Bar Plots, Grouped and Stacked Bars, Dot Plots and Heatmaps, Visualizing Distributions: Histograms and Density Plots- Visualizing a Single Distribution, Visualizing Multiple Distributions at the Same Time, Visualizing Distributions: Empirical Cumulative Distribution Functions and Q-Q Plots-Empirical Cumulative Distribution Functions, Highly Skewed Distributions, Quantile Plots, Visualizing Many Distributions at Once-Visualizing Distributions Along the Vertical Axis, Visualizing Distributions Along the Horizontal Axis

UNIT III:
VISUALIZING ASSOCIATIONS & TIME SERIES: Visualizing Proportions-A Case for Pie Charts, A Case for Side-by-Side Bars, A Case for Stacked Bars and Stacked Densities, Visualizing Proportions Separately as Parts of the Total ,Visualizing Nested Proportions- Nested Proportions Gone Wrong, Mosaic Plots and Treemaps, Nested Pies ,Parallel Sets. Visualizing Associations Among Two or More Quantitative Variables-Scatterplots, Correlograms, Dimension Reduction, Paired Data. Visualizing Time Series and Other Functions of an Independent Variable-Individual Time Series , Multiple Time Series and Dose–Response Curves, Time Series of Two or More Response Variables

UNIT IV:
VISUALIZING UNCERTIANITY: Visualizing Trends-Smoothing, Showing Trends with a Defined Functional Form, Detrending and Time-Series Decomposition, Visualizing Geospatial Data-Projections, Layers, Choropleth Mapping, Cartograms, Visualizing Uncertainty-Framing Probabilities as Frequencies, Visualizing the Uncertainty of Point Estimates, Visualizing the Uncertainty of Curve Fits, Hypothetical Outcome Plots

UNIT V:
PRINCIPLE OF PROPORTIONAL INK: The Principle of Proportional Ink-Visualizations Along Linear Axes, Visualizations Along Logarithmic Axes, Direct Area Visualizations, Handling Overlapping Points-Partial Transparency and Jittering, 2D Histograms, Contour Lines, Common Pitfalls of Color Use-Encoding

Too Much or Irrelevant Information ,Using Nonmonotonic Color Scales to Encode Data Values, Not Designing for Color-Vision Deficiency

Text Books:

1. Claus Wilke, "Fundamentals of Data Visualization: A Primer on Making Informative and Compelling Figures", 1st edition, O'Reilly Media Inc, 2019.
2. Ossama Embarak, Data Analysis and Visualization Using Python: Analyze Data to Create Visualizations for BI Systems, Apress, 2018

Reference Books:

1. Tony Fischetti, Brett Lantz, R: Data Analysis and Visualization, O'Reilly, 2016

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III B Tech I Sem		L	T	P	C
		3	0	0	3
DevOps (Professional Elective-I)					

Course Objectives:

- Introduces the basic concepts of Information System.
- To understand The Management Control Framework and The Application Control Framework.

Course Outcomes: At the end of the course, student will be able to

- Enumerate the principles of continuous development and deployment, automation of configuration management, inter-team collaboration, and IT service agility.
- Describe DevOps & DevSecOps methodologies and their key concepts
- Illustrate the types of version control systems, continuous integration tools, continuous monitoring tools, and cloud models
- Set up complete private infrastructure using version control systems and CI/CD tools
- Acquire the knowledge of maturity model, Maturity Assessment

UNIT I:
Phases of Software Development Life Cycle, Values and principles of agile software development.

UNIT II:
Fundamentals of DevOps: Architecture, Deployments, Orchestration, Need, Instance of applications, DevOps delivery pipeline, DevOps eco system.

UNIT III:
DevOps adoption in projects: Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes

UNIT IV:
CI/CD: Introduction to Continuous Integration, Continuous Delivery and Deployment, Benefits of CI/CD, Metrics to track CICD practices

UNIT V:
Devops Maturity Model: Key factors of DevOps maturity model, stages of Devops maturity model, DevOps maturity Assessment

Text Books:

1. The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, Gene Kim , John Willis , Patrick Debois , Jez Humb,1st Edition, O'Reilly publications, 2016.
2. What is Devops? Infrastructure as code, 1st Edition, Mike Loukides ,O'Reilly publications, 2012.

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III B Tech I Sem		L	T	P	C
		0	0	3	1.5
OPERATING SYSTEMS & COMPILER DESIGN LAB					

Course Objectives:

The man objective of this course is to implement operating systems and compiler design concept

Course Outcomes:

By the end of the course, student will be able to

- Implement various scheduling, page replacement algorithms and algorithms related to deadlocks
- Design programs for shared memory management and semaphores
- Determine predictive parsing table for a CFG
- Apply Lex and Yacc tools
- Examine LR parser and generating SLR Parsing table

List of Experiments:

1. Simulate the following CPU scheduling algorithms:
   a. Round Robin (b) SJF (c) FCFS (d) Priority
2. Simulate the following:
   a) Multiprogramming with a fixed number of tasks (MFT)
   b) Multiprogramming with a variable number of tasks (MVT)
3. Simulate the following page replacement algorithms:
   a) FIFO b) LRU c) LFU
4. Write a C program that illustrates two processes communicating using shared memory
5. Write a C program to simulate producer and consumer problem using semaphores
6. Simulate Bankers Algorithm for Dead Lock Avoidance
7. Simulate Bankers Algorithm for Dead Lock Prevention.
8. Write a C program to identify different types of Tokens in a given Program.
9. Write a Lex Program to implement a Lexical Analyzer using Lex tool.
10. Write a C program to Simulate Lexical Analyzer to validating a given input String.
11. Write a C program to implement the Brute force technique of Top down Parsing.
12. Write a C program to implement a Recursive Descent Parser.
13. Write C program to compute the *First* and *Follow* Sets for the given Grammar.
14. Write a C program for eliminating the left recursion and left factoring of a given grammar
15. Write a C program to check the validity of input string using Predictive Parser.
16. Write a C program for implementation of LR parsing algorithm to accept a given input string.
17. Write a C program for implementation of a Shift Reduce Parser using Stack Data Structure to accept a given input string of a given grammar
18. Simulate the calculator using LEX and YACC tool.

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III B Tech I Sem		L	T	P	C
		0	0	3	1.5
MACHINE LEARNING LAB					

Course Objectives:
This course will enable students to learn and understand different Data sets in implementing the machine learning algorithms.

Course Outcomes (Cos): At the end of the course, student will be able to

- Implement procedures for the machine learning algorithms
- Design and Develop Python programs for various Learning algorithms
- Apply appropriate data sets to the Machine Learning algorithms
- Develop Machine Learning algorithms to solve real world problems

Requirements: Develop the following program using Anaconda/ Jupiter/ Spider and evaluate ML models.

Experiment-1:
Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.

Experiment-2:
For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.

Experiment-3:
Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

Experiment-4:
Exercises to solve the real-world problems using the following machine learning methods: a) Linear Regression b) Logistic Regression c) Binary Classifier

Experiment-5: Develop a program for Bias, Variance, Remove duplicates , Cross Validation
Experiment-6: Write a program to implement Categorical Encoding, One-hot Encoding

Experiment-7:
Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.

Experiment-8:
Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions.

Experiment-9: Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.



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Experiment-10:
Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.

Experiment-11: Apply EM algorithm to cluster a Heart Disease Data Set. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.

Experiment-12: Exploratory Data Analysis for Classification using Pandas or Matplotlib.

Experiment-13:
Write a Python program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set

Experiment-14:
Write a program to Implement Support Vector Machines and Principle Component Analysis

Experiment-15:
Write a program to Implement Principle Component Analysis

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III B Tech I Sem		L	T	P	C
		0	0	4	2
CONTINUOUS INTEGRATION AND CONTINUOUS DELIVERY USING DevOps (Skill Oriented Course III)					

Course Outcomes:
At the end of the Course, Student will be able to:

- Understand the why, what and how of DevOps adoption
- Attain literacy on Devops
- Align capabilities required in the team
- Create an automated CICD pipeline using a stack of tools

List of Exercises:

Note: There are online courses indicated in the reference links section. Learners need to go through the contents in order to perform the given exercises

Exercise 1:

Reference course name :Software engineering and Agile software development
Get an understanding of the stages in software development lifecycle, the process models, values and principles of agility and the need for agile software development. This will enable you to work in projects following an agile approach to software development.
Solve the questions given in the reference course name to gauge your understanding of the topic

Exercise 2:

Reference course name: Development & Testing with Agile: Extreme Programming
Get a working knowledge of using extreme automation through XP programming practices of test first development, refactoring and automating test case writing.
Solve the questions in the "Take test" module given in the reference course name to gauge your understanding of the topic

Exercise 3:

Module name : DevOps adoption in projects
It is important to comprehend the need to automate the software development lifecycle stages through DevOps. Gain an understanding of the capabilities required to implement DevOps, continuous integration and continuous delivery practices.
Solve the questions given in Quiz1, Quiz2, Quiz 3

Exercise 4:

Module name :Implementation of CICD with Java and open source stack
Configure the web application and Version control using Git using Git commands and version control operations.

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Exercise 5:

Module Name: Implementation of CICD with Java and open source stack
Configure a static code analyzer which will perform static analysis of the web application code and identify the coding practices that are not appropriate. Configure the profiles and dashboard of the static code analysis tool.

Exercise 6:

Module Name: Implementation of CICD with Java and open source stack
Write a build script to build the application using a build automation tool like Maven. Create a folder structure that will run the build script and invoke the various software development build stages. This script should invoke the static analysis tool and unit test cases and deploy the application to a web application server like Tomcat.

Exercise 7:

Module Name: Implementation of CICD with Java and open source stack
Configure the Jenkins tool with the required paths, path variables, users and pipeline views.

Exercise 8:

Module name: Implementation of CICD with Java and open source stack
Configure the Jenkins pipeline to call the build script jobs and configure to run it whenever there is a change made to an application in the version control system. Make a change to the background color of the landing page of the web application and check if the configured pipeline runs.

Exercise 9:

Module name: Implementation of CICD with Java and open source stack
Create a pipeline view of the Jenkins pipeline used in Exercise 8. Configure it with user defined messages.

Exercise 10 :

Module name: Implementation of CICD with Java and open source stack
In the configured Jenkins pipeline created in Exercise 8 and 9, implement quality gates for static analysis of code.

Exercise 11:

Module name :Implementation of CICD with Java and open source stack
In the configured Jenkins pipeline created in Exercise 8 and 9, implement quality gates for static unit testing.

Exercise 12:

Module name :Course end assessment
In the configured Jenkins pipeline created in Exercise 8 and 9, implement quality gates for code coverage.

Reference Books:

1. Learning Continuous Integration with Jenkins: A beginner's guide to implementing Continuous Integration and Continuous Delivery using Jenkins - Nikhil Pathania ,Packt publication [https://www.amazon.in/Learning-Continuous-Integration-Jenkins-Pathania/dp/1785284835]
2. Jenkins 2 – Up and Running: Evolve Your Deployment Pipeline for Next Generation Automation - Brent Laster, O'Reilly publication [https://www.amazon.in/Jenkins-2-Running-Brent-Laster/dp/1491979593]

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Hardware and software configuration:

1. Git [GitHub or Gitlab]
2. Sonarqube
3. Jenkins
4. JUnit
5. Eclipse
6. Tomcat server
7. Maven
8. Cobertura or JaCoCo
9. Java SDK
10. All necessary drivers and jar files for connecting the software
11. Windows machine with 16GB RAM

Web Links: (Courses mapped to Infosys Springboard platform)

1. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_013382690411003904735_shared/overview [Software Engineering and Agile software development]

2. https://infyspringboard.onwingspan.com/en/viewer/html/lex_auth_013501578194976768104 67 [Development & Testing with Agile: Extreme Programming]
3. https://infyspringboard.onwingspan.com/en/viewer/html/lex_auth_0135389891719249922 6_shared [DevOps CICD]

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III B Tech I Sem		L	T	P	C
		2	0	0	0
EMPLOYABILITY SKILLS-I					

Course Objectives:
The main objective of this course is to assist students in developing employability skills and personal qualities related to gaining and sustaining employment.

Course Outcomes: The end of the course student will be able to

- Understand the corporate etiquette.
- Make presentations effectively with appropriate body language
- Be composed with positive attitude
- Understand the core competencies to succeed in professional and personal life

UNIT I:
Analytical Thinking & Listening Skills: Self-Introduction, Shaping Young Minds - A Talk by Azim Premji (Listening Activity), Self – Analysis, Developing Positive Attitude, Perception.
Communication Skills: Verbal Communication; Non Verbal Communication (Body Language)

UNIT II:
Self-Management Skills: Anger Management, Stress Management, Time Management, Six Thinking Hats, Team Building, Leadership Qualities
Etiquette: Social Etiquette, Business Etiquette, Telephone Etiquette, Dining Etiquette

UNIT III:
Standard Operation Methods: Note Making, Note Taking, Minutes Preparation, Email & Letter Writing
Verbal Ability: Synonyms, Antonyms, One Word Substitutes-Correction of Sentences-Analogies, Spotting Errors, Sentence Completion, Course of Action -Sentences Assumptions, Sentence Arguments, Reading Comprehension, Practice work

UNIT IV:
Job-Oriented Skills –I: Group Discussion, Mock Group Discussions

UNIT V:
Job-Oriented Skills –II: Resume Preparation, Interview Skills, Mock Interviews

Text Books and Reference Books:

1. Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011.
2. S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010.
3. R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand & Company Ltd., 2018.
4. Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.

e-resources:

1. www. Indiabix.com
2. www.freshersworld.com



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		3	0	2	4
MACHINE LEARNING					

Course Objectives:
This course will enable students to learn and understand different Data sets in implementing the machine learning algorithms.

Course Outcomes: At the end of the course, student will be able to

- Implement procedures for the machine learning algorithms
- Design and Develop Python programs for various Learning algorithms
- Apply appropriate data sets to the Machine Learning algorithms
- Develop Machine Learning algorithms to solve real world problems

Unit I:
Introduction- Artificial Intelligence, Machine Learning, Deep learning, Types of Machine Learning Systems, Main Challenges of Machine Learning.
Statistical Learning: Introduction, Supervised and Unsupervised Learning, Training and Test Loss, Tradeoffs in Statistical Learning, Estimating Risk Statistics, Sampling distribution of an estimator, Empirical Risk Minimization.

Unit II:
Supervised Learning(Regression/Classification):Basic Methods: Distance based Methods, Nearest Neighbours, Decision Trees, Naive Bayes, **Linear Models:** Linear Regression, Logistic Regression, Generalized Linear Models, Support Vector Machines

Unit III:
Binary Classification: Multiclass/Structured outputs, MNIST, Ranking.
Ensemble Learning and Random Forests: Introduction, Voting Classifiers, Bagging and Pasting, Random Forests, Boosting, Stacking.

Unit IV:
Support Vector Machine: Linear SVM Classification, Nonlinear SVM Classification SVM Regression, Naïve Bayes Classifiers.

Unit V:
Unsupervised Learning Techniques: Clustering, K-Means, Limits of K-Means, Using Clustering for Image Segmentation, Using Clustering for Preprocessing, Using Clustering for Semi-Supervised Learning, DBSCAN, Gaussian Mixtures.
Dimensionality Reduction: The Curse of Dimensionality, Main Approaches for Dimensionality Reduction, PCA, Using Scikit-Learn, Randomized PCA, Kernel PCA.

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Requirements: Develop the following program using Anaconda/ Jupiter/ Spider and evaluate ML models.

List of Experiments:

Experiment-1:
For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.

Experiment-2:
Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

Experiment-3:
Exercises to solve the real-world problems using the following machine learning methods: a) Linear Regression b) Logistic Regression c) Binary Classifier

Experiment-4: Develop a program for Bias, Variance, Remove duplicates , Cross Validation

Experiment-5:
Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions.

Experiment-6: Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

Experiment-7:
Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.

Experiment-8:
Write a program to Implement Support Vector Machines and Principle Component Analysis

Text Books:

1. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 2nd Edition, O'Reilly Publications, 2019
2. Data Science and Machine Learning Mathematical and Statistical Methods,Dirk P. Kroese, Zdravko I. Botev, Thomas Taimre, Radislav Vaisman,25th November 2020

Reference Books:

1. Machine Learning Probabilistic Approach, Kevin P. Murphy, MIT Press, 2012.

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DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

III B Tech II Sem		L	T	P	C
		3	0	0	3
COMPUTER NETWORKS					

Course Objectives:
- To provide insight about networks, topologies, and the key concepts.
- To gain comprehensive knowledge about the layered communication architectures (OSI and TCP/IP) and its functionalities.
- To understand the principles, key protocols, design issues, and significance of each layers in ISO and TCP/IP.
- To know the basic concepts of network services and various network applications.

Course Outcomes:
By the end of the course, the student will be able to
- Demonstrate different network models for networking links OSI, TCP/IP, B-ISDN, N-BISDN and get knowledge about various communication techniques, methods and protocol standards.
- Discuss different transmission media and different switching networks.
- Analyze data link layer services, functions and protocols like HDLC and PPP.
- Compare and Classify medium access control protocols like ALOHA, CSMA, CSMA/CD, CSMA/CA, Polling, Token passing, FDMA, TDMA, CDMA protocols
- Determine application layer services and client server protocols working with the client server paradigms like WWW, HTTP, FTP, e-mail and SNMP etc.

UNIT I:
Introduction: Network Types, LAN, MAN, WAN, Network Topologies Reference models- The OSI Reference Model- the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models, OSI Vs TCP/IP, Lack of OSI models success, Internet History.
Physical Layer –Introduction to Guided Media- Twisted-pair cable, Coaxial cable and Fiber optic cable and unguided media: Wireless-Radio waves, microwaves, infrared.

UNIT II:
Data link layer: Design issues, **Framing**: fixed size framing, variable size framing, flow control, error control, error detection and correction codes, CRC, Checksum: idea, one's complement internet checksum, services provided to Network Layer, **Elementary Data Link Layer protocols**: simplex protocol, Simplex stop and wait, Simplex protocol for Noisy Channel.
Sliding window protocol: One bit, Go back N, Selective repeat-Stop and wait protocol, Data link layer in HDLC: configuration and transfer modes, frames, control field, point to point protocol (PPP): framing transition phase, multiplexing, multi link PPP.

UNIT – III:
Media Access Control: Random Access: ALOHA, Carrier sense multiple access (CSMA), CSMA with Collision Detection, CSMA with Collision Avoidance, **Controlled Access:** Reservation, Polling, Token Passing, **Channelization:** frequency division multiple Access (FDMA), time division multiple access(TDMA), code division multiple access(CDMA).
Wired LANs: Ethernet, Ethernet Protocol, Standard Ethernet, Fast Ethernet(100 Mbps), Gigabit Ethernet, 10 Gigabit Ethernet.

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UNIT – IV:

The Network Layer Design Issues – Store and Forward Packet Switching-Services Provided to the Transport layer- Implementation of Connectionless Service-Implementation of Connection Oriented Service- Comparison of Virtual Circuit and Datagram Networks, Routing Algorithms-The Optimality principle-Shortest path, Flooding, Distance vector, Link state, Hierarchical, Congestion Control algorithms-General principles of congestion control, Congestion prevention polices, Approaches to Congestion Control-Traffic Aware Routing- Admission Control-Traffic Throttling-Load Shedding. Traffic Control Algorithm-Leaky bucket & Token bucket.

Internet Working: How networks differ, How networks can be connected, Tunnelling, internetwork routing, Fragmentation, network layer in the internet, IP protocols, IP Version 4 protocol, IPV4 Header Format, IP addresses, Class full Addressing, CIDR, NAT, Subnets, IP Version 6, The main IPV6 header, Transition from IPV4 to IPV6, Comparision of IPV4 & IPV6, Internet control protocols- ICMP, ARP, DHCP

UNIT –V:

The Transport Layer: Transport layer protocols: Introduction, services, port number, User datagram protocol, User datagram, UDP services, UDP applications, Transmission control protocol: TCP services, TCP features, Segment, A TCP connection, windows in TCP, flow control, Error control, Congestion control in TCP.

Application Layer: World Wide Web: HTTP, Electronic mail-Architecture, web based mail, email security, TELENET, local versus remote Logging, Domain Name System: Name Space, DNS in Internet, Resolution, Caching, Resource Records, DNS messages, Registrars, security of DNS Name Servers, SNMP.

Text Books:

1. Computer Networks, Andrew S Tanenbaum, Fifth Edition. Pearson Education/PHI
2. Data Communications and Networks, Behrouz A. Forouzan, Fifth Edition TMH.

References Books:

1. Data Communications and Networks- Achut S Godbole, AtulKahate
2. Computer Networks, Mayank Dave, CENGAGE

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		3	0	0	3
DEEP LEARNING					

Course Objectives: At the end of the course, the students will be expected to:

- Learn deep learning methods for working with sequential data,
- Learn deep recurrent and memory networks,
- Learn deep Turing machines,
- Apply such deep learning mechanisms to various learning problems.
- Know the open issues in deep learning, and have a grasp of the current research directions.

Course Outcomes: After the completion of the course, student will be able to

- Demonstrate the fundamental concepts learning techniques of Artificial Intelligence, Machine Learning and Deep Learning.
- Discuss the Neural Network training, various random models**.**
- Explain the Techniques of Keras, TensorFlow, Theano and CNTK
- Classify the Concepts of CNN and RNN
- Implement Interactive Applications of Deep Learning.

UNIT I:
Fundamentals of Deep Learning: Artificial Intelligence, History of Machine learning: Probabilistic Modeling, Early Neural Networks, Kernel Methods, Decision Trees, Random forests and Gradient Boosting Machines, **Fundamentals of Machine Learning:** Four Branches of Machine Learning, Evaluating Machine learning Models, Overfitting and Underfitting. **[Text Book 2]**

UNIT II: Introducing Deep Learning: Biological and Machine Vision, Human and Machine Language, Artificial Neural Networks, Training Deep Networks, Improving Deep Networks. **[Text Book3]**

UNIT III: Neural Networks: Anatomy of Neural Network, Introduction to Keras: Keras, TensorFlow, Theano and CNTK, Setting up Deep Learning Workstation, Classifying Movie Reviews: Binary Classification, Classifying newswires: Multiclass Classification. **[Text Book 2]**

UNIT IV:
Convolutional Neural Networks: Nerual Network and Representation Learing, Convolutional Layers, Multichannel Convolution Operation, **Recurrent Neural Networks:** Introduction to RNN, RNN Code, PyTorch Tensors: Deep Learning with PyTorch, CNN in PyTorch. **[Text Book 3]**

UNIT V:
Interactive Applications of Deep Learning: Machine Vision, Natural Language processing, Generative Adversial Networks, Deep Reinforcement Learning. **[Text Book 1]**
Deep Learning Research: Autoencoders**,** Deep Generative Models: Boltzmann Machines Restricted Boltzmann Machines, Deep Belief Networks. **[Text Book 1]**

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Text Books:

1. Deep Learning- Ian Goodfellow, Yoshua Bengio and Aaron Courvile, MIT Press, 2016
2. Deep Learning with Python - Francois Chollet, Released December 2017, Publisher(s): Manning Publications, ISBN: 9781617294433
3. Deep Learning Illustrated: A Visual, Interactive Guide to Artificial Intelligence - Jon Krohn, Grant Beyleveld, Aglaé Bassens, Released September 2019, Publisher(s): Addison-Wesley Professional, ISBN: 9780135116821
4. Deep Learning from Scratch - Seth Weidman, Released September 2019, Publisher(s): O'Reilly Media, Inc., ISBN: 9781492041412

Reference Books:

1. Artificial Neural Networks, Yegnanarayana, B., PHI Learning Pvt. Ltd, 2009.
2. Matrix Computations, Golub, G.,H., and Van Loan,C.,F, JHU Press,2013.
3. Neural Networks: A Classroom Approach, Satish Kumar, Tata McGraw-Hill Education, 2004.

Web Link:

Swayam NPTEL: Deep Learning: https://onlinecourses.nptel.ac.in/noc22_cs22/preview

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		3	0	0	3
DESIGN AND ANALYSIS OF ALGORITHMS					

Course Objectives:

Upon completion of this course, students will be able to do the following:

- Ability to understand, analyze and denote time complexities of algorithms
- To introduce the different algorithmic approaches for problem solving through numerous example problems
- Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms, and analyze them.
- To provide some theoretical grounding in terms of finding the lower bounds of algorithms and the NP-completeness

Course Outcomes: After the completion of the course, student will be able to

- Analyze the performance of a given algorithm, denote its time complexity using the asymptotic notation for recursive and non-recursive algorithms
- List and describe various algorithmic approaches and Solve problems using divide and conquer &greedy Method
- Synthesize efficient algorithms dynamic programming approaches to solve in common engineering design situations.
- Organize important algorithmic design paradigms and methods of analysis: backtracking, branch and bound algorithmic approaches
- Demonstrate NP- Completeness theory ,lower bound theory and String Matching

UNIT I:

Introduction: Algorithm Definition, Algorithm Specification, performance Analysis, Performance measurement, asymptotic notation, Randomized Algorithms.

UNIT II:

Divide and Conquer: General Method, Defective chessboard, Binary Search, finding the maximum and minimum, Merge sort, Quick sort.

The Greedy Method: The general Method, knapsack problem, minimum-cost spanning Trees, Optimal Merge Patterns, Single Source Shortest Paths.

UNIT III:

Dynamic Programming: The general method, multistage graphs, All pairs-shortest paths, optimal Binary search trees, 0/1 knapsack, The traveling salesperson problem.

UNIT IV:

Backtracking: The General Method, The 8-Queens problem, sum of subsets, Graph coloring, Hamiltonian cycles, knapsack problem.

UNIT V:

NP-Hard and NP-Complete problems: Basic concepts, non-deterministic algorithms, NP - Hard and NP-Complete classes, Cook’s theorem.

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Text Books:

1. Ellis Horowitz, SartajSahni, Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", 2nd Edition, Universities Press.
2. Introduction to Algorithms Thomas H. Cormen, PHI Learning
3. Harsh Bhasin, "Algorithms Design & Analysis", Oxford University Press.

Reference Books:

1. Horowitz E. Sahani S: "Fundamentals of Computer Algorithms", 2nd Edition, Galgotia Publications, 2008.
2. S. Sridhar, "Design and Analysis of Algorithms", Oxford University Press.

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		3	0	0	3
SOFTWARE PROJECT MANAGEMENT (Professional Elective-II)					

Course Objectives:
At the end of the course, the student shall be able to:
- To describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project
- To compare and differentiate organization structures and project structures
- To implement a project to manage project schedule, expenses and resources with the application of suitable project management tools

Course outcomes:
Upon the completion of the course students will be able to:-
- Apply the process to be followed in the software development life-cycle models
- Apply the concepts of project management & planning
- Implement the project plans through managing people, communications and change
- Conduct activities necessary to successfully complete and close the Software projects
- Implement communication, modeling, and construction & deployment practices in software development

UNIT I:
Conventional Software Management: The waterfall model, conventional software Management performance.
Evolution of Software Economics: Software Economics, pragmatic software cost estimation.
Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.
The old way and the new: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

UNIT II:
Life cycle phases: Engineering and production stages, inception, Elaboration, construction, transition phases.
Artifacts of the process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

UNIT III:
Model based software architectures: A Management perspective and technical perspective.
Work Flows of the process: Software process workflows, Iteration workflows.
Checkpoints of the process: Major mile stones, Minor Milestones, Periodic status assessments.
Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

UNIT IV:
Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.
Process Automation: Automation Building blocks, The Project Environment.



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Project Control and Process instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.

UNIT V:
Agile Methodology, ADAPTing to Scrum, Patterns for Adopting Scrum, Iterating towards Agility.
Fundamentals of DevOps: Architecture, Deployments, Orchestration, Need, Instance of applications, DevOps delivery pipeline, DevOps eco system. DevOps adoption in projects: Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes

Text Books:

1. Software Project Management, Walker Royce, PEA, 2005.
2. Succeeding with Agile: Software Development Using Scrum, Mike Cohn, Addison Wesley.
3. The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, Gene Kim , John Willis , Patrick Debois , Jez Humb,1st Edition, O'Reilly publications, 2016.

Reference Books:

1. Software Project Management, Bob Hughes,3/e, Mike Cotterell, TMH
2. Software Project Management, Joel Henry, PEA
3. Software Project Management in practice, Pankaj Jalote, PEA, 2005,
4. Effective Software Project Management, Robert K.Wysocki, Wiley,2006
5. Project Management in IT, Kathy Schwalbe, Cengage

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		3	0	0	3
DISTRIBUTED SYSTEMS (Professional Elective-II)					

Course Objectives:

- To understand the foundations of distributed systems.
- To learn issues related to clock Synchronization and the need for global state in distributedsystems
- To learn distributed mutual exclusion and deadlock detection algorithms
- To understand the significance of agreement, fault tolerance and recovery protocols in Distributed Systems
- To learn the characteristics of peer-to-peer and distributed shared memory systems

Course Outcomes:

At the end of the course, the students will be able to:

- Elucidate the foundations and issues of distributed systems
- Illustrate the various synchronization issues and global state for distributed systems
- Illustrate the Mutual Exclusion and Deadlock detection algorithms in distributed systems
- Describe the agreement protocols and fault tolerance mechanisms in distributed systems
- Describe the features of peer-to-peer and distributed shared memory systems

UNIT I:

Distributed Systems: Definition, Relation to computer system components, Motivation, Relationto parallel systems, Message-passing systems versus shared memory systems, Primitives for distributed communication, Synchronous versus asynchronous executions, Design issues and challenges.

A model of distributed computations: A distributed program, A model of distributed executions, Models of communication networks, Global state, Cuts, Past and future cones of an event, Modelsof process communications.

Logical Time: A framework for a system of logical clocks, Scalar time, Vector time, Physical clock synchronization: NTP.

UNIT II:

Message Ordering & Snapshots: Message ordering and group communication: Message ordering paradigms, Asynchronous execution with synchronous communication, Synchronous program order on an asynchronous system, Group communication, Causal order (CO), Total order. Global state and snapshot recording algorithms: Introduction, System model and definitions, Snapshot algorithms for FIFO channels.

UNIT III:

Distributed Mutex & Deadlock: Distributed mutual exclusion algorithms: Introduction, Preliminaries, Lamport‘s algorithm, Ricart-Agrawala algorithm, Maekawa‘s algorithm, Suzuki–Kasami‘s broadcast algorithm. Deadlock detection in distributed systems: Introduction, System model, Preliminaries, Models of deadlocks, Knapp‘s classification, Algorithms forthe single resource model, the AND model and the OR model.

UNIT IV:

Recovery & Consensus: Check pointing and rollback recovery: Introduction, Background and

definitions, Issues in failure recovery, Checkpoint-based recovery, Log-based rollback recovery, Coordinated check pointing algorithm, Algorithm for asynchronous check pointing and recovery. Consensus and agreement algorithms: Problem definition, Overview of results, Agreement in a failure, free system, Agreement in synchronous systems with failures.

UNIT V:

Peer-to-peer computing and overlay graphs: Introduction, Data indexing and overlays, Chord – Content addressable networks, Tapestry.
Distributed shared memory: Abstraction and advantages, Memory consistency models, Shared memory Mutual Exclusion.

Text Books:

1. Distributed Systems Concepts and Design, George Coulouris, Jean Dollimore and TimKindberg, Fifth Edition, Pearson Education, 2012.
2. Distributed computing: Principles, algorithms, and systems, Ajay Kshemkalyani and Mukesh Singhal, Cambridge University Press, 2011.

Reference Books:

1. Distributed Operating Systems: Concepts and Design, Pradeep K Sinha, Prentice Hall ofIndia, 2007.
2. Advanced concepts in operating systems. Mukesh Singhal and Niranjan G. Shivaratri,McGraw-Hill, 1994.
3. Distributed Systems: Principles and Paradigms, Tanenbaum A.S., Van Steen M.,PearsonEducation, 2007.

e-Resources:

1) https://nptel.ac.in/courses/106/106/106106168/

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		3	0	0	3
INTERNET OF THINGS (Professional Elective-II)					

Course Objectives:
From the course the student will learn
- the application areas of IOT
- the revolution of Internet in Mobile Devices, Cloud & Sensor Networks
- building blocks of Internet of Things and characteristics

Course Outcomes:
By the end of the course, student will be able to
- Review Internet of Things (IoT).
- Demonstrate various business models relevant to IoT.
- Construct designs for web connectivity
- Organize sources of data acquisition related to IoT, integrate to enterprise systems.
- Describe IoT with Cloud technologies.

UNIT I:
The Internet of Things- An Overview of Internet of things, Internet of Things Technology, behind IoTs Sources of the IoTs, Examples OF IoTs, Design Principles For Connected Devices, Internet connectivity, **Application Layer Protocols-** HTTP, HTTPS, FTP

UNIT II:
Business Models for Business Processes in the Internet of Things, IoT/M2M systems LAYERS AND designs standardizations, Modified OSI Stack for the IoT/M2M Systems, ETSI M2M domains and High-level capabilities, Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability.

UNIT III:
Design Principles for the Web Connectivity for connected-Devices, Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected-Devices.

UNIT IV:
Data Acquiring, Organizing and Analytics in IoT/M2M, Applications/ Services/Business Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in the Internet Of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.

UNIT V:
Data Collection, Storage and Computing Using a Cloud Platform for IoT/M2M Applications/Services, Data Collection, Storage and Computing Using cloud platform Everything as a service and Cloud Service Models, IOT cloud-based services using the Xively (Pachube/COSM), Nimbits and other platforms Sensor, Participatory Sensing, Actuator, Radio Frequency Identification, and Wireless, Sensor Network Technology, Sensors Technology, Sensing the World.

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Text Books:

1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education
2. Internet of Things, A.Bahgya and V.Madisetti, Univesity Press, 2015

Reference Books:

1. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley
2. Getting Started with the Internet of Things, CunoPfister , Oreilly

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III B Tech II Sem		L	T	P	C
		3	0	0	3
NETWORK PROGRAMMING (Professional Elective-II)					

Course Objectives:
Having successfully completed this course, the student will be able to:

- Demonstrate mastery of main protocols comprising the Internet.
- Develop skills in network programming techniques.
- Implement network services that communicate through the Internet.
- Apply the client-server model in networking applications.
- Practice networking commands available through the operating system

Course Outcomes: At the end of the course, student will be able to

- Identifying different models and sockets
- Demonstrate different TCP Echo server functions and I/O models
- Rationalize IPV4 and IPV6 Socket options
- Identifying daemon processing and Advanced input and output functions
- Analyze Broadcasting and multicasting

UNIT I:
Introduction to Network Programming: Introduction to Network Programming: OSI model, UNIX standards, TCP and UDP & TCP connection establishment and Format, Buffer sizes and limitation, standard internet services, Protocol usage by common internet application Elementary Sockets: Sockets introduction, Elementary TCP sockets.

UNIT II:
TCP client server: Introduction, TCP Echo server functions, Normal startup, terminate and signal handling server process termination, Crashing and Rebooting of server host shutdown of server host.I/O Multiplexing: I/O Models, the select and poll functions, Batch input and buffering, shutdown function.

UNIT III:
UDP and Socket options: Elementary UDP sockets: Introduction UDP Echo server functions, lost datagram, summary of UDP example, Lack of flow control with UDP. **Socket options:** getsockopt and setsockopt functions. Socket states, Generic socket options IPV4 socket options, IPV6 socket options, ICMPV6 socket options and TCP socket options, SCTP socket options, fcntl function.

UNIT IV:
Advanced Sockets and Daemon Processes: IPV4 and IPV6 interoperability, introduction, IPV4 client: IPV6 server, IPV6 client: IPV4 Server, IPV6 Address-testing macros. Daemon Processes and inetdSuperserver –Introduction, syslogd Daemon, syslog Function, daemon_init Function, inetd Daemon, daemon_inetd. Advanced I/O functions: Socket timeouts, recv and send functions, ready and writev functions, recvmsg and send msg functions, Ancillary data.

UNIT V:
Broadcasting and Multicasting: Broadcasting introduction, broadcast addresses, unicast versus Broadcast, dg_cli function using broadcasting, race conditions, Multicasting addresses, multicasting versus broadcasting on a LAN, multicasting on a WAN, source-specific multicast, multcast socket options. **Raw**



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Sockets: Introduction, Raw Socket Creation, Raw Socket Output, Raw Socket Input, Ping Program, Traceroute Program

Text Books:

1. UNIX Network Programming, by W. Richard Stevens, Bill Fenner, Andrew M. Rudoff, Pearson Education
2. UNIX Network Programming, 1st Edition, W. Richard Stevens. PHI.

Reference Books:

1. UNIX Systems Programming using C++ T CHAN, PHI.
2. UNIX for Programmers and Users, 3rd Edition Graham GLASS, King abls, Pearson Education
3. Advanced UNIX Programming 2nd Edition M. J. ROCHKIND, Pearson Education

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		3	0	0	3
MEAN STACK DEVELOPMENT (Job Oriented Course)					

Course Outcomes:
At the end of the Course, Student will be able to:

- Build static web pages using HTML 5 elements.
- Apply JavaScript to embed programming interface for web pages and also to perform Client side validations.
- Build a basic web server using Node.js, work with Node Package Manager (NPM) and recognize the need for Express.js.
- Develop JavaScript applications using typescript and work with document database using MongoDB.
- Utilize Angular JS to design dynamic and responsive web pages.

UNIT-I:
HTML 5: Introduction to Web, Overview of Web Technologies, HTML - Introduction, HTML - Need, Case-insensitivity, Platform-independency, DOCTYPE Declaration, Types of Elements, HTML Elements - Attributes, Metadata Element, Sectioning Elements, Paragraph Element, Division and Span Elements, List Element, Link Element, Character Entities, HTML5 Global Attributes, Creating Table Elements, Table Elements : Colspan/ Rowspan Attributes, border, cellspacing and cellpadding attributes, Creating Form Elements, Input Elements - Attributes, Color and Date Pickers, Select and Datalist Elements, Editing Elements, Media, Iframe, Why HTML Security, HTML Injection, Clickjacking, HTML5 Attributes & Events Vulnerabilities, Local Storage Vulnerabilities, HTML5 - Cross-browser support, Best Practices For HTML Web Pages.

UNIT-II:
JavaScript: Why we need JavaScript, What is JavaScript, Environment Setup, Working with Identifiers, Type of Identifiers, Primitive and Non Primitive Data Types, Operators and Types of Operators, Types of Statements, Non - Conditional Statements, Types of Conditional Statements, If and Switch Statements, Types of Loops, Types of Functions, Declaring and Invoking Function, Arrow Function, Function Parameters, Nested Function, Built-in Functions, Variable Scope in Functions, Working With Classes, Creating and Inheriting Classes, In-built Events and Handlers, Working with Objects, Types of Objects, Creating Objects, Combining and cloning Objects using Spread operator, Destructuring Objects, Browser and Document Object Model, Creating Arrays, Destructuring Arrays, Accessing Arrays, Array Methods, Introduction to Asynchronous Programming, Callbacks, Promises, Async and Await, Executing Network Requests using Fetch API, Creating and consuming Modules.

UNIT-III:
Node.js: Why and What Node.js, How to use Node.js, Create a web server in Node.js, Node Package Manager, Modular programming in Node.js, Restarting Node Application, File Operations.
Express.js: Express Development Environment, Defining a route, Handling Routes, Route and Query Parameters, How Middleware works, Chaining of Middlewares, Types of Middlewares, Connecting to MongoDB with Mongoose, Validation Types and Defaults, Models, CRUD Operations, API Development, Why Session management, Cookies, Sessions, Why and What Security, Helmet Middleware, Using a Template Engine Middleware, Stylus CSS Preprocessor.

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UNIT-IV:

Typescript: Installing TypeScript, Basics of TypeScript, Function, Parameter Types and Return Types, Arrow Function, Function Types, Optional and Default Parameters, Rest Parameter, Creating an Interface, Duck Typing, Function Types, Extending Interfaces, Classes, Constructor, Access Modifiers, Properties and Methods, Creating and using Namespaces, Creating and using Modules, Module Formats and Loaders, Module Vs Namespace, What is Generics, What are Type Parameters, Generic Functions, Generic Constraints.

MongoDB: Introduction Module Overview, Document Database Overview, Understanding JSON, MongoDB Structure and Architecture, MongoDB Remote Management, Installing MongoDB on the local computer (Mac or Windows), Introduction to MongoDB Cloud, Create MongoDB Atlas Cluster, GUI tools Overview, Install and Configure MongoDB Compass, Introduction to the MongoDB Shell, MongoDB Shell JavaScript Engine, MongoDB Shell JavaScript Syntax, Introduction to the MongoDB Data Types, Introduction to the CRUD Operations on documents, Create and Delete Databases and Collections, Introduction to MongoDB Queries.

UNIT-V:

What is Angular, Features of Angular, Angular Application Setup, Components and Modules, Executing Angular Application, Elements of Template, Change Detection, Structural Directives - ngIf, ngFor, ngSwitch, Custom Structural Directive, Attribute Directives - ngStyle, ngClass, Custom Attribute Directive, Property Binding, Attribute Binding, Style and Event Binding, Built in Pipes, Passing Parameters to Pipes, Nested Components Basics, Passing data from Container Component to Child Component, Passing data from Child Component to ContainerComponent, Shadow DOM, Component Life Cycle, Template Driven Forms, Model Driven Forms or Reactive Forms, Custom Validators in Reactive Forms, Custom Validators in Template Driven forms, Dependency Injection, Services Basics, RxJS Observables, Server Communication using HttpClient, Communicating with different backend services using Angular HttpClient, Routing Basics, Router Links, Route Guards, Asynchronous Routing, Nested Routes.

Text Books:

1. Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson.
2. Pro Mean Stack Development, 1st Edition, ELadElrom, Apress O'Reilly.
3. Full Stack JavaScript Development with MEAN, Colin J Ihrig, Adam Bretz, 1st edition, SitePoint, SitePoint Pty. Ltd., O'Reilly Media.
4. MongoDB – The Definitive Guide, 2nd Edition, Kristina Chodorow,O'Reilly.

Reference Books:

1. Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book,1st Edition, Dream Tech.
2. An Introduction to Web Design, Programming, 1st Edition, Paul S Wang, Sanda SKatila, Cengage Learning.

Web Links:

1. https://infyspringboard.onwingspan.com/en/app/toc/lex_17739732834840810000_shared/overview (HTML5)

2. https://infyspringboard.onwingspan.com/en/app/toc/lex_18109698366332810000_shared/overview (Javascript)

3. https://infyspringboard.onwingspan.com/en/app/toc/lex_32407835671946760000_shared/overview (Node.js & Express.js)



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4. https://infyspringboard.onwingspan.com/en/app/toc/lex_9436233116512678000_shared/overview (Typescript)

5. https://infyspringboard.onwingspan.com/en/app/toc/lex_20858515543254600000_shared/overview (Angular JS)

6. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_013177169294712832113_shared/overview (MongoDB)

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III B Tech II Sem		L	T	P	C
		0	0	3	1.5
COMPUTER NETWORKS LAB					

Course Objectives:
Learn basic concepts of computer networking and acquire practical notions of protocols with the emphasis on TCP/IP. A lab provides a practical approach to Ethernet/Internet networking: networks are assembled, and experiments are made to understand the layered architecture and how do some important protocols work

Course Outcomes:
By the end of the course student will be able to

- Know how reliable data communication is achieved through data link layer.
- Suggest appropriate routing algorithm for the network.
- Provide internet connection to the system and its installation.
- Work on various network management tools

List of Experiments:

1. Study of Network devices in detail and connect the computers in Local Area Network.
2. Write a Program to implement the data link layer farming methods such as
   i) Character stuffing ii) bit stuffing.
3. Write a Program to implement data link layer farming method checksum.
4. Write a program for Hamming Code generation for error detection and correction.
5. Write a Program to implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC CCIP.
6. Write a Program to implement Sliding window protocol for Goback N.
7. Write a Program to implement Sliding window protocol for Selective repeat.
8. Write a Program to implement Stop and Wait Protocol.
9. Write a program for congestion control using leaky bucket algorithm
10. Write a Program to implement Dijkstra‘s algorithm to compute the Shortest path through a graph.
11. Write a Program to implement Distance vector routing algorithm by obtaining routing table at each node (Take an example subnet graph with weights indicating delay between nodes).
12. Write a Program to implement Broadcast tree by taking subnet of hosts.
13. Wireshark
    i. Packet Capture Using Wire shark
    ii. Starting Wire shark
    iii. Viewing Captured Traffic
    iv. Analysis and Statistics & Filters.
14. How to run Nmap scan
15. Operating System Detection using Nmap
16. Do the following using NS2 Simulator
    i. NS2 Simulator-Introduction
    ii. Simulate to Find the Number of Packets Dropped
    iii. Simulate to Find the Number of Packets Dropped by TCP/UDP
    iv. Simulate to Find the Number of Packets Dropped due to Congestion
    v. Simulate to Compare Data Rate& Throughput.

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III B Tech II Sem		L	T	P	C
		0	0	3	1.5
ALGORITHMS FOR EFFICIENT CODING LAB					

Course Objective:

- To develop efficient coding for the algorithms with various inputs and algorithms

Course Outcomes:

By completing the course the students will be able to:

- Analyze the program execution time

List of Experiments:

1. Develop a program and measure the running time for Binary Search with Divide and Conquer
2. Develop a program and measure the running time for Merge Sort with Divide and Conquer
3. Develop a program and measure the running time for Quick Sort with Divide and Conquer
4. Develop a program and measure the running time for estimating minimum-cost spanning Trees with Greedy Method
5. Develop a program and measure the running time for estimating Single Source Shortest Paths with Greedy Method
6. Develop a program and measure the running time for optimal Binary search trees with Dynamic Programming
7. Develop a program and measure the running time for identifying solution for traveling salesperson problem with Dynamic Programming
8. Develop a program and measure the running time for identifying solution for 8-Queens problem with Backtracking
9. Develop a program and measure the running time for Graph Coloring with Backtracking
10. Develop a program and measure the running time to generate solution of Hamiltonian Cycle problem with Backtracking
11. Develop a program and measure the running time running time to generate solution of Knapsack problem with Backtracking

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III B Tech II Sem		L	T	P	C
		0	0	3	1.5
DEEP LEARNING WITH TENSORFLOW					

Course Outcomes:
On completion of this course, the student will be able to

- Implement deep neural networks to solve real world problems
- Choose appropriate pre-trained model to solve real time problem
- Interpret the results of two different deep learning models

Software Packages required:

- Keras
- Tensorflow
- PyTorch

List of Experiments:

1. Implement multilayer perceptron algorithm for MNIST Hand written Digit Classification.
2. Design a neural network for classifying movie reviews (Binary Classification) using IMDB dataset.
3. Design a neural Network for classifying news wires (Multi class classification) using Reuters dataset.
4. Design a neural network for predicting house prices using Boston Housing Price dataset.
5. Build a Convolution Neural Network for MNIST Hand written Digit Classification.
6. Build a Convolution Neural Network for simple image (dogs and Cats) Classification
7. Use a pre-trained convolution neural network (VGG16) for image classification.
8. Implement one hot encoding of words or characters.
9. Implement word embeddings for IMDB dataset.
10. Implement a Recurrent Neural Network for IMDB movie review classification problem.

Text Books:

1. Reza Zadeh and BharathRamsundar, “Tensorflow for Deep Learning”, O’Reilly publishers, 2018

References:

1. https://github.com/fchollet/deep-learning-with-python-notebooks

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III B Tech II Sem		L	T	P	C
		0	0	4	2
MEAN STACK TECHNOLOGIES-MODULE I- HTML 5, JAVASCRIPT, NODE.JS, EXPRESS.JS, AND TYPESCRIPT (Skill Oriented Course)					

Course Outcomes:
At the end of the Course, Student will be able to:

- Develop professional web pages of an application using HTML elements like lists, navigations, tables, various form elements, embedded media which includes images, audio, video and CSS Styles.
- Utilize JavaScript for developing interactive HTML web pages and validate form data.
- Build a basic web server using Node.js and also working with Node Package Manager (NPM).
- Build a web server using Express.js
- Make use of Typescript to optimize JavaScript code by using the concept of strict type checking.

List of Exercises

1.a	**Course Name:** HTML5 - The Language
	Module Name: Case-insensitivity, Platform-independency, DOCTYPE Declaration, Types of Elements, HTML Elements - Attributes, Metadata Element
	Include the Metadata element in Homepage.html for providing description as "IEKart's is an online shopping website that sells goods in retail. This company deals with various categories like Electronics, Clothing, Accessories etc.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28320667711144660000_shared?collectionId=lex_177397328348408100 00_shared&collectionType=Course
1.b	**Course Name:** HTML5 - The Language
	Module Name: Sectioning Elements
	Enhance the Homepage.html of IEKart's Shopping Application by adding appropriate sectioning elements.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_6372291347110857000_shared?collectionId=lex_1773973283484081000 0_shared&collectionType=Course
1.c	**Course Name:** HTML5 - The Language
	Module Name: Paragraph Element, Division and Span Elements, List Element
	Make use of appropriate grouping elements such as list items to "About Us" page of IEKart's Shopping Application
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_32785192040894940000_shared?collectionId=lex_177397328348408100 00_shared&collectionType=Course
1.d	**Course Name:** HTML5 - The Language
	Module Name: Link Element
	Link "Login", "SignUp" and "Track order" to "Login.html", "SignUp.html" and "Track.html" page respectively. Bookmark each category to its details of IEKart's Shopping application.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_15515105953273338000_shared?collectionId=lex_177397328348408100 00_shared&collectionType=Course

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1.e	**Course Name:** HTML5 - The Language
	Module Name: Character Entities
	Add the © symbol in the Home page footer of IEKart's Shopping application.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_547667376938096260_shared?collectionId=lex_17739732834840810000_shared&collectionType=Course
1.f	**Course Name:** HTML5 - The Language
	Module Name: HTML5 Global Attributes
	Add the global attributes such as contenteditable, spellcheck, id etc. to enhance the Signup Page functionality of IEKart's Shopping application.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28723566050321920000_shared?collectionId=lex_177397328348408100000_shared&collectionType=Course
2.a	**Course Name:** HTML5 - The Language
	Module Name: Creating Table Elements, Table Elements : Colspan/Rowspan Attributes, border, cellspacing, cellpadding attributes
	Enhance the details page of IEKart's Shopping application by adding a table element to display the available mobile/any inventories.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013168035284033536113_shared?collectionId=lex_17739732834840810000_shared&collectionType=Course
2.b	**Course Name:** HTML5 - The Language
	Module Name: Creating Form Elements, Color and Date Pickers, Select and Datalist Elements
	Using the form elements create Signup page for IEKart's Shopping application.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_13975270903118459000_shared?collectionId=lex_177397328348408100000_shared&collectionType=Course
2.c	**Course Name:** HTML5 - The Language
	Module Name: Input Elements - Attributes
	Enhance Signup page functionality of IEKart's Shopping application by adding attributes to input elements.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_14048414537062347000_shared?collectionId=lex_177397328348408100000_shared&collectionType=Course
2.d	**Course Name:** HTML5 - The Language
	Module Name: Media, Iframe
	Add media content in a frame using audio, video, iframe elements to the Home page of IEKart's Shopping application.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_30738402225794945000_shared?collectionId=lex_177397328348408100000_shared&collectionType=Course
3.a	**Course Name:** Javascript
	Module Name: Type of Identifiers
	Write a JavaScript program to find the area of a circle using radius (var and let - reassign and observe the difference with var and let) and PI (const)
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013053264414818304732_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course

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3.b	**Course Name:** Javascript
	Module Name: Primitive and Non Primitive Data Types
	Write JavaScript code to display the movie details such as movie name, starring, language, and ratings. Initialize the variables with values of appropriate types. Use template literals wherever necessary.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_21528322245232402000_shared?collectionId=lex_181096983663328100 00_shared&collectionType=Course
3.c	**Course Name:** Javascript
	Module Name: Operators and Types of Operators
	Write JavaScript code to book movie tickets online and calculate the total price, considering the number of tickets and price per ticket as Rs. 150. Also, apply a festive season discount of 10% and calculate the discounted amount.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_13808338384481720000_shared?collectionId=lex_181096983663328100 00_shared&collectionType=Course
3.d	**Course Name:** Javascript
	Module Name: Types of Statements, Non - Conditional Statements, Types of Conditional Statements, if Statements, switch Statements
	Write a JavaScript code to book movie tickets online and calculate the total price based on the 3 conditions: (a) If seats to be booked are not more than 2, the cost per ticket remains Rs. 150. (b) If seats are 6 or more, booking is not allowed. (c) If se
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_16257498471333610000_shared?collectionId=lex_181096983663328100 00_shared&collectionType=Course
3.e	**Course Name:** Javascript
	Module Name: Types of Loops
	Write a JavaScript code to book movie tickets online and calculate the total price based on the 3 conditions: (a) If seats to be booked are not more than 2, the cost per ticket remains Rs. 150. (b) If seats are 6 or more, booking is not allowed. (c) If
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_6238536888292970000_shared?collectionId=lex_181096983663328100 0_shared&collectionType=Course
4.a	**Course Name:** Javascript
	Module Name: Types of Functions, Declaring and Invoking Function, Arrow Function, Function Parameters, Nested Function, Built-in Functions, Variable Scope in Functions
	Write a JavaScript code to book movie tickets online and calculate the total price based on the 3 conditions: (a) If seats to be booked are not more than 2, the cost per ticket remains Rs. 150. (b) If seats are 6 or more, booking is not allowed. (c) If
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_15455199570613326000_shared?collectionId=lex_181096983663328100 00_shared&collectionType=Course
4.b	**Course Name:** Javascript
	Module Name: Working With Classes, Creating and Inheriting Classes
	Create an Employee class extending from a base class Person. Hints: (i) Create a class Person with name and age as attributes. (ii) Add a constructor to initialize the values (iii) Create a class Employee extending Person with additional attributes role
	https://infyspringboard.onwingspan.com/web/en/viewer/web-

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	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_012599811117760512458_shared?collectionId=lex_181096983663332810000_shared&collectionType=Course
4.c	**Course Name:** Javascript
	Module Name: In-built Events and Handlers
	Write a JavaScript code to book movie tickets online and calculate the total price based on the 3 conditions: (a) If seats to be booked are not more than 2, the cost per ticket remains Rs. 150. (b) If seats are 6 or more, booking is not allowed. (c) If se
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_4192188372573027000_shared?collectionId=lex_1810969836633281000 0_shared&collectionType=Course
4.d	**Course Name:** Javascript
	Module Name: Working with Objects, Types of Objects, Creating Objects, Combining and cloning Objects using Spread operator, Destructuring Objects, Browser Object Model, Document Object Model
	If a user clicks on the given link, they should see an empty cone, a different heading, and a different message and a different background color. If user clicks again, they should see a re-filled cone, a different heading, a different message, and a diffe
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_13197025862804100000_shared?collectionId=lex_181096983663328100 00_shared&collectionType=Course
5.a	**Course Name:** Javascript
	Module Name: Creating Arrays, Destructuring Arrays, Accessing Arrays, Array Methods
	Create an array of objects having movie details. The object should include the movie name, starring, language, and ratings. Render the details of movies on the page using the array.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013053270191734784711_shared?collectionId=lex_181096983663 32810000_shared&collectionType=Course
5.b	**Course Name:** Javascript
	Module Name: Introduction to Asynchronous Programming, Callbacks, Promises, Async and Await, Executing Network Requests using Fetch API
	Simulate a periodic stock price change and display on the console. Hints: (i) Create a method which returns a random number - use Math.random, floor and other methods to return a rounded value. (ii) Invoke the method for every three seconds and stop when
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_012599811633905664460_shared?collectionId=lex_181096983663 32810000_shared&collectionType=Course
5.c	**Course Name:** Javascript
	Module Name: Creating Modules, Consuming Modules
	Validate the user by creating a login module. Hints: (i) Create a file login.js with a User class. (ii) Create a validate method with username and password as arguments. (iii) If the username and password are equal it will return "Login Successful" else w
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013052857053585408667_shared?collectionId=lex_181096983663 32810000_shared&collectionType=Course
6.a	**Course Name:** Node.js
	Module Name: How to use Node.js

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	Verify how to execute different functions successfully in the Node.js platform.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_19002830632103186000_shared?collectionId=lex_3240783567194676000_shared&collectionType=Course
6.b	**Course Name:** Node.js
	Module Name: Create a web server in Node.js
	Write a program to show the workflow of JavaScript code executable by creating web server in Node.js.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28177338996267815000_shared?collectionId=lex_3240783567194676000_shared&collectionType=Course
6.c	**Course Name:** Node.js
	Module Name: Modular programming in Node.js
	Write a Node.js module to show the workflow of Modularization of Node application.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28865394191004004000_shared?collectionId=lex_3240783567194676000_shared&collectionType=Course
6.d	**Course Name:** Node.js
	Module Name: Restarting Node Application
	Write a program to show the workflow of restarting a Node application.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_91740738560001590000_shared?collectionId=lex_3240783567194676000_shared&collectionType=Course
6.e	**Course Name:** Node.js
	Module Name: File Operations
	Create a text file src.txt and add the following data to it. Mongo, Express, Angular, Node.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_33376440180246100000_shared?collectionId=lex_3240783567194676000_shared&collectionType=Course
7.a	**Course Name:** Express.js
	Module Name: Defining a route, Handling Routes, Route Parameters, Query Parameters
	Implement routing for the AdventureTrails application by embedding the necessary code in the routes/route.js file.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_29394215542149950000_shared?collectionId=lex_3240783567194676000_shared&collectionType=Course
7.b	**Course Name:** Express.js
	Module Name: How Middleware works, Chaining of Middlewares, Types of Middlewares
	In myNotes application: (i) we want to handle POST submissions. (ii) display customized error messages. (iii) perform logging.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_13930661312009580000_shared?collectionId=lex_3240783567194676000_shared&collectionType=Course
7.c	**Course Name:** Express.js
	Module Name: Connecting to MongoDB with Mongoose, Validation Types and Defaults

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	Write a Mongoose schema to connect with MongoDB.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_01303558877548544069 1_shared?collectionId=lex_324078356719467600 00_shared&collectionType=Course
7.d	**Course Name:** Express.js
	Module Name: Models
	Write a program to wrap the Schema into a Model object.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_01303559389686988866 2_shared?collectionId=lex_324078356719467600 00_shared&collectionType=Course
8.a	**Course Name:** Express.js
	Module Name: CRUD Operations
	Write a program to perform various CRUD (Create-Read-Update-Delete) operations using Mongoose library functions.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_01303568427012915269 6_shared?collectionId=lex_324078356719467600 00_shared&collectionType=Course
8.b	**Course Name:** Express.js
	Module Name: API Development
	In the myNotes application, include APIs based on the requirements provided. (i) API should fetch the details of the notes based on a notesID which is provided in the URL. Test URL - http://localhost:3000/notes/7555 (ii) API should update the details bas
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_01303575452509757447 55_shared?collectionId=lex_324078356719467600 00_shared&collectionType=Course
8.c	**Course Name:** Express.js
	Module Name: Why Session management, Cookies
	Write a program to explain session management using cookies.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24299316914857090000_shared?collectionId=lex_324078356719467600 00_shared&collectionType=Course
8.d	**Course Name:** Express.js
	Module Name: Sessions
	Write a program to explain session management using sessions.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_905413034723449100_shared?collectionId=lex_32407835671946760000 _shared&collectionType=Course
8.e	**Course Name:** Express.js
	Module Name: Why and What Security, Helmet Middleware
	Implement security features in myNotes application
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_31677453061177940000_shared?collectionId=lex_324078356719467600 00_shared&collectionType=Course
9.a	**Course Name:** Typescript
	Module Name: Basics of TypeScript
	On the page, display the price of the mobile-based in three different colors. Instead of using the number in our code, represent them by string values like GoldPlatinum, PinkGold, SilverTitanium.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-

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	module/lex_28910354929502245000_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
9.b	**Course Name:** Typescript
	Module Name: Function
	Define an arrow function inside the event handler to filter the product array with the selected product object using the productId received by the function. Pass the selected product object to the next screen.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_10783156469383723000_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
9.c	**Course Name:** Typescript
	Module Name: Parameter Types and Return Types
	Consider that developer needs to declare a function - getMobileByVendor which accepts string as input parameter and returns the list of mobiles.
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712912427057152901_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
9.d	**Course Name:** Typescript
	Module Name: Arrow Function
	Consider that developer needs to declare a manufacturer's array holding 4 objects with id and price as a parameter and needs to implement an arrow function - myfunction to populate the id parameter of manufacturers array whose price is greater than or equ
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712910875500544904_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
9.e	**Course Name:** Typescript
	Module Name: Optional and Default Parameters
	Declare a function - getMobileByManufacturer with two parameters namely manufacturer and id, where manufacturer value should passed as Samsung and id parameter should be optional while invoking the function, if id is passed as 101 then this function shoul
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712914940641280906_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
10.a	**Course Name:** Typescript
	Module Name: Rest Parameter
	Implement business logic for adding multiple Product values into a cart variable which is type of string array.
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712921860915200909_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
10.b	**Course Name:** Typescript
	Module Name: Creating an Interface
	Declare an interface named - Product with two properties like productId and productName with a number and string datatype and need to implement logic to populate the Product details.
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712925244276736910_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course

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10.c	**Course Name:** Typescript
	Module Name: Duck Typing
	Declare an interface named - Product with two properties like productId and productName with the number and string datatype and need to implement logic to populate the Product details.
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_01271292599545856091 2_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
10.d	**Course Name:** Typescript
	Module Name: Function Types
	Declare an interface with function type and access its value.
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_01271294894534656091 8_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
11.a	**Course Name:** Typescript
	Module Name: Extending Interfaces
	Declare a productList interface which extends properties from two other declared interfaces like Category,Product as well as implementation to create a variable of this interface type.
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_01271295165213900892 0_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
11.b	**Course Name:** Typescript
	Module Name: Classes
	Consider the Mobile Cart application, Create objects of the Product class and place them into the productlist array.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_3705824317381604400_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
11.c	**Course Name:** Typescript
	Module Name: Constructor
	Declare a class named - Product with the below-mentioned declarations: (i) productId as number property (ii) Constructor to initialize this value (iii) getProductId method to return the message "Product id is <<id value>>".
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_01271295461678284892 7_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
11.d	**Course Name:** Typescript
	Module Name: Access Modifiers
	Create a Product class with 4 properties namely productId, productName, productPrice, productCategory with private, public, static, and protected access modifiers and accessing them through Gadget class and its methods.
	https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_01271295351717068893 1_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
12.a	**Course Name:** Typescript
	Module Name: Properties and Methods
	Create a Product class with 4 properties namely productId and methods to setProductId() and getProductId().

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	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_9356738095572543000_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
12.b	**Course Name:** Typescript
	Module Name: Creating and using Namespaces
	Create a namespace called ProductUtility and place the Product class definition in it. Import the Product class inside productlist file and use it.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_20787271128051925000_shared?collectionId=lex_943623311651267800 0_shared&collectionType=Course
12.c	**Course Name:** Typescript
	Module Name: Creating and using Modules
	Consider the Mobile Cart application which is designed as part of the functions in a module to calculate the total price of the product using the quantity and price values and assign it to a totalPrice variable.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24788158187785620000_shared?collectionId=lex_943623311651267800 0_shared&collectionType=Course
12.d	**Course Name:** Typescript
	Module Name: What is Generics, What are Type Parameters, Generic Functions, Generic Constraints
	Create a generic array and function to sort numbers as well as string values.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_446287045482942800_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course

Software configuration and installation

1. HTML & Javascript
   - Simple editors such as Notepad or go for IDEs like Visual Studio Code(recommended), Eclipse etc. which makes coding easier.
   - And, to execute application, you can use any commonly used browser such as Google Chrome(recommended), Mozilla Firefox etc
   - Setup details: Environmental Setup for HTML5 - Viewer Page | Infosys Springboard (onwingspan.com)
   - Environment Setup: Internal - Viewer Page | Infosys Springboard (onwingspan.com)
2. Node JS
   Download **Node.js** from the official site
   Setup details : How to use Node.js - Viewer Page | Infosys Springboard (onwingspan.com)
3. Typescript
   Installing TypeScript - Internal - Viewer Page | Infosys Springboard (onwingspan.com)

Text Books:

1. Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson.
2. Pro Mean Stack Development, 1st Edition, ELadElrom, Apress O'Reilly.
3. Full Stack JavaScript Development with MEAN, Colin J Ihrig, Adam Bretz, 1st edition, SitePoint, SitePoint Pty. Ltd., O'Reilly Media.

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Reference Books:

1. Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, 1st Edition, Dream Tech.
2. An Introduction to Web Design, Programming, 1st Edition, Paul S Wang, Sanda S Katila, Cengage Learning.

Web Links:

1. https://infyspringboard.onwingspan.com/en/app/toc/lex_17739732834840810000_shared/overview (HTML5)
2. https://infyspringboard.onwingspan.com/en/app/toc/lex_18109698366332810000_shared/overview (Javascript)
3. https://infyspringboard.onwingspan.com/en/app/toc/lex_32407835671946760000_shared/overview (Node.js & Express.js)
4. https://infyspringboard.onwingspan.com/en/app/toc/lex_9436233116512678000_shared/overview (Typescript)

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III B Tech II Sem		L	T	P	C
		0	0	4	2
BIG DATA : APACHE SPARK (Skill Oriented Course)					

Course Objectives:
The main objective of the course is to process Big Data with advance architecture like spark and streaming data in Spark

Course Outcomes:
By the end of the course , the student will be able to
- Develop MapReduce Programs to analyze large dataset Using Hadoop and Spark
- Write Hive queries to analyze large dataset Outline the Spark Ecosystem and its components
- Perform the filter, count, distinct, map, flatMap RDD Operations in Spark.
- Build Queries using Spark SQL
- Apply Spark joins on Sample Data Sets
- Make use of sqoop to import and export data from hadoop to database and vice-versa

List of Experiments:

1.

EXPERIMENT-1:
To Study of Big Data Analytics and Hadoop Architecture
(i) know the concept of big data architecture
(ii) know the concept of Hadoop architecture
https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01256841991858585686_shared/overview

2. Loading DataSet in to HDFS for Spark Analysis

EXPERIMENT-2:
Installation of Hadoop and cluster management
(i) Installing Hadoop single node cluster in ubuntu environment
(ii) Knowing the differencing between single node clusters and multi-node clusters
(iii) Accessing WEB-UI and the port number
(iv) Installing and accessing the environments such as hive and sqoop
(We can restrict to standalone or if the facilities available can try for pseudo-distribution mode {or} fully distribution mode)
https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_013295035317460992435 39_shared?collectionId=lex_auth_013295035804901376435 44_shared&collectionType=Collection

EXPERIMENT-3:
File management tasks & Basic linux commands
(i) Creating a directory in HDFS
(ii) Moving forth and back to directories

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(iii) Listing directory contents
(iv) Uploading and downloading a file in HDFS
(v) Checking the contents of the file
(vi) Copying and moving files
(vii) Copying and moving files between local to HDFS environment
(viii) Removing files and paths
(ix) Displaying few lines of a file
(x) Display the aggregate length of a file
(xi) Checking the permissions of a file
(xii) Zipping and unzipping the files with & without permission pasting it to a location
(xiii) Copy, Paste commands
https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01257430580733542457_shared?collectionId=lex_auth_01256841991858585686_shared&collectionType=Course

EXPERIMENT-4:
Map-reducing
(i) Definition of Map-reduce
(ii) Its stages and terminologies
(iii) Word-count program to understand map-reduce
(Mapper phase, Reducer phase, Driver code)
https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01257421539761356848_shared?collectionId=lex_auth_01256841991858585686_shared&collectionType=Course

EXPERIMENT-5:
Implementing Matrix-Multiplication with Hadoop Map-reduce

EXPERIMENT-6:
Compute Average Salary and Total Salary by Gender for an Enterprise.

EXPERIMENT-7:
(i) Creating hive tables(External and internal)
(ii) Loading data to external hive tables from sql tables(or)Structured c.s.v using scoop
(iii) Performing operations like filterations and updations
(iv) Performing Join(inner, outer etc)
(v) Writing User defined function on hive tables
https://infyspringboard.onwingspan.com/web/en/viewer/webmodule/lex_auth_01257841711418572848_shared?collectionId=lex_auth_01258388119638835242_shared&collectionType=Course

EXPERIMENT-8:
Create a sql table of employees
Employee table with id,designation
Salary table (salary ,dept id)
Create external table in hive with similar schema of above tables,Move data to hive using scoop and load the

contents into tables,filter a new table and write a UDF to encrypt the table with AES-algorithm, Decrypt it with key to show contents
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_012606909641981952143_shared?collectionId=lex_auth_012605268423008256169 2_shared&collectionType=Course

EXPERIMENT-9:
(i) Pyspark Definition(Apache Pyspark) and difference between Pyspark, Scala, pandas
(ii) Pyspark files and class methods
(i) get(file name)
(ii) get root directory()

EXPERIMENT-10 :
Pyspark -RDD'S
(i) what is RDD's?
(ii) ways to Create RDD
(i) parallelized collections
(ii) external dataset
(iii) existing RDD's
(iv) Spark RDD's operations
(Count, foreach(), Collect, join,Cache()
https://infyspringboard.onwingspan.com/web/en/app/toc/lex_3509975869549336000_shared/overviw

EXPERIMENT-11 :
Perform pyspark transformations
(i) map and flatMap
(ii) to remove the words, which are not necessary to analyze this text.
(iii) groupBy
(iv) What if we want to calculate how many times each word is coming in corpus ?
(v) .How do I perform a task (say count the words 'spark' and 'apache' in rdd3) separatly on each partition and get the output of the task performed in these partition ?
(vi) unions of RDD
(vii) join two pairs of RDD Based upon their key
https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013301505844518912251 82_shared/overview

EXPERIMENT-12:
Pyspark sparkconf-Attributes and applications
(i) What is Pyspark spark conf ()
(ii) Using spark conf create a spark session to write a dataframe to read details in a c.s.v and later move that c.s.v to another location

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Hardware and software configuration:

Hardware Configuration for each Node (Suggested)

Operating System:
NAME="Red Hat Enterprise Linux Server", VERSION="7.9 (Maipo)"
CPU Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
CPU(s): 32
RAM: 64G

Software Required

Java: openjdk version "1.8.0_202" (installed in all nodes)
For Hive metastore – we have installed MySQL
MySQL: Ver 8.0.19 for Linux on x86_64 (MySQL Community Server - GPL)

Resource Links for installation

- Hadoop Installation steps: Apache Hadoop 3.3.2 – Hadoop: Setting up a Single Node Cluster. & Apache Hadoop 3.3.2 – Hadoop Cluster Setup
- Links to download different versions of Hadoop : Index of /hadoop/ common (apache.org) &Index of /dist/hadoop/core (apache.org)

Text Books:

1. Spark in Action, Marko Bonaci and Petar Zecevic, Manning.
2. PySpark SQL Recipes: With HiveQL, Dataframe and Graphframes, Raju Kumar Mishra and Sundar Rajan Raman, Apress Media.

Web Links:	
1.	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013301505844518912251822_shared/overview
2.	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01258388119638835242_shared/overview
3.	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012605268423008256169 2_shared/overview

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III B Tech II Sem		L	T	P	C
		2	0	0	0
EMPLOYABILITY SKILLS-II					

Course Objectives:
The main objective of this course is to assist students in developing employability skills and personal qualities related to gaining and sustaining employment.

Course Outcomes: After completion of this course
- Solve various Basic Mathematics problems by following different methods
- Follow strategies in minimizing time consumption in problem solving Apply shortcut methods to solve problems
- Confidently solve any mathematical problems and utilize these mathematical skills both in their professional as well as personal life.
- Analyze, summarize and present information in quantitative forms including table, graphs and formulas

UNIT I:
Numerical ability l: Number system, HCF & LCM, Average, Simplification, Problems on numbers
Numerical ability II: Ratio & Proportion, Partnership, Percentages, Profit & Loss

UNIT II:
Arithmetical ability l: Problems on ages, Time & Work, Pipes & Cistern, Chain Rule.
Arithmetical ability ll: Time & Distance, Problems on boats &Steams, Problems on Trains

UNIT III:
Arithmetical ability lll: Allegation, Simple interest and compound interest, Races & Games of skills, Calendar and Clock,
Logical ability: Permutations and Combination and Probability.

UNIT IV:
Mensuration: Geometry, Areas, Volumes

UNIT V:
Data interpretation: Tabulation, Bar graphs, Pie charts, line graphs

Text Books And Reference Books:
1. R. S. Aggarwal “Quantitative Aptitude”, Revised ed., S Chand publication, 2017 ISBN:8121924987

E- resources:
1. https://blog.feedspot.com/aptitude_youtube_channels/
2. https://www.tutorialspoint.com/quantitative_aptitude/
3. https://www.careerbless.com/aptitude/qa/home.php

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		3	0	2	4
DEEP LEARNING					

Course Outcomes: After the completion of the course, student will be able to

- Implement deep neural networks to solve real world problems
- Choose appropriate pre-trained model to solve real time problem
- Interpret the results of two different deep learning models

UNIT I:
Fundamentals of Deep Learning: Artificial Intelligence, History of Machine learning: Probabilistic Modeling, Early Neural Networks, Kernel Methods, Decision Trees, Random forests and Gradient Boosting Machines, **Fundamentals of Machine Learning:** Four Branches of Machine Learning, Evaluating Machine learning Models, Overfitting and Underfitting. **[Text Book 2]**

UNIT II: Introducing Deep Learning: Biological and Machine Vision, Human and Machine Language, Artificial Neural Networks, Training Deep Networks, Improving Deep Networks. **[Text Book3]**

UNIT III: Neural Networks: Anatomy of Neural Network, Introduction to Keras: Keras, TensorFlow, Theano and CNTK, Setting up Deep Learning Workstation, Classifying Movie Reviews: Binary Classification, Classifying newswires: Multiclass Classification. **[Text Book 2]**

UNIT IV:
Convolutional Neural Networks: Nerual Network and Representation Learing, Convolutional Layers, Multichannel Convolution Operation,

UNIT V:
Recurrent Neural Networks: Introduction to RNN, RNN Code, PyTorch Tensors: Deep Learning with PyTorch, CNN in PyTorch. **[Text Book 3]**

Software Packages required:

- Keras
- Tensorflow
- PyTorch

List of Experiments:

1. Implement multilayer perceptron algorithm for MNIST Hand written Digit Classification.
2. Design a neural network for classifying movie reviews (Binary Classification) using IMDB dataset.
3. Design a neural Network for classifying news wires (Multi class classification) using Reuters dataset.
4. Design a neural network for predicting house prices using Boston Housing Price dataset.
5. Build a Convolution Neural Network for MNIST Hand written Digit Classification.
6. Build a Convolution Neural Network for simple image (dogs and Cats) Classification

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Text Books:

1. Deep Learning- Ian Goodfellow, Yoshua Bengio and Aaron Courvile, MIT Press, 2016
2. Deep Learning with Python - Francois Chollet, Released December 2017, Publisher(s): Manning Publications, ISBN: 9781617294433
3. Deep Learning Illustrated: A Visual, Interactive Guide to Artificial Intelligence - Jon Krohn, Grant Beyleveld, Aglaé Bassens, Released September 2019, Publisher(s): Addison-Wesley Professional, ISBN: 9780135116821
4. Deep Learning from Scratch - Seth Weidman, Released September 2019, Publisher(s): O'Reilly Media, Inc., ISBN: 9781492041412
5. Reza Zadeh and BharathRamsundar, "Tensorflow for Deep Learning", O'Reilly publishers, 2018

Reference Books:

1. Artificial Neural Networks, Yegnanarayana, B., PHI Learning Pvt. Ltd, 2009.
2. Matrix Computations, Golub, G.,H., and Van Loan,C.,F, JHU Press,2013.
3. Neural Networks: A Classroom Approach, Satish Kumar, Tata McGraw-Hill Education, 2004.
4. https://github.com/fchollet/deep-learning-with-python-notebooks

Web Link:

Swayam NPTEL: Deep Learning: https://onlinecourses.nptel.ac.in/noc22_cs22/preview

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IV B Tech I Sem		L	T	P	C
		3	0	0	3
REINFORCEMENT LEARNING (Professional Elective-III)					

Course Objective:

- Learn various approaches to solve decision problems with functional models and algorithms for task formulation, Tabular based solutions, Function approximation solutions, policy gradients and model based reinforcement learning.

Course Outcomes:

By completing the course the students will be able to:

- Understand basic concepts of Reinforcement learning
- Identifying appropriate learning tasks for Reinforcement learning techniques
- Understand various methods and applications of reinforcement learning

UNIT I:

Introduction: Reinforcement Learning, Examples, Elements of Reinforcement Learning, Limitations and Scope, An Extended Example: Tic-Tac-Toe

Multi-armed Bandits: A k-armed Bandit Problem, Action-value methods, The 10-armed Testbed, Incremental Implementation, Tracking a Nonstationary Problem, Optimistic Initial Values, Upper – Confidence-Bound Action Selection, Gradient Bandit Algorithm

UNIT II:

Finite Markov Decision Process: The Agent-Environment Interface, Goals and Rewards, Returns and Episodes, Unified Notataion for Episodic and Continuing Tasks, Policies and Value Functions,

Dynamic Programming: Policy Evaluation, Policy Improvement, Policy Iteration, Value Iteration, Asynchronous Dynamic Programming, Generalized Policy Iteration, Efficiency of Dynamic Programming

UNIT III:

Monte Carlo Methods: Monte Carlo Prediction, Monte Carlo Estimation of Action Values, Monte Carlo Control, Monte Carlo Control without Exploring Starts, Off-policy Prediction via Importance Sampling, Incremental Implementation, Discontinuing-aware Importance Sampling, Per-decision Importance Sampling

***n*-step Bootstrapping:** *n*-step TD Prediction, *n*-step Sarsa, *n*-step Off-policy Learning, Per-decision methods with Control Variables, A Unifying Algorithm: *n*-step Q(σ)

UNIT IV:

Off-policy Methods with Approximation: Semi-gradient Methods, Examples of Off-policy Divergence, The Deadly Triad, Linear Value-function Geometry, Gradient Descent in the Bellman Error, The Bellman Error is not Learnable, Gradient-TD methods, Emphatic-TD methods, Reducing Variance

Eligibility Traces: The λ-return, TD(λ), *n*-step Truncated λ-return methods, Online λ –return Algorithm, True Online TD(λ), Dutch Traces in Monte Carlo Learning, Sarsa(λ), Variable λ and γ, Off-policy Traces with Control Variables, Watkins's Q(λ) to Tree-Backup(λ)

UNIT V:

Policy Gradient Methods: Policy Approximation and its Advantages, The Policy Gradient Theorem, REINFOECE: Monte Carlo Policy Gradient, REINFORCE with Baseline, Actor-Critic Methods, Policy Gradient for Continuing Problems, Policy Parameterization for Continuous Actions

Applications and Case Studies: TD-Gammon, Samuel's Checkers Player, Watson's Daily Double

Wagering, Optimizing Memory Control, Personalized Web Services

Text Books:

1. R. S. Sutton and A. G. Bart,. "Reinforcement Learning - An Introduction," MIT Press, 2018.

References:

1. Szepesvári, Csaba, "Algorithms for Reinforcement Learning," United States: Morgan & Claypool, 2010.
2. Puterman, Martin L., "Markov Decision Processes: Discrete Stochastic Dynamic Programming," Germany: Wiley, 2014.

Web References:

1. https://onlinecourses.nptel.ac.in/noc20_cs74/preview
2. https://www.coursera.org/learn/fundamentals-of-reinforcement-learning

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IV B Tech I Sem		L	T	P	C
		3	0	0	3
SOFT COMPUTING (Professional Elective-III)					

Course Objectives: In the course the student will Learn soft computing concepts and techniques and foster their abilities in designing and implementing soft computing based solutions for real-world problems.

Course Outcomes (COs):
At the end of the course, student will be able to

- Able to apply fuzzy logic and reasoning to handle uncertainty in engineering problems Make use of genetic algorithms to combinatorial optimization problems
- Apply artificial intelligence techniques, including search heuristics, knowledge representation, planning and reasoning.
- Learn and apply the principles of self adopting and self organizing neuro fuzzy inference systems
- Evaluate and compare solutions by various soft computing approaches for a given problem

UNIT I:
Fuzzy Set Theory: Introduction to Neuro – Fuzzy and Soft Computing, Fuzzy Sets, Basic Definition and Terminology, Set-theoretic Operations, Member Function Formulation and Parameterization, Fuzzy Rules and Fuzzy Reasoning, Extension Principle and Fuzzy Relations. Fuzzy Inference Systems, Mamdani Fuzzy Models, Sugeno Fuzzy Models.

UNIT II:
Optimization: Derivative based Optimization, Descent Methods, The Method of Steepest Descent, Classical Newton's Method, Step Size Determination, Derivative-free Optimization, Genetic Algorithms.

UNIT III:
Artificial Intelligence: Introduction, Knowledge Representation, Reasoning, Issues and Acquisition: Prepositional and Predicate Calculus Rule Based knowledge Representation Symbolic Reasoning, Heuristic Search: Techniques for Heuristic search Heuristic Classification.

UNIT IV:
Neuro Fuzzy Modeling: Adaptive Neuro-Fuzzy Inference Systems, Architecture, Hybrid Learning Algorithm, Learning Methods that Cross-fertilize ANFIS and RBFN, Framework Neuron Functions for Adaptive Networks, Neuro Fuzzy Spectrum.

UNIT V:
Applications Of Computational Intelligence: Printed Character Recognition, Inverse Kinematics Problems, Automobile Fuel Efficiency Prediction, Soft Computing for Color Recipe Prediction.

Text Books:

1. J.S.R.Jang, C.T.Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI, 2004, Pearson Education 2004
2. N.P.Padhy, "Artificial Intelligence and Intelligent Systems", Oxford University Press, 2006.

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Reference Books:

1. Elaine Rich & Kevin Knight, Artificial Intelligence, Second Edition, Tata Mcgraw Hill Publishing Comp., 2006, New Delhi.
2. Timothy J.Ross, "Fuzzy Logic with Engineering Applications", McGraw-Hill, 1997.
3. Davis E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 1989.
4. S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI,
5. R.Eberhart, P.Simpson and R.Dobbins, "Computational Intelligence - PC Tools", AP Professional, Boston, 1996.
6. Amit Konar, "Artificial Intelligence and Soft Computing Behaviour and Cognitive model of the human brain", CRC Press, 2008

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IV B Tech I Sem		L	T	P	C
		3	0	0	3
CRYPTOGRAPHY AND NETWORK SECURITY (Professional Elective-III)					

Course Objectives:
The main objectives of this course are to explore the working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, public key algorithms, design issues and working principles of various authentication protocols and various secure communication standards including Kerberos, IPsec, and SSL/TLS.

Course Outcomes:
At the end of the course, student will be able to

- Explain different security threats and countermeasures and foundation course of cryptography mathematics.
- Classify the basic principles of symmetric key algorithms and operations of some symmetric key algorithms and asymmetric key cryptography
- Revise the basic principles of Public key algorithms and Working operations of some Asymmetric key algorithms such as RSA, ECC and some more
- Design applications of hash algorithms, digital signatures and key management techniques
- Determine the knowledge of Application layer, Transport layer and Network layer security Protocols such as PGP, S/MIME, SSL,TSL, and IPsec .

UNIT I:
Basic Principles: Security Goals, Cryptographic Attacks, Services and Mechanisms, Mathematics of Cryptography.

UNIT II:
Symmetric Encryption: Mathematics of Symmetric Key Cryptography, Introduction to Modern Symmetric Key Ciphers, Data Encryption Standard, Advanced Encryption Standard.

UNIT III:
Asymmetric Encryption: Mathematics of Asymmetric Key Cryptography, Asymmetric Key Cryptography

UNIT IV:
Data Integrity, Digital Signature Schemes & Key Management: Message Integrity and Message Authentication, Cryptographic Hash Functions, Digital Signature, Key Management.

UNIT V:
Network Security-I: Security at application layer: PGP and S/MIME, Security at the Transport Layer: SSL and TLS, **Network Security-II:** Security at the Network Layer: IPSec, System Security

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Text Books:

1. Cryptography and Network Security, 3rd Edition Behrouz A Forouzan, Deb deep Mukhopadhyay, McGraw Hill,2015
2. Cryptography and Network Security,4th Edition, William Stallings, (6e) Pearson,2006
3. Everyday Cryptography, 1st Edition, Keith M.Martin, Oxford,2016

Reference Books:

1. Network Security and Cryptography, 1st Edition, Bernard Meneges, Cengage Learning,2018

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IV B Tech I Sem		L	T	P	C
		3	0	0	3
BLOCK CHAIN TECHNOLOGIES (Professional Elective-III)					

Course Objectives:
To understand block chain technology and Cryptocurrency works

Course Outcomes:
After the completion of the course, student will be able to

- Demonstrate the block chain basics, Crypto currency
- To compare and contrast the use of different private vs. public block chain and use cases
- Design an innovative Bit coin Block chain and scripts, Block chain Science on varies coins
- Classify Permission Block chain and use cases – Hyper ledger, Corda
- Make Use of Block-chain in E-Governance, Land Registration, Medical Information Systems and others

UNIT I:
Introduction: Introduction, basic ideas behind block chain, how it is changing the landscape of digitalization, introduction to cryptographic concepts required, Block chain or distributed trust, Currency, Cryptocurrency, How a Cryptocurrency works, Financial services, Bitcoin prediction markets.

UNIT II:
Hashing, public key cryptosystems, private vs public block chain and use cases, Hash Puzzles, Extensibility of Block chain concepts, Digital Identity verification, Block chain Neutrality, Digital art, Block chain Environment

UNIT III:
Introduction to Bitcoin: Bitcoin Block chain and scripts, Use cases of Bitcoin Blockchain scripting language in micropayment, escrow etc Downside of Bit coin mining, Block chain Science: Grid coin, Folding coin, Block chain Genomics, Bit coin MOOCs.

UNIT IV:
Ethereum continued, IOTA, The real need for mining, consensus, Byzantine Generals Problem, and Consensus as a distributed coordination problem, Coming to private or permissioned block chains, Introduction to Hyper ledger, Currency, Token, Campus coin, Coin drop as a strategy for Public adoption, Currency Multiplicity, Demurrage currency

UNIT V:
Technical challenges, Business model challenges, Scandals and Public perception, Government Regulations, Uses of Block chain in E-Governance, Land Registration, Medical Information Systems.

Text Books:
1. Blockchain Blue print for Economy by Melanie Swan

Reference Books:
1. Blockchain Basics: A Non-Technical Introduction in 25 Steps 1st Edition, by Daniel Drescher

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IV B Tech I Sem		L	T	P	C
		3	0	0	3
SPEECH PROCESSING (Professional Elective-III)					

Course Objectives:
The main objective of the course is to understand the basic principles of sound and speech production and perception, speech recognition, synthesis and dialogue systems

Course Outcomes:
By the end of the course, students will be able to

- Understand the speech production and perception process.
- Analyze speech signals in time and frequency domain.
- Design and implement algorithms for processing speech signals.

UNIT I:
Fundamentals of Digital Speech Processing: Anatomy & Physiology of Speech Organs, The process of Speech Production, Acoustic Phonetics, Articulatory Phonetics, The Acoustic Theory of Speech Production-Uniform lossless tube model, effect of losses in vocal tract, effect of radiation at lips, Digital models for speech signals.

UNIT II:
Time Domain Models for Speech Processing: Introduction- Window considerations, Short time energy and average magnitude Short time average zero crossing rate, Speech Vs Silence discrimination using energy and zero crossing, Pitch period estimation using a parallel processing approach, The short time autocorrelation function, The short time average magnitude difference function, Pitch period estimation using the autocorrelation function.

UNIT III:
Linear Predictive Coding (LPC) Analysis: Basic principles of Linear Predictive Analysis: The Autocorrelation Method, The Covariance Method, Solution of LPC Equations: Cholesky Decomposition Solution for Covariance Method, Durbin's Recursive Solution for the Autocorrelation Equations, Comparison between the Methods of Solution of the LPC Analysis Equations, Applications of LPC Parameters: Pitch Detection using LPC Parameters, Formant Analysis using LPC Parameters.

UNIT IV:
Homomorphic Speech Processing: Introduction, Homomorphic Systems for Convolution: Properties of the Complex Cepstrum, Computational Considerations, The Complex Cepstrum of Speech, Pitch Detection, Formant Estimation, The Homomorphic Vocoder. Speech Enhancement: Nature of interfering sounds, Speech enhancement techniques: Single Microphone Approach : spectral subtraction, Enhancement by re-synthesis, Comb filter, Wiener filter, Multi microphone Approach

UNIT V:
Automatic Speech & Speaker Recognition: Basic pattern recognition approaches, Parametric representation of speech, Evaluating the similarity of speech patterns, Isolated digit Recognition System, Continuous digit Recognition System. Hidden Markov Model (HMM) for Speech: Hidden Markov Model (HMM) for speech recognition, Viterbi algorithm, Training and testing using HMMS. Speaker Recognition: Recognition techniques, Features that distinguish speakers, Speaker Recognition Systems: Speaker Verification System, Speaker Identification System.

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Text Books:

1. L.R. Rabiner and S. W. Schafer, "Digital Processing of Speech Signals", Pearson Education.
2. Douglas O'Shaughnessy, "Speech Communications: Human & Machine", 2nd Ed., Wiley India, 2000.
3. L.R Rabinar and R W Jhaung, "Digital Processing of Speech Signals", 1978, Pearson Education.

Reference Books:

1. Thomas F. Quateri, "Discrete Time Speech Signal Processing: Principles and Practice", 1st Edition., PE.
2. Ben Gold & Nelson Morgan, "Speech & Audio Signal Processing", 1st Edition, Wiley

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ROBOTIC PROCESS AUTOMATION (Professional Elective-IV)					

Course Outcomes:

At the end of the course, the student will be able to,

- Describe RPA, where it can be applied and how it's implemented.
- Describe the different types of variables, Control Flow and data manipulation techniques.
- Identify and understand Image, Text and Data Tables Automation.
- Describe how to handle the User Events and various types of Exceptions and strategies.
- Understand the Deployment of the Robot and to maintain the connection.

UNIT I:

Introduction to Robotic Process Automation: Scope and techniques of automation, Robotic process automation, What can RPA do, Benefits of RPA, Components of RPA, RPA platforms, The future of automation.

RPA Basics: History of Automation, What is RPA, RPA vs Automation, Processes & Flowcharts, Programming Constructs in RPA, What Processes can be Automated, Types of Bots, Workloads which can be automated, RPA Advanced Concepts, Standardization of processes, RPA Development methodologies, Difference from SDLC, Robotic control flow architecture, RPA business case, RPA Team, Process Design Document/Solution Design Document, Industries best suited for RPA, Risks & Challenges with RPA, RPA and emerging ecosystem.

UNIT II:

RPA Tool Introduction and Basics:

Introduction to RPA Tool: The User Interface, Variables, Managing Variables, Naming Best Practices, The Variables Panel, Generic Value Variables, Text Variables, True or False Variables, Number Variables, Array Variables, Date and Time Variables, Data Table Variables, Managing Arguments, Naming Best Practices, The Arguments Panel, Using Arguments, About Imported Namespaces, Importing New Namespaces, Control Flow, Control Flow Introduction, If Else Statements, Loops, Advanced Control Flow, Sequences, Flowcharts, About Control Flow, Control Flow Activities, The Assign Activity, The Delay Activity, The Do While Activity, The If Activity, The Switch Activity, The While Activity, The For Each Activity, The Break Activity, Data Manipulation, Data Manipulation Introduction, Scalar variables, collections and Tables, Text Manipulation, Data Manipulation, Gathering and Assembling Data

UNIT III:

Advanced Automation Concepts & Techniques: Recording Introduction, Basic and Desktop Recording, Web Recording, Input/ Output Methods, Screen Scraping, Data Scraping, Scraping advanced techniques, Selectors, Defining and Assessing Selectors, Customization, Debugging, Dynamic Selectors, Partial Selectors, RPA Challenge, Image, Text & Advanced Citrix Automation, Introduction to Image & Text Automation, Image based automation, Keyboard based automation, Information Retrieval, Advanced Citrix Automation challenges, Best Practices, Using tab for Images, Starting Apps, Excel Data Tables & PDF, Data Tables in RPA, Excel and Data Table basics, Data Manipulation in excel, Extracting Data from PDF, Extracting a single piece of data, Anchors, Using anchors in PDF.

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UNIT IV:

Handling User Events & Assistant Bots, Exception Handling: What are assistant bots, Monitoring system event triggers, Hotkey trigger, Mouse trigger, System trigger, Monitoring image and element triggers, An example of monitoring email, Example of monitoring a copying event and blocking it, Launching an assistant bot on a keyboard event.

Exception Handling: Debugging and Exception Handling, Debugging Tools, Strategies for solving issues, Catching errors.

UNIT V:

Deploying and Maintaining The Bot: Publishing using publish utility, Creation of Server, Using Server to control the bots, Creating a provision Robotfrom the Server, Connecting a Robot to Server, Deploy the Robot to Server, Publishing and managing updates, Managing packages, Uploading packages, Deleting packages

Text Books:

1. Alok Mani Tripathi, "*Learning Robotic Process Automation*", Packt Publishing, 2018.

Reference Books:

1. Frank Casale , Rebecca Dilla, Heidi Jaynes , Lauren Livingston, "Introduction to Robotic Process Automation:a Primer", Institute of Robotic Process Automation,1st Edition 2015.
2. Richard Murdoch, Robotic Process Automation: Guide To Building Software Robots, Automate RepetitiveTasks & Become An RPA Consultant", Independently Published, 1st Edition 2018.
3. Srikanth Merianda, "Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation", Consulting Opportunity Holdings LLC, 1st Edition 2018.
4. Lim Mei Ying, "Robotic Process Automation with Blue Prism Quick Start Guide: Create software robots andautomate business processes", Packt Publishing, 1st Edition 2018.

Web References:

1. https://www.uipath.com/rpa/robotic-process-automation
2. https://www.academy.uipath.com

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CLOUD COMPUTING (Professional Elective-IV)					

Course Objectives:

- To explain the evolving computer model caned cloud computing.
- To introduce the various levels of services that can be achieved by cloud.
- To describe the security aspects in cloud.
- To motivate students to do programming and experiment with the various cloud computing environments.

Course Outcomes: At the end of the course, student will be able to

- Illustrate the key dimensions of the challenge of Cloud Computing
- Classify the Levels of Virtualization and mechanism of tools.
- Analyze Cloud infrastructure including Google Cloud and Amazon Cloud.
- Create Combinatorial Auctions for cloud resource and design scheduling algorithms for computing cloud
- Assess control storage systems and cloud security, the risks involved its impact and develop cloud application

UNIT I:
Systems Modeling, Clustering and Virtualization: Scalable Computing over the Internet-The Age of Internet Computing, Scalable computing over the internet, Technologies for Network Based Systems, System models for Distributed and Cloud Computing, , Performance, Security and Energy Efficiency

UNIT II:
Virtual Machines and Virtualization of Clusters and Data Centers: Implementation Levels of Virtualization, Virtualization Structures/ Tools and Mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data-Center Automation.

UNIT III:
Cloud Platform Architecture: Cloud Computing and Service Models, Public Cloud Platforms, Service Oriented Architecture, Programming on Amazon AWS and Microsoft Azure

UNIT IV:
Cloud Resource Management and Scheduling: Policies and Mechanisms for Resource Management, Applications of Control Theory to Task Scheduling on a Cloud, Stability of a Two Level Resource Allocation Architecture, Feedback Control Based on Dynamic Thresholds. Coordination of Specialized Autonomic Performance Managers, Resource Bundling, Scheduling Algorithms for Computing Clouds-Fair Queuing, Start Time Fair Queuing.

UNIT V:
Storage Systems: Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system.

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Text Books:

1. Distributed and Cloud Computing, Kai Hwang, Geoffry C. Fox, Jack J. Dongarra MK Elsevier.
2. Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier.

Reference Books:

1. Cloud Computing, A Hands on approach, ArshadeepBahga, Vijay Madisetti, University Press
2. Cloud Computing, A Practical Approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH
3. Mastering Cloud Computing, Foundations and Application Programming, Raj Kumar Buyya, Christen vecctiola, S Tammaraiselvi, TMH

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BIG DATA ANALYTICS (Professional Elective-IV)					

Course Objectives:

- To optimize business decisions and create competitive advantage with Big Data analytics
- To learn to analyze the big data using intelligent techniques
- To introduce programming tools PIG & HIVE in Hadoop echo system

Course Outcomes:

At the end of the course, the students will be able to

- Illustrate big data challenges in different domains including social media, transportation, finance and medicine
- Use various techniques for mining data stream
- Design and develop Hadoop
- Identify the characteristics of datasets and compare the trivial data and big data forvarious applications
- Explore the various search methods and visualization techniques

UNIT I:

Introduction: Introduction to big data: Introduction to Big Data Platform, Challenges of Conventional Systems, Intelligent data analysis, Nature of Data, Analytic Processes and Tools, Analysis vs Reporting.

UNIT II:

Stream Processing: Mining data streams: Introduction to Streams Concepts, Stream Data Model and Architecture, Stream Computing, Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream, Estimating Moments, Counting Oneness in a Window, Decaying Window, Real time Analytics Platform (RTAP) Applications, Case Studies - Real Time Sentiment Analysis - Stock Market Predictions.

UNIT III:

Introduction to Hadoop: Hadoop: History of Hadoop, the Hadoop Distributed File System, Components of Hadoop Analysing the Data with Hadoop, Scaling Out, Hadoop Streaming, Design of HDFS, Java interfaces to HDFS Basics, Developing a Map Reduce Application, How Map Reduce Works, Anatomy of a Map Reduce Job run, Failures, Job Scheduling, Shuffle and Sort, Task execution, Map Reduce Types and Formats, Map Reduce Features Hadoop environment.

UNIT IV:

Frameworks and Applications: Frameworks: Applications on Big Data Using Pig and Hive, Data processing operators in Pig, Hive services, HiveQL, Querying Data in Hive, fundamentals of HBase and ZooKeeper.

UNIT V:

Predictive Analytics and Visualizations: Predictive Analytics, Simple linear regression, Multiple linear regression, Interpretation of regression coefficients, Visualizations, Visual data analysis techniques, interaction techniques, Systems and application

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Text Books:

1. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'reilly Media, Fourth Edition, 2015.
2. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGrawHill Publishing, 2012.
3. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", CUP, 2012

Reference Books:

1. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley& sons, 2012.
2. Paul Zikopoulos, DirkdeRoos, Krishnan Parasuraman, Thomas Deutsch, James Giles, David Corrigan, "Harness the Power of Big Data:The IBM Big Data Platform", Tata McGraw Hill Publications, 2012.
3. Arshdeep Bahga and Vijay Madisetti, "Big Data Science & Analytics: A Hands On Approach ", VPT, 2016.
4. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications (WILEY Big Data Series)", John Wiley & Sons, 2014.

Software Links:

1. Hadoop:http://hadoop.apache.org/
2. Hive: https://cwiki.apache.org/confluence/display/Hive/Home
3. Piglatin: http://pig.apache.org/docs/r0.7.0/tutorial.html

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NOSQL DATABASES (Professional Elective-IV)					

Course Objective: The student will be able to

- Define, compare and use the four types of NoSQL Databases (Document-oriented, Key-Value Pairs, Column-oriented and Graph).
- Demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases.
- Explain the detailed architecture, define objects, load data, query data and performance tune Document-oriented NoSQL databases.

Course Outcomes: At the end of the course, student will be able to

- Discuss about Aggregate Data Models
- Explain about Master-Slave Replication, Peer-to-Peer Replication
- Describe the Structure of Data, Scaling, Suitable Use Cases
- Make use of Complex Transactions Spanning Different Operations
- Identify Routing, Dispatch and Location-Based Services

UNIT-I: Why NoSQL, The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, A (Mostly) Standard Model, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL, Aggregate Data Models; Aggregates, Example of Relations and Aggregates, Consequences of Aggregate Orientation, Key-Value and Document Data Models, Column-Family Stores, Summarizing Aggregate-Oriented Databases. More Details on Data Models; Relationships, Graph Databases, Schema less Databases, Materialized Views, Modelling for Data Access,

UNIT-II: Distribution Models: Single Server, Shading, Master-Slave Replication, Peer-to-Peer Replication, Combining Shading and Replication. Consistency, Update Consistency, Read Consistency, Relaxing Consistency, The CAP Theorem, Relaxing Durability, Quorums. Version Stamps, Business and System Transactions, Version Stamps on Multiple Nodes

UNIT-III: What Is a Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preference, Shopping Cart Data, When Not to Use, Relationships among Data, Multi operation Transactions, Query by Data, Operations by Sets.

UNIT-IV: Document Databases, What Is a Document Database, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, Ecommerce Applications, When Not to Use, Complex Transactions Spanning different Operations, Queries against Varying Aggregate Structure

UNIT-V: Graph Databases, What Is a Graph Database, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Connected Data, Routing, Dispatch and Location-Based Services, Recommendation Engines, When Not to Use



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Text Books:

1. Sadalage, P. & Fowler, No SQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Pearson Addision Wesley, 2012

Reference Books:

1. Dan Sullivan, "NoSQL For Mere Mortals", 1st Edition, Pearson Education India, 2015. (ISBN13: 978-9332557338)
2. Dan McCreary and Ann Kelly, "Making Sense of NoSQL: A guide for Managers and the Rest of us", 1st Edition, Manning Publication/Dreamtech Press, 2013. (ISBN-13: 978-9351192022)
3. Kristina Chodorow, "Mongodb: The Definitive Guide- Powerful and Scalable Data Storage", 2nd Edition, O'Reilly Publications, 2013. (ISBN-13: 978-9351102694)

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VIDEO ANALYTICS (Professional Elective-IV)					

Course Objectives:
The main objectives of the course is to make student understand the need for video Analytics, the basic configuration of video analytics, the functional blocks of a video analytic system and to get exposed to the various applications of video analytics

Course Outcomes:
At the end of the course, the student should be able to:
• Design video analytic algorithms for security applications
• Design video analytic algorithms for business intelligence
• Design custom made video analytics system for the given target application

UNIT I:
Video Analytic Components: Need for Video Analytics, Overview of video Analytics, Foreground extraction, Feature extraction, classifier, Preprocessing, edge detection, smoothening, Feature space-PCA-FLD-SIFT features

UNIT II:
Foreground Extraction: Background estimation, Averaging, Gaussian Mixture Model, Optical Flow based, Image Segmentation, Region growing, Region splitting, Morphological operations, erosion, Dilation, Tracking in a multiple camera environment

UNIT III:
Classifiers: Neural networks (back propagation), Deep learning networks, Fuzzy Classifier, Bayesian classifier, HMM based classifier

UNIT IV:
Video Analytics for Security: Abandoned object detection, human behavioral analysis, human action recognition, perimeter security, crowd analysis and prediction of crowd congestion

UNIT V:
Video Analytics For Business Intelligence & Traffic Monitiring And Assistance: Customer behavior analysis, people counting, Traffic rule violation detection, traffic congestion identification for route planning, driver assistance, lane change warning

Text Books:
1. Graeme A. Jones, Nikos Paragios, Carlo S. Regazzoni, "Video-Based Surveillance Systems: Computer Vision and Distributed Processing", Kluwer academic publisher, 2001
2. Nilanjan Dey, Amira Ashour and Suvojit Acharjee, "Applied Video Processing in Surveillance and Monitoring Systems", (IGI global) 2016



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Reference Books:

1. Zhihao Chen, Ye Yang, Jingyu Xue, Liping Ye, Feng Guo, "The Next Generation of Video Surveillance and Video Analytics: The Unified Intelligent Video Analytics Suite", CreateSpace Independent Publishing Platform, 2014
2. Caifeng Shan, Fatih Porikli, Tao Xiang, Shaogang Gong, "Video Analytics for Business Intelligence", Springer, 2012

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IV B Tech I Sem		L	T	P	C
		3	0	0	3
SOCIAL NETWORK ANALYSIS (Professional Elective-V)					

Course Objectives:

- Formalize different types of entities and relationships as nodes and edges and represent thisinformation as relational data
- Plan and execute network analytical computations
- Use advanced network analysis software to generate visualizations and perform empirical investigations of network data
- Interpret and synthesize the meaning of the results with respect to a question, goal, or task
- Collect network data in different ways and from different sources while adhering to legal standards and ethics standards

Course Outcomes:

After completing the course student should:

- Know basic notation and terminology used in network science
- Be able to visualize, summarize and compare networks
- Illustrate basic principles behind network analysis algorithms
- Develop practical skills of network analysis in R programming language
- Be capable of analyzing real work networks

UNIT I:

Social Network Analysis: Preliminaries and definitions, Erdos Number Project, Centrality measures, Balance and Homophily.

UNIT II:

Random graph models**:** Random graphs and alternative models, Models of network growth, Navigation in social Networks, Cohesive subgroups, Multidimensional Scaling, Structural equivalence, roles and positions.

UNIT III:

Network topology and diffusion, Contagion in Networks, Complex contagion, Percolation and information, Navigation in Networks Revisited.

UNIT IV:

Small world experiments, small world models, origins of small world, Heavy tails, Small Diameter, Clustering of connectivity, The Erdos Renyi Model, Clustering Models.

UNIT V:

Network structure -Important vertices and page rank algorithm, towards rational dynamics in networks, basics of game theory, Coloring and consensus, biased voting, network formation games, network structure and equilibrium, behavioral experiments, Spatial and agent-based models.

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Text Books:

1. S. Wasserman and K. Faust. "Social Network Analysis: Methods and Applications", Cambridge University Press.
2. D. Easley and J. Kleinberg, "Networks, Crowds and Markets: Reasoning about a highly connected world" , Cambridge University Press, 1st edition,2010

Reference Books:

1. Maarten van Steen. "Graph Theory and Complex Networks. An Introduction", 2010.
2. Reza Zafarani, Mohammed Ali Abbasi, Huan Liu. "Social Media Mining: An Introduction". Cambridge University Press 2014.
3. Maksim Tsvetovat and Alexander Kouznetsov. "Social Network Analysis for Startups". O'Reilly Media, 2011.

e-Resources:

1) https://www.classcentral.com/course/edx-social-network-analysis-sna-9134
2) https://www.coursera.org/learn/social-network-analysis

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RECOMMENDER SYSTEMS (Professional Elective-V)					

Course Objective:
To develop state-of-the-art recommender systems that automates a variety of choice-making strategies with the goal of providing affordable, personal, and high-quality recommendations

Course Outcomes:
By completing the course the students will be able to:
• Understand the basic concepts of recommender systems
• Carry out performance evaluation of recommender systems based on various metrics
• Implement machine-learning and data-mining algorithms in recommender systems data sets.
• Design and implement a simple recommender system.

UNIT I :
An Introduction to Recommender Systems: Goals of Recommender Systems, Basic Models of Recommender Systems, Collaborative Filtering Models, Content-Based Recommender Systems, Knowledge-Based Recommender Systems, Domain-Specific Challenges in Recommender Systems, Advanced Topics and Applications.

UNIT II:
Neighborhood-Based Collaborative Filtering: Key Properties of Ratings Matrices, Predicting Ratings with Neighborhood-Based Methods, Clustering and Neighborhood-Based Methods, Dimensionality Reduction and Neighborhood Methods, A Regression Modeling View of Neighborhood Methods, Graph Models for Neighborhood-Based Methods

UNIT III:
Model-Based Collaborative Filtering: Decision and Regression Trees, Rule-Based Collaborative Filtering, Naïve Bayes Collaborative Filtering, Latent Factor Models, Integrating Factorization and Neighborhood Models

UNIT IV:
Content-Based Recommender Systems: Basic Components of Content-Based Systems, Preprocessing and Feature Extraction, Learning User Profiles and Filtering, Content-Based Versus Collaborative Recommendations
Knowledge-Based Recommender Systems: Constraint-Based Recommender Systems, Case-Based Recommenders, Persistent Personalization in Knowledge-Based Systems.

UNIT V:
Evaluating Recommender Systems: Evaluation Paradigms, General Goals of Evaluation Design, Design Issues in Offline Recommender Evaluation, Accuracy Metrics in Offline Evaluation, Limitations of Evaluation Measures

Text Books:
1. Charu .C. Aggarwal, Recommender Systems: The Textbook, Springer, 2016.

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Reference Books:

1. Jannach D., Zanker M. and FelFering A., Recommender Systems: An Introduction, Cambridge University Press(2011), 1st ed.
2. Ricci F., Rokach L., Shapira D., Kantor B.P., Recommender Systems Handbook, Springer(2011), 1st ed.
3. Manouselis N., Drachsler H., Verbert K., Duval E., Recommender Systems For Learning, Springer (2013), 1st ed.
4. J. Leskovec, A. Rajaraman and J. Ullman, Mining of massive datasets, 2nd Ed., Cambridge, 2012

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AI CHATBOTS (Professional Elective-V)					

Course Objectives:

- Learn how artificial intelligence powers chatbots, get an overview of the bot ecosystem and bot anatomy, and study different types of bots and use cases.
- Identify best practices for defining a chatbot use case, and use a rapid prototyping framework to develop a use case for a personalized chatbot.

Course Outcomes:

- Develop an in-depth understanding of conversation design, including onboarding, flows, utterances, entities, and personality.
- Design, build, test, and iterate a fully-functional, interactive chatbot using a commercial platform.
- Deploy the finished chatbot for public use and interaction.

UNIT I:
Introduction: Benefits from Chatbots for a Business, A Customer-Centric Approach in Financial Services, Chatbots in the Insurance Industry, Conversational Chatbot Landscape,
Identifying the Sources of Data: Chatbot Conversations, Training Chatbots for Conversations, Personal Data in Chatbots, Introduction to the General Data Protection Regulation (GDPR)

UNIT II:
Chatbot Development Essentials: Customer Service-Centric Chatbots, Chatbot Development Approaches, Rules-Based Approach, AI-Based Approach, Conversational Flow, Key Terms in Chatbots, Utterance, Intent, Entity, Channel, Human Takeover, Use Case: 24x7 Insurance Agent

UNIT III:
Building a Chatbot Solution: Business Considerations, Chatbots Vs Apps, Growth of Messenger Applications, Direct Contact Vs Chat, Business Benefits of Chatbots, Success Metrics, Customer Satisfaction Index, Completion Rate, Bounce Rate, Managing Risks in Chatbots Service, Generic Solution Architecture for Private Chatbots

UNIT IV:
Natural Language Processing, Understanding, and Generation: Chatbot Architecture, Popular Open Source NLP and NLU Tools, Natural Language Processing, Natural Language Understanding, Natural Language Generation, Applications.

UNIT V:
Introduction to Microsoft Bot, RASA, and Google Dialog flow: Microsoft Bot Framework, Introduction to QnA Maker, Introduction to LUIS, Introduction to RASA, RASA Core, RASA NLU, Introduction to Dialog flow
Chatbot Integration Mechanism: Integration with Third-Party APIs, Connecting to an Enterprise Data Store, Integration Module

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DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

Text Books:

1. Abhishek Singh, Karthik Ramasubramanian, Shrey Shivam, "Building an Enterprise Chatbot: Work with Protected Enterprise Data Using Open Source Frameworks", ISBN 978-1-4842-5034-1, Apress,2019

Reference Books:

1. Janarthanam and Srini, Hands-on chatbots and conversational UI development: Build chatbots and voice user interfaces with C (1 ed.), Packt Publishing Ltd, 2017. ISBN 978-1788294669.
2. Galitsky, Boris., Developing Enterprise Chatbots (1 ed.), Springer International Publishing, 2019. ISBN 978-303004298
3. Kelly III, John E. and Steve Hamm, Smart machines: IBM's Watson and the era of cognitive computing (1 ed.), Columbia University Press, 2013. ISBN 978- 0231168564.
4. Abhishek Singh, Karthik Ramasubramanian and Shrey Shivam, Building an Enterprise Chatbot (1 ed.), Springer, 2019. ISBN 978-1484250334.

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DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

IV B Tech I Sem		L	T	P	C
		3	0	0	3
OBJECT ORIENTED ANALYSIS AND DESIGN (Professional Elective-V)					

Course Objectives: The main objective is the students to

- Become familiar with all phases of OOAD.
- Master the main features of the UML.
- Master the main concepts of Object Technologies and how to apply them at work and develop the ability to analyze and solve challenging problem in various domains.
- Learn the Object design Principles and understand how to apply them towards Implementation.

Course Outcomes: After finishing this course student will be able to:

- Analyze the nature of complex system and its solutions.
- Illustrate & relate the conceptual model of the UML, identify & design the classes and relationships
- Analyze &Design Class and Object Diagrams that represent Static Aspects of a Software System and apply basic and Advanced Structural Modeling Concepts for designing real time applications.
- Analyze & Design behavioral aspects of a Software System using Use Case, Interaction and Activity Diagrams.
- Analyze & Apply techniques of State Chart Diagrams and Implementation Diagrams to model behavioral aspects and Runtime environment of Software Systems.

UNIT I:
Introduction: The Structure of Complex systems, The Inherent Complexity of Software, Attributes of Complex System, Organized and Disorganized Complexity, Bringing Order to Chaos, Designing Complex Systems. **Case Study:** System Architecture: Satellite-Based Navigation

UNIT II:
Introduction to UML: Importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture, and Software Development Life Cycle. **Basic Structural Modeling:** Classes, Relationships, common Mechanisms, and diagrams. **Case Study:** Control System: Traffic Management.

UNIT III:
Class & Object Diagrams: Terms, concepts, modeling techniques for Class & Object Diagrams. **Advanced Structural Modeling:** Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages. **Case Study:** AI: Cryptanalysis.

UNIT IV:
Basic Behavioral Modeling-I: Interactions, Interaction diagrams Use cases, Use case Diagrams, Activity Diagrams. **Case Study:** Web Application: Vacation Tracking System

UNIT V:
Advanced Behavioral Modeling: Events and signals, state machines, processes and Threads, time and space, state chart diagrams. **Architectural Modeling:** Component, Deployment, Component diagrams and Deployment diagrams
Case Study: Weather Forecasting

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Text Books:

1. Grady BOOCH, Robert A. Maksimchuk, Michael W. ENGLE, Bobbi J. Young, Jim Conallen, Kellia Houston , "Object- Oriented Analysis and Design with Applications", 3rd edition, 2013, PEARSON.
2. Grady Booch, James Rumbaugh, Ivar Jacobson: The Unified Modeling Language User Guide, Pearson Education.

Reference Books:

1. Meilir Page-Jones: Fundamentals of Object Oriented Design in UML, Pearson Education.
2. Pascal Roques: Modeling Software Systems Using UML2, WILEY- Dreamtech India Pvt. Ltd.
3. Atul Kahate: Object Oriented Analysis & Design, The McGraw-Hill Companies.
4. Appling UML and Patterns: An introduction to Object – Oriented Analysis and Design and Unified Process, Craig Larman, Pearson Education.

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IV B Tech I Sem		L	T	P	C
		3	0	0	3
SEMANTIC WEB (Professional Elective-V)					

Course Objectives:

- To learn Web Intelligence
- To learn Knowledge Representation for the Semantic Web
- To learn Ontology Engineering
- To learn Semantic Web Applications, Services and Technology
- To learn Social Network Analysis and semantic web

Course Outcomes: After the completion of the course, student will be able to

- Demonstrate social network analysis and measures.
- Analyze random graph models and navigate social networks data
- Apply the network topology and Visualization tools.
- Analyze the experiment with small world models and clustering models.
- Compare the application driven virtual communities from social network Structure.

UNIT I:

Web Intelligence: Thinking and Intelligent Web Applications, The Information Age ,The World Wide Web, Limitations of Today's Web, The Next Generation Web, Machine Intelligence, Artificial Intelligence, Ontology, Inference engines, Software Agents, Berners-Lee www, Semantic Road Map, Logic on the semantic Web.

UNIT II:

Knowledge Representation for the Semantic Web: Ontologies and their role in the semantic web, Ontologies Languages for the Semantic Web –Resource Description Framework(RDF) / RDF Schema, Ontology Web Language(OWL), UML, XML/XML Schema.

UNIT III:

Ontology Engineering: Ontology Engineering, Constructing Ontology, Ontology Development Tools, Ontology Methods, Ontology Sharing and Merging, Ontology Libraries and Ontology Mapping, Logic, Rule and Inference Engines.

UNIT IV:

Semantic Web Applications, Services and Technology: Semantic Web applications and services, Semantic Search, e-learning, Semantic Bioinformatics, Knowledge Base ,XML Based Web Services, Creating an OWL-S Ontology for Web Services, Semantic Search Technology, Web Search Agents and Semantic Methods,

UNIT V:

Social Network Analysis and semantic web: What is social Networks analysis, development of the social networks analysis, Electronic Sources for Network Analysis – Electronic Discussion networks, Blogs and Online Communities, Web Based Networks, Building Semantic Web Applications with social network features.

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Text Books:

1. Thinking on the Web – Berners Lee, Godel and Turing, Wiley inter science, 2008.
2. Social Networks and the Semantic Web, Peter Mika, Springer, 2007.

Reference Books:

1. Semantic Web Technologies, Trends and Research in Ontology Based Systems, J. Davies, R. Studer, P. Warren, John Wiley & Sons.
2. Semantic Web and Semantic Web Services -Liyang Lu Chapman and Hall/CRC Publishers,(Taylor & Francis Group)
3. Information sharing on the semantic Web – Heiner Stucken schmidt; Frank Van Harmelen, Springer Publications.
4. Programming the Semantic Web, T. Segaran, C. Evans, J. Taylor, O'Reilly, SPD.

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IV B Tech I Sem		L	T	P	C
		3	0	0	3
API AND MICROSERVICES (Job Oriented Course)					

Course Outcomes:
At the end of this course, the student will be able to

- Develop a Spring Data JPA application with Spring Boot
- Implement CRUD operations using Spring Data JPA
- Implement pagination and sorting mechanism using Spring Data JPA
- Implement query methods for querying the database using Spring Data JPA
- Implement a custom repository to customize a querying mechanism using Spring Data JPA
- Understand update operation using query approaches in Spring Data JPA
- Implement Spring Transaction using Spring Data JPA
- Develop RESTful endpoints using Spring REST Processing URI parameters
- Write RESTful services using Spring REST that consumes and produces data in different formats
- Handle exceptions and errors in Spring REST endpoints
- Write Spring based REST clients to consume RESTful services programmatically
- Create secure RESTful endpoints using Spring Security Document and version the Spring REST endpoints Implement CORS in a Spring REST application

UNIT I:
Spring 5 Basics : Why Spring, What is Spring Framework, Spring Framework - Modules, Configuring IoC container using Java-based configuration, Introduction To Dependency Injection, Constructor Injection, Setter Injection, What is AutoScanning

UNIT II:
Spring Boot: Creating a Spring Boot Application, Spring Boot Application Annotation, What is Autowiring , Scope of a bean, Logger, Introduction to Spring AOP, Implementing AOP advices, Best Practices : Spring Boot Application

UNIT III:
Spring Data JPA with Boot: Limitations of JDBC API, Why Spring Data JPA, Spring Data JPA with Spring Boot, Spring Data JPA Configuration, Pagination and Sorting, Query Approaches, Named Queries and Query, Why Spring Transaction, Spring Declarative Transaction, Update Operation in Spring Data JPA, Custom Repository Implementation, Best Practices - Spring Data JPA

UNIT IV:
Web Services: Why Web services, SOA - Service Oriented Architecture, What are Web Services, Types of Web Services, SOAP based Web Services, RESTful Web Services, How to create RESTful Services

UNIT V:
Spring REST: Spring REST - An Introduction, Creating a Spring REST Controller, @RequestBody and ResponseEntity, Parameter Injection, Usage of @PathVariable, @RequestParam and @MatrixVariable, Exception Handling, Data Validation, Creating a REST Client, Versioning a Spring REST endpoint, Enabling CORS in Spring REST, Securing Spring REST endpoints

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Hardware and software configuration
- 4 or 8 GB RAM/126 GB ROM
- Swagger tool suite(opensource)
- OpenJDK 17 or Java 11,Maven 3.2 or above and MySQL 8.0 or above,Spring Tool suite, Postman

Text Books:
1. Spring in action, 5th Edition, Author: Craig Walls, Ryan Breidenbach, Manning books

Web Links [Courses mapped to Infosys Springboard platform]:

Infosys Springboard courses:
1. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_01296689056211763272_shared/overview [Spring 5 Basics with Spring Boot]
2. https://infyspringboard.onwingspan.com/en/app/toc/lex_4313461831752789500_shared/overview [Spring Data JPA with Boot]
3. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_012731900963905536190_shared/overview [Spring REST]

Web references:

1. Dependency Injection in spring - javatpoint
2. Autowiring in Spring - javatpoint
3. https://docs.spring.io/spring-boot/docs/2.0.x/reference/html/using-boot-using-springbootapplication-annotation.html
4. Autowiring in Spring - javatpoint,https://www.baeldung.com/spring-bean-scopes
5. Spring Boot Logging | How does logging works in spring boot with example (educba.com)
6. Spring AOP Tutorial | Aspect Oriented Programming - javatpoint
7. Spring Boot Best Practices (javaguides.net)
8. Introduction to Spring Data JPA | SpringHow
9. https://asbnotebook.com/spring-data-jpa-crud-example/ ,https://www.bezkoder.com/spring-boot-jpa-crud-rest-api/
10. Pagination and Sorting using Spring Data JPA - PagingAndSortingRepository (javaguides.net)
11. https://www.javaguides.net/2018/11/spring-data-jpa-query-creation-from-method-names.html,https://www.javaguides.net/2022/02/spring-data-jpa-namedqueries-example.html
12. https://javadeveloperzone.com/spring/spring-declarative-transaction-management/
13. https://javadeveloperzone.com/spring/spring-declarative-transaction-management/
14. https://javabeat.net/spring-data-custom-repository/
15. https://www.jrebel.com/blog/jpa-application-performance-best-practices
16. https://www.javatpoint.com/service-oriented-architecture,https://www.javatpoint.com/web-services-tutorial
17. https://www.javatpoint.com/soap-web-services,https://www.javatpoint.com/restful-web-services
18. RESTful Web Services - javatpoint
19. https://www.javatpoint.com/restful-web-services-spring-boot
20. https://www.javatpoint.com/restful-web-services-spring-

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boothttps://dzone.com/articles/lifecycle-of-a-request-response-process-for-a-spri
21. https://www.ibm.com/docs/en/was/8.5.5?topic=applications-defining-uri-patterns-resources-in-restful
22. https://www.baeldung.com/exception-handling-for-rest-with-spring
23. https://howtodoinjava.com/spring-boot2/resttemplate/spring-restful-client-resttemplate-example/
24. https://www.javatpoint.com/restful-web-services-versioning
25. https://spring.io/guides/gs/rest-service-cors/
26. https://www.javatpoint.com/restful-web-services-basic-authentication-with-spring-security
27. https://www.springboottutorial.com/rest-api-best-practices-with-java-and-spring

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DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

IV B Tech I Sem		L	T	P	C
		3	0	0	3
SECURE CODING TECHNIQUES (Job Oriented Course)					

Course Outcomes:
At the end of the Course, student will be able to:

- Differentiate the objectives of information security
- Understand the trend, reasons and impact of the recent Cyber attacks
- Understand OWASP design principles while designing a web application
- Understand Threat modelling
- Importance of security in all phases of SDLC
- Write secure coding using some of the practices in C/C++/Java and Python programming languages

UNIT I:
Network and Information security Fundamentals: Network Basics, Network Components, Network Types, Network Communication Types, Introduction to Networking Models, Cyber Security Objectives and Services, Other Terms of Cyber Security, Myths Around Cyber Security, Myths Around Cyber Security, Recent Cyber Attacks, Generic Conclusion about Attacks, Why and What is Cyber Security, Categories of Attack

UNIT II:
Introduction to Cyber security: Introduction to OWASP Top 10, A1 Injection, A1 Injection Risks Root Causes and its Mitigation, A1 Injection, A2 Broken Authentication and Session Management, A7 Cross Site Scripting XSS,A3 Sensitive Data Exposure, A5 Broken Access Control, A4 XML External Entity (XEE), A6 Security Misconfiguration, A7 Missing Function Level Access Control, A8 Cross Site Request Forgery CSRF, A8 Insecure Deserialization, A9 Using Components With Known Vulnerabilities, A10 Unvalidated Redirects and Forwards, A10 Insufficient Logging and Monitoring, Secure Coding Practices, Secure Design Principles, Threat Modelling, Microsoft SDL Tool

UNIT III:
Secure coding practices and OWASP Top 10: Declarative Security, Programmatic Security, Concurrency, Configuration, Cryptography, Input and Output Sanitization, Error Handling, Input Validation, Logging and auditing, Session Management, Exception Management, Safe APIs, Type Safety, Memory Management, Tokenizing, Sandboxing, Static and dynamic testing, vulnerability scanning and penetration testing

UNIT IV:
Secure coding practices in C/C++ and Java: Potential Software Risks in C/C++, Defensive coding, Preventative Planning, Clean Code, Iterative Design, Assertions, Pre Post Conditions, Low level design inspections, Unit Tests
Java- Managing Denial of Service, Securing Information, Data Integrity, Accessibility and Extensibility, Securing Objects, Serialization Security

UNIT V:
Secure coding in Python: Interactive Python Scripting, Python Variables, Conditionals, Loops, Functions, External Modules, File operations, Web requests

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DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

Text Books:

1. Networking Fundamentals, 2019 edition, Packt, Author: Gordon Davies
2. Principles of Information Security, Authors: Michael E. Whitman and Herbert J. Mattord, Course technology incorp.
3. CSSLP SECURE SOFTWARE LIFECYCLE PROFESSIONAL ALL-IN-ONE EXAM GUIDE, Third Edition, 3rd Edition, Authors: Wm. Arthur Conklin, Daniel Paul Shoemaker, Released February 2022,Publisher(s): McGraw-Hill,ISBN: 9781264258215
4. OCP Oracle Certified Professional Java SE 11 Programmer II Study Guide: Exam 1Z0-816 and Exam 1Z0-817 Paperback – 6 August 2020, Authors: Scott Selikoff , Jeanne Boyarsky
5. OWASP 2017 Handbook,

https://owasp.org/www-pdf-archive/OWASP_Top_10_2017_RC2_Final.pdf

Web Links:

Infosys Springboard courses

1. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_012683751296065536354_shared/contents [Network Fundamentals]
2. https://infyspringboard.onwingspan.com/en/app/toc/lex_3388902307073574000_shared/overview [Introduction to cybersecurity]
3. https://infyspringboard.onwingspan.com/en/viewer/html/lex_auth_013501569657159680916 0 [Certified Secure Software Lifecycle Professional (CSSLP) 2019: Secure Coding Practices]
4. https://infyspringboard.onwingspan.com/en/viewer/html/lex_auth_013501568992755712966 0 [OWASP Top 10: Web Application Security]
5. https://infyspringboard.onwingspan.com/en/viewer/html/lex_auth_013501593040977920130 93 [Defensive coding fundamentals in C and C++]
6. https://infyspringboard.onwingspan.com/en/viewer/html/lex_auth_013501591729692672131 25 [Java SE 11 Programmer II: Secure Coding in Java SE 11 Applications]
7. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_013501581644931072111 92/overview [Security Programming: Python Scripting Essentials]

Web references:

1. https://www.stealthlabs.com/blog/infographic-top-15-cybersecurity-myths-vs-reality/
2. https://microage.ca/cybersecurity-layering-approach/
3. https://www.synopsys.com/glossary/what-is-threat-modeling.html#:~:text=Threat%20modeling%20is%20a%20structured,An%20abstraction%20of%20the%20system
4. https://www.microsoft.com/en-us/securityengineering/sdl/threatmodeling
5. https://www.checkpoint.com/cyber-hub/threat-prevention/what-is-sandboxing/
6. https://www.skillsoft.com/course/defensive-coding-fundamentals-for-cc-f44c02f9-1bcc-11e7-b15b-0242c0a80b07#:~:text=Defensive%20Programming%20is%20a%20methodology,%2C%20testing%2C%20and%20input%20validation.
7. https://www.oracle.com/java/technologies/javase/seccodeguide.html
8. https://www.skillsoft.com/course/security-programming-python-scripting-essentials-be99adad-1f65-47a8-a4b5-6b5346072b8e

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DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

IV B Tech I Sem		L	T	P	C
		3	0	0	3
UNIVERSAL HUMAN VALUES 2: UNDERSTANDING HARMONY					

Human Values Courses
This course also discusses their role in their family. It, very briefly, touches issues related to their role in the society and the nature, which needs to be discussed at length in one more semester for which the foundation course named as "H-102 Universal Human Values 2: Understanding Harmony" is designed which may be covered in their III or IV semester. During the Induction Program, students would get an initial exposure to human values through Universal Human Values – I. This exposure is to be augmented by this compulsory full semester foundation course.

Universal Human Values 2: Understanding Harmony
Course code: HSMC (H-102)
Credits: L-T-P-C 2-1-0-3 or 2L:1T:0P 3 credits
Pre-requisites: None. Universal Human Values 1 (desirable)

1. Objective:
The objective of the course is four fold:
1. Development of a holistic perspective based on self-exploration about themselves (human being),family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

2. Course Topics:
The course has 28 lectures and 14 practice sessions in 5 modules:

Module 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education
1. Purpose and motivation for the course, recapitulation from Universal Human Values-I
2. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

Module 2: Understanding Harmony in the Human Being - Harmony in Myself!
7. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
8. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
9. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
10. Understanding the characteristics and activities of 'I' and harmony in 'I'
11. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail

12. Programs to ensureSanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

Module 3: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

13. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
14. Understanding the meaning of Trust; Difference between intention and competence
15. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
16. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
17. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family**.**

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

Module 4: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

18. Understanding the harmony in the Nature
19. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature
20. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space
21. Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

Module 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics

22. Natural acceptance of human values
23. Definitiveness of Ethical Human Conduct
24. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
25. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people- friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
26. Case studies of typical holistic technologies, management models and production systems
27. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations
28. Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

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3. READINGS:

3.1 Text Book
1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

3.2 Reference Books
1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

4. MODE OF CONDUCT (L-T-P-C 2-1-0-3 or 2L:1T:0P 3 credits)
Lectures hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them.
Tutorial hours are to be used for practice sessions.
While analysing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.

In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self-exploration. Scenarios may be used to initiate discussion. The student is encouraged to take up" ordinary" situations rather than" extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions (tutorials)
would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.

It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional content may be offered in separate, higher courses.

This course is to be taught by faculty from every teaching department, including HSS faculty. Teacher preparation with a minimum exposure to at least one 8-day FDP on Universal Human Values is deemed essential.



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5. ASSESSMENT:

This is a compulsory credit course. The assessment is to provide a fair state of development of the student, so participation in classroom discussions, self-assessment, peer assessment etc. will be used in evaluation.
Example:

Assessment by faculty mentor: 10 marks
Self-assessment: 10 marks
Assessment by peers: 10 marks
Socially relevant project/Group Activities/Assignments: 20 marks
Semester End Examination: 50 marks

The overall pass percentage is 40%. In case the student fails, he/she must repeat the course**.**

6. OUTCOME OF THE COURSE:

By the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.
This is only an introductory foundational input. It would be desirable to follow it up by
a) faculty-student or mentor-mentee programs throughout their time with the institution
b) Higher level courses on human values in every aspect of living. E.g. as a professional

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IV B Tech I Sem		L	T	P	C
		0	0	4	2
MACHINE LEARNING WITH GO (Skill Oriented Course)					

Course Objectives:

- To turn the students into a productive, innovative data analyst who can leverage Go to build robust and valuable applications.
- To introduce the technical aspects of building predictive models in Go, but also helps you understand how machine learning workflows are applied in real-world scenarios.
- To understand how to gather, organize, and parse real-work data from a variety of sources.
- To develop a solid statistical toolkit that will allow you to quickly understand gain intuition about the content of a dataset.
- To implement essential machine learning techniques (regression, classification, clustering, and so on) with the relevant Go packages.

Prerequisites:

1. Bash Shell
2. Go-an editor

List of Experiments:

1. a) Write a Go program to read CSV file and find the maximum value in a particular column.
   b) Write a Go program to read iris dataset which is in csv format and demonstrate handling of unexpected fields, types and manipulating CSV data.
2. a) Demonstrate how JSON data can be parsed using Go.
   b) Demonstrate how to connect and Querying SQL like databases (Postgres MySQL, SQL Lite) using Go
3. Demonstrate how to cache data in memory using Go
4. a) Demonstrate how to represent matrices and vectors in Go
   b) Write a Go program to get statistical measures like mean, median, standard deviation and so on for any dataset.
   c) Write a Go program to visualize data distributions using Histogram, Box Plots.
5. a) Write a Go program to demonstrate Mean Squared Error(MSE), Mean Absolute Error (MAE) , R^2 (R Squared).
   b) Write a Go program to compute Accuracy, Precision , Recall, AUC (Area Under Cover)
6. a) Demonstrate how to build a linear regression model using Go.
   b) Demonstrate how to build a multiple linear regression model using Go.
7. Demonstrate how to build a logistic regression model using Go
8. Apply k-nearest neighbor classifier on iris dataset using Go
9. Build a decision tree on iris dataset using Go.
10. Demonstrate K-Means clustering method using Go.
11. Build auto regressive models for time series data using Go
12. Demonstrate how to build a simple neural network using Go

References:

https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013094429228687360238 3_shared/overview

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IV B Tech I Sem		L	T	P	C
		0	0	4	2
MEAN STACK TECHNOLOGIES-MODULE II- ANGULAR JS AND MONGODB (Skill Oriented Course)					

Course Outcomes:

- Build a component-based application using Angular components and enhance their functionality using directives.
- Utilize data binding for developing Angular forms and bind them with model data.
- Apply Angular built-in or custom pipes to format the rendered data.
- Develop a single page application by using synchronous or asynchronous Angular routing.
- Make use of MongoDB queries to perform CRUD operations on document database.

List of Exercises:

1.a	**Course Name:** Angular JS
	Module Name: Angular Application Setup
	Observe the link http://localhost:4200/welcome on which the mCart application is running. Perform the below activities to understand the features of the application.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24049616594198490000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
1.b	**Course Name:** Angular JS
	Module Name: Components and Modules
	Create a new component called hello and render Hello Angular on the page
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28217843279641040000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
1.c	**Course Name:** Angular JS
	Module Name: Elements of Template
	Add an event to the hello component template and when it is clicked, it should change the courseName.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_19226434057992030000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
1.d	**Course Name:** Angular JS
	Module Name: Change Detection
	progressively building the PoolCarz application
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_25609816371207710000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
2.a	**Course Name:** Angular JS
	Module Name: Structural Directives - ngIf
	Create a login form with username and password fields. If the user enters the correct credentials, it should render a "Welcome <<username>>" message otherwise it should render "Invalid Login!!! Please try again..." message
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_012763740226043904259 5_shared?collectionId=lex_20858515543

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	254600000_shared&collectionType=Course
2.b	**Course Name:** Angular JS
	Module Name: ngFor
	Create a courses array and rendering it in the template using ngFor directive in a list format.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_32795774277593590000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
2.c	**Course Name:** Angular JS
	Module Name: ngSwitch
	Display the correct option based on the value passed to ngSwitch directive.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_23388127475984175000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
2.d	**Course Name:** Angular JS
	Module Name: Custom Structural Directive
	Create a custom structural directive called 'repeat' which should repeat the element given a number of times.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24073319904331424000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
3.a	**Course Name:** Angular JS
	Module Name: Attribute Directives - ngStyle
	Apply multiple CSS properties to a paragraph in a component using ngStyle.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24037156998765367000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
3.b	**Course Name:** Angular JS
	Module Name: ngClass
	Apply multiple CSS classes to the text using ngClass directive.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_34596102970741820000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
3.c	**Course Name:** Angular JS
	Module Name: Custom Attribute Directive
	Create an attribute directive called 'showMessage' which should display the given message in a paragraph when a user clicks on it and should change the text color to red.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_14783742359773809000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
4.a	**Course Name:** Angular JS
	Module Name: Property Binding
	Binding image with class property using property binding.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_8951964709153619000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
4.b	**Course Name:** Angular JS
	Module Name: Attribute Binding

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	Binding colspan attribute of a table element to the class property.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_7154252883180625000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
4.c	**Course Name:** Angular JS
	Module Name: Style and Event Binding
	Binding an element using inline style and user actions like entering text in input fields.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_7417401021103822000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
5.a	**Course Name:** Angular JS
	Module Name: Built in Pipes
	Display the product code in lowercase and product name in uppercase using built-in pipes.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_11810543990912035000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
5.b	**Course Name:** Angular JS
	Module Name: Passing Parameters to Pipes
	Apply built-in pipes with parameters to display product details.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_21187073707540988000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
5.c	**Course Name:** Angular JS
	Module Name: Nested Components Basics
	Load CourseslistComponent in the root component when a user clicks on the View courses list button.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24231999287700136000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
6.a	**Course Name:** Angular JS
	Module Name: Passing data from Container Component to Child Component
	Create an AppComponent that displays a dropdown with a list of courses as values in it. Create another component called the CoursesList component and load it in AppComponent which should display the course details. When the user selects a course from the
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_15758356947336235000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
6.b	**Course Name:** Angular JS
	Module Name: Passing data from Child Component to ContainerComponent
	Create an AppComponent that loads another component called the CoursesList component. Create another component called CoursesListComponent which should display the courses list in a table along with a register .button in each row. When a user clicks on th
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_2494980689916818400_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

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6.c	**Course Name:** Angular JS
	Module Name: Shadow DOM
	Apply ShadowDOM and None encapsulation modes to components.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_10312243404892470000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
6.d	**Course Name:** Angular JS
	Module Name: Component Life Cycle
	Override component life-cycle hooks and logging the corresponding messages to understand the flow.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_10818939635948007000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
7.a	**Course Name:** Angular JS
	Module Name: Template Driven Forms
	Create a course registration form as a template-driven form.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_2810668513603024400_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
7.b	**Course Name:** Angular JS
	Module Name: Model Driven Forms or Reactive Forms
	Create an employee registration form as a reactive form.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_33704702617536004000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
7.c	**Course Name:** Angular JS
	Module Name: Custom Validators in Reactive Forms
	Create a custom validator for an email field in the employee registration form (reactive form)
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_33728128192769250000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
8.a	**Course Name:** Angular JS
	Module Name: Custom Validators in Template Driven forms
	Create a custom validator for the email field in the course registration form.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_27688491925133280000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
8.b	**Course Name:** Angular JS
	Module Name: Services Basics
	Create a Book Component which fetches book details like id, name and displays them on the page in a list format. Store the book details in an array and fetch the data using a custom service.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_32584403823635940000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
8.c	**Course Name:** Angular JS
	Module Name: RxJS Observables
	Create and use an observable in Angular.

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	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_6209609363905256000_shared?collectionId=lex_2085851554325460000 0_shared&collectionType=Course
9.a	**Course Name:** Angular JS
	Module Name: Server Communication using HttpClient
	Create an application for Server Communication using HttpClient
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_012763739531706368261 5_shared?collectionId=lex_20858515543 254600000_shared&collectionType=Course
9.b	**Course Name:** Angular JS
	Module Name: Communicating with different backend services using Angular HttpClient
	Create a custom service called ProductService in which Http class is used to fetch data stored in the JSON files.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_4266333361795059700_shared?collectionId=lex_2085851554325460000 0_shared&collectionType=Course
10. a	**Course Name:** Angular JS
	Module Name: Routing Basics, Router Links
	Create multiple components and add routing to provide navigation between them.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_3782024852517635000_shared?collectionId=lex_2085851554325460000 0_shared&collectionType=Course
10. b	**Course Name:** Angular JS
	Module Name: Route Guards
	Considering the same example used for routing, add route guard to BooksComponent. Only after logging in, the user should be able to access BooksComponent. If the user tries to give the URL of Bookscomponent in another tab or window, or if the user tries
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_30303325731876470000_shared?collectionId=lex_208585155432546000 00_shared&collectionType=Course
10. c	**Course Name:** Angular JS
	Module Name: Asynchronous Routing
	Apply lazy loading to BookComponent. If lazy loading is not added to the demo, it has loaded in 1.14 s. Observe the load time at the bottom of the browser console. Press F12 in the browser and click the Network tab and check the Load time
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_9878739890118246000_shared?collectionId=lex_2085851554325460000 0_shared&collectionType=Course
10. d	**Course Name:** Angular JS
	Module Name: Nested Routes
	Implement Child Routes to a submodule.
	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_012768043900444672140_shared?collectionId=lex_208585155432 54600000_shared&collectionType=Course
11. a	**Course Name:** MongoDB Essentials - A Complete MongoDB Guide
	Module Name: Installing MongoDB on the local computer, Create MongoDB Atlas Cluster
	Install MongoDB and configure ATLAS

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	https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01281821437313024030083_shared?collectionId=lex_auth_013177169294712832113_shared&collectionType=Course
11. b	**Course Name:** MongoDB Essentials - A Complete MongoDB Guide
	Module Name: Introduction to the CRUD Operations
	Write MongoDB queries to perform CRUD operations on document using insert(), find(), update(), remove()
	https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01281821874166169630118_shared?collectionId=lex_auth_013177169294712832113_shared&collectionType=Course
12. a	**Course Name:** MongoDB Essentials - A Complete MongoDB Guide
	Module Name: Create and Delete Databases and Collections
	Write MongoDB queries to Create and drop databases and collections.
	https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01281821654119219230121_shared?collectionId=lex_auth_013177169294712832113_shared&collectionType=Course
12. b	**Course Name:** MongoDB Essentials - A Complete MongoDB Guide
	Module Name: Introduction to MongoDB Queries
	Write MongoDB queries to work with records using find(), limit(), sort(), createIndex(), aggregate().
	https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_013289081626451968250 5_shared?collectionId=lex_auth_013177169294712832113_shared&collectionType=Course

Text Books:

1. Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson.
2. Pro Mean Stack Development, 1st Edition, ELadElrom, Apress O'Reilly.
3. Full Stack JavaScript Development with MEAN, Colin J Ihrig, Adam Bretz, 1st edition, SitePoint, SitePoint Pty. Ltd., O'Reilly Media.
4. MongoDB – The Definitive Guide, 2nd Edition, Kristina Chodorow, O'Reilly

Software configuration and installation:

1. Angular
   Setup details: Angular Application Setup - Internal - Viewer Page | Infosys Springboard (onwingspan.com)
2. MongoDB
   TOC - MongoDB Essentials - A Complete MongoDB Guide | Infosys Springboard (onwingspan.com)

Web Links:

1. https://infyspringboard.onwingspan.com/en/app/toc/lex_20858515543254600000_shared/overview (Angular JS)

2. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_013177169294712832113_shared/overview (MongoDB)

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IV B Tech I Sem	Minor	L	T	P	C
		4	0	0	4
REINFORCEMENT LEARNING					

Course Objective:

- Learn various approaches to solve decision problems with functional models and algorithms for task formulation, Tabular based solutions, Function approximation solutions, policy gradients and model based reinforcement learning.

Course Outcomes:

By completing the course the students will be able to:

- Understand basic concepts of Reinforcement learning
- Identifying appropriate learning tasks for Reinforcement learning techniques
- Understand various methods and applications of reinforcement learning

UNIT I:

Introduction: Reinforcement Learning, Examples, Elements of Reinforcement Learning, Limitations and Scope, An Extended Example: Tic-Tac-Toe

Multi-armed Bandits: A k-armed Bandit Problem, Action-value methods, The 10-armed Testbed, Incremental Implementation, Tracking a Nonstationary Problem, Optimistic Initial Values, Upper – Confidence-Bound Action Selection, Gradient Bandit Algorithm

UNIT II:

Finite Markov Decision Process: The Agent-Environment Interface, Goals and Rewards, Returns and Episodes, Unified Notataion for Episodic and Continuing Tasks, Policies and Value Functions,

Dynamic Programming: Policy Evaluation, Policy Improvement, Policy Iteration, Value Iteration, Asynchronous Dynamic Programming, Generalized Policy Iteration, Efficiency of Dynamic Programming

UNIT III:

Monte Carlo Methods: Monte Carlo Prediction, Monte Carlo Estimation of Action Values, Monte Carlo Control, Monte Carlo Control without Exploring Starts, Off-policy Prediction via Importance Sampling, Incremental Implementation, Discontinuing-aware Importance Sampling, Per-decision Importance Sampling

***n*-step Bootstrapping:** *n*-step TD Prediction, *n*-step Sarsa, *n*-step Off-policy Learning, Per-decision methods with Control Variables, A Unifying Algorithm: *n*-step Q(σ)

UNIT IV:

Off-policy Methods with Approximation: Semi-gradient Methods, Examples of Off-policy Divergence, The Deadly Triad, Linear Value-function Geometry, Gradient Descent in the Bellman Error, The Bellman Error is not Learnable, Gradient-TD methods, Emphatic-TD methods, Reducing Variance

Eligibility Traces: The λ-return, TD(λ), *n*-step Truncated λ-return methods, Online λ –return Algorithm, True Online TD(λ), Dutch Traces in Monte Carlo Learning, Sarsa(λ), Variable λ and γ, Off-policy Traces with Control Variables, Watkins's Q(λ) to Tree-Backup(λ)

UNIT V:

Policy Gradient Methods: Policy Approximation and its Advantages, The Policy Gradient Theorem, REINFOECE: Monte Carlo Policy Gradient, REINFORCE with Baseline, Actor-Critic Methods, Policy Gradient for Continuing Problems, Policy Parameterization for Continuous Actions

Applications and Case Studies: TD-Gammon, Samuel's Checkers Player, Watson's Daily Double

Wagering, Optimizing Memory Control, Personalized Web Services

Text Books:

1. R. S. Sutton and A. G. Bart,. "Reinforcement Learning - An Introduction," MIT Press, 2018.

References:

1. Szepesvári, Csaba, "Algorithms for Reinforcement Learning," United States: Morgan & Claypool, 2010.
2. Puterman, Martin L., "Markov Decision Processes: Discrete Stochastic Dynamic Programming," Germany: Wiley, 2014.

Web References:

3. https://onlinecourses.nptel.ac.in/noc20_cs74/preview
4. https://www.coursera.org/learn/fundamentals-of-reinforcement-learning

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE STRUCTURE AND SYLLABUS

For UG – R20

B. TECH - ELECTRONICS AND COMMUNICATION ENGINEERING

(Applicable for batches admitted from 2020-2021)

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE STRUCTURE

I Year –I SEMESTER

S. No.	Category	Subjects	L	T	P	Credits
1	HS	Communicative English	3	0	0	3
2	BS	Mathematics –I(Calculus)	3	0	0	3
3	BS	Applied Chemistry	3	0	0	3
4	ES	Programming for Problem Solving Using C	3	0	0	3
5	BS	Engineering Drawing	2	0	2	3
6	LC	English Communication Skills Laboratory	0	0	3	1.5
7	LC	Applied Chemistry Lab	0	0	3	1.5
8	LC	Programming for Problem Solving Using C Lab	0	0	3	1.5
					Total Credits	**19.5**

I Year – II SEMESTER

S. No	Category	Subjects	L	T	P	Credits
1	BS	Mathematics –II (Linear Algebra and Numerical Methods)	3	0	0	3
2	BS	Applied Physics	3	0	0	3
3	ES	Object Oriented Programming through Java	2	0	2	3
4	ES	Network Analysis	3	0	0	3
5	ES	Basic Electrical Engineering	3	0	0	3
6	LC	Electronic workshop Lab	0	0	3	1.5
7	LC	Basic Electrical Engineering Lab	0	0	3	1.5
8	LC	Applied Physics Lab	0	0	3	1.5
9	MC	Environmental Science	3	0	0	0.0
					Total Credits	**19.5**

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II Year –I Semester

S. No	Category	Name of the Subject	L	T	P	Credits
1	PC	Electronic Devices and Circuits	3	1	0	3
2	PC	Switching Theory and Logic Design	3	1	0	3
3	PC	Signals and Systems	3	1	0	3
4	BS	Mathematics-III (Transforms and Vector Calculus)	3	1	0	3
5	BS	Random Variables and Stochastic Processes	3	1	0	3
6	LC	OOPS through Java Lab	0	0	2	1.5
7	LC	Electronic Devices and Circuits -Lab	0	0	2	1.5
8	LC	Switching Theory and Logic Design–Lab	0	0	2	1.5
9	SC	Python Programming	0	0	4	2
					Total Credits	**21.5**

II Year – II Semester

S. No	Category	Name of the subject	L	T	P	Credits
1	PC	Electronic Circuit Analysis	3	1	0	3
2	PC	Digital IC Design	3	1	0	3
3	PC	Analog Communications	3	0	0	3
4	ES	Linear control Systems	3	1	0	3
5	HS	Management and Organizational Behavior	3	0	0	3
6	LC	Electronic Circuit Analysis Lab	0	0	3	1.5
7	LC	Analog Communications Lab	0	0	3	1.5
8	LC	Digital IC Design Lab	0	0	3	1.5
9	SC	Soft Skills	0	0	4	2
10	MC	Constitution of India	3	0	0	0
					Total Credits	**21.5**
Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)						**4**

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III Year - I Semester

S. No	Category	Name of the subject	L	T	P	Credits
1	PC	Analog ICs and Applications	3	0	0	3
2	PC	Electromagnetic Waves and Transmission Lines	3	0	0	3
3	PC	Digital Communications	3	0	0	3
4	OE1	Open Elective Course/Job oriented elective-1	2	0	2	3
5	PE1	Professional Elective courses -1	3	0	0	3
6	LC	Analog ICs and Applications LAB	0	0	3	1.5
7	LC	Digital Communications Lab	0	0	3	1.5
8	SC	Data Structures using Java Lab	0	0	4	2
9	MC	Indian Traditional Knowledge	2	0	0	0
	Summer Internship 2 Months (Mandatory) after second year (to be evaluated during V semester		0	0	0	1.5
					Total credits	**21.5**
	Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)					**4**

PE1:	**OE1:**
1. Antenna and Wave Propagation 2.Electronic Measurements and Instrumentation 3.Computer Architecture & Organization	Candidate should select the subject from list of subjects offered by other departments

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III Year –II Semester

S. No	Category	Name of the subject	L	T	P	Credits
1	PC	Microprocessor and Microcontrollers	3	1	0	3
2	PC	VLSI Design	3	0	0	3
3	PC	Digital Signal Processing	3	0	0	3
4	PE2	Professional Elective courses - 2	3	0	0	3
5	OE 2	Open Elective Course/Job oriented elective -2	2	0	2	3
6	LC	Microprocessor and Microcontrollers - Lab	0	0	3	1.5
7	LC	VLSI Design Lab	0	0	3	1.5
8	LC	Digital Signal Processing Lab	0	0	3	1.5
9	SC	ARM based/ Aurdino based Programming	1	0	2	2
10	MC	Research Methodology	2	0	0	0
					Total credits	**21.5**
	Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)					**4**

Industrial/Research Internship (Mandatory) 2 Months during summer vacation

PE2:	**OE2:**
1. Microwave Engineering 2. Mobile & Cellular Communication 3.Embedded Systems 4.CMOS Analog IC Design	Candidate should select the subject from list of subjects offered by other departments

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IV Year –I Semester

S. No	Category	Name of the subject	L	T	P	Credits
1	PE	Professional Elective courses -3	3	0	0	3
2	PE	Professional Elective courses -4	3	0	0	3
3	PE	Professional Elective courses -5	3	0	0	3
4	OE	Open Elective Courses/ Job oriented elective -3	2	0	2	3
5	OE	Open Elective Courses/ Job oriented elective -4	2	0	2	3
6	HS	***Humanities and Social Science Elective**	3	0	0	3
7	SC	**Designer tools (HFSS,** Microwave Studio CST. Cadence Virtuoso. Synopsys, Mentor Graphics, Xilinx.)	1	0	2	2
Industrial/Research Internship 2 Months (Mandatory) afterthird year (to be evaluated during VII semester			0	0	0	3
		Total credits				**23**
	Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)					**4**

PE 3:	PE5:
1. Optical Communication 2. Digital Image Processing 3. Low Power VLSI Design	1. Radar engineering 2.Pattern recognition & Machine Learning 3.Internet of Things
PE4: 1.Satellite Communications 2.Soft Computing Techniques 3.Digital IC Design using CMOS	

IV Year – II Semester

S. No.	Category	Code	Course Title	Hours per week			Credits
1	Major Project	PROJ	Project work, seminar and internship inindustry	-	-	-	12
INTERNSHIP (6 MONTHS)							
			Total credits				**12**

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SUBJECTS FOR HONORS

POOL-1

Instrumentation and Control Systems: (any four of the following subjects which are not chosen as professional electives are to be considered for Honors Degree)

S. No.	Subject	L-T-P	Credits
1	Data Acquisition systems	3-1-0	4
2	Adaptive Control Systems	3-1-0	4
3	Bio-Medical Instrumentation	3-1-0	4
4	Digital Control Systems	3-1-0	4
5	Process Control Instrumentation	3-1-0	4
6	Transducers & sensors	3-1-0	4
7	MEMS	3-1-0	4
8	Intelligent & Smart Instrumentation	3-1-0	4
In addition to any of the four subjects, MOOC/NPTEL Courses for 04 credits (02 courses@ 2 credits each) are compulsory in the domain of Electronics and Communication Engineering			

POOL-2

Integrated circuits and Systems: (any four of the following subjects which are not chosen asprofessional electives are to be considered for Honors Degree)

S. No	Subject	L-T-P	Credits
1	VLSI Technology and Design	3-1-0	4
2	CMOS Analog IC Design	3-1-0	4
3	CMOS Digital IC design	3-1-0	4
4	Design for Testability	3-1-0	4
5	System on Chip	3-1-0	4
6	Programmable Logic Devices and ASIC	3-1-0	4
7	Scripting Language	3-1-0	4
8	Low Power VLSI Design	3-1-0	4
In addition to any of the four subjects, MOOC/NPTEL Courses for 04 credits (02 courses@ 2 credits each) are compulsory in the domain of Electronics and Communication Engineering			

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POOL-3

Communication Engineering: (any four of the following subjects which are not chosen as a professional electives are to be considered for Honors Degree)

S. No	Subject	L-T-P	Credits
1	Wireless Sensor Networks	3-1-0	4
2	Software defined radio	3-1-0	4
3	Data Communications & Computer Networks	3-1-0	4
4	Cognitive radio	3-1-0	4
5	5G Communications	3-1-0	4
6	Satellite communication	3-1-0	4
7	Optical Communication	3-1-0	4
8	Global navigational satellite systems	3-1-0	4
In addition to any of the four subjects, MOOC/NPTEL Courses for 04 credits (02 courses@ 2 credits each) are compulsory in the domain of Electronics and Communication Engineering			

POOL-4

Digital Signal processing (any four of the following subjects which are not chosen as professional electives are to be considered for Honors Degree)

S. No	Subject	L-T-P	Credits
1	Speech Signal Processing	3-1-0	4
2	Video Signal Processing	3-1-0	4
3	Adaptive Signal Processing	3-1-0	4
4	Bio- Medical Signal Processing	3-1-0	4
5	DSP Processors and Architectures	3-1-0	4
6	Wavelet Theory	3-1-0	4
7	Multirate Systems And Filter Banks	3-1-0	4
8	Mathematical methods for signal processing	3-1-0	4
In addition to any of the four subjects Compulsory MOOC/NPTEL Courses for 04 credits (02 courses@ 2 credits each)			

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GENERAL MINOR TRACKS

S. No.	Subject	L-T-P	Credits
1	Electronics Devices and Basic Circuits	3-1-0	4
2	Digital Electronics	3-1-0	4
3	Principles of Communication	3-1-0	4
4	Signal Analysis	3-1-0	4
In addition to any of the four subjects, MOOC/NPTEL Courses for 04 credits (02 courses@ 2 credits each) are compulsory in the domain of Electronics and Communication Engineering			

List of the **OPEN ELECTIVES** offered by **ECE** Department to **other Branches**:

1. Basics of Signals and Systems
2. Electronic Measurements and Instrumentation
3. Principles of Signal Processing
4. Industrial Electronics
5. Consumer Electronics
6. Fundamentals of Microprocessors and Microcontrollers
7. Transducers and Sensors
8. IOT and Applications
9. Soft Computing Techniques
10. IC Applications
11. Principles of Communications
12. Basic Electronics
13. Data Communications
14. Digital Logic design
15. Remote Sensing and GIS
16. Bio Medical Instrumentation

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I Year - I Semester		L	T	P	C
		3	0	0	3
COMMUNICATIVE ENGLISH					

Introduction

The course is designed to train students in receptive (listening and reading) as well as productive and interactive (speaking and writing) skills by incorporating a comprehensive, coherent and integrated approach that improves the learners' ability to effectively use English language in academic/ workplace contexts. The shift is from *learning about the language* to *using the language*. On successful completion of the compulsory English language course/s in B.Tech., learners would be confident of appearing for international language qualification/proficiency tests such as IELTS, TOEFL, or BEC, besides being able to express themselves clearly in speech and competently handle the writing tasks and verbal ability component of campus placement tests. Activity based teaching-learning methods would be adopted to ensure that learners would engage in actual use of language both in the classroom and laboratory sessions.

Course Objectives

- Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Learning Outcomes

At the end of the module, the learners will be able to

- understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information
- ask and answer general questions on familiar topics and introduce oneself/others
- employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information
- recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs
- form sentences using proper grammatical structures and correct word forms

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Unit 1:

Lesson-1: A Drawer full of happiness from "**Infotech English**", Maruthi Publications

Lesson-2: Deliverance by Premchand from "**The Individual Society",**Pearson Publications. (Non-detailed)

Listening: Listening to short audio texts and identifying the topic. Listening to prose, prose and conversation.
Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests. Self introductions and introducing others.
Reading: Skimming text to get the main idea. Scanning to look for specific pieces of information.
Reading for Writing: Paragraph writing (specific topics) using suitable cohesive devices; linkers, sign posts and transition signals; mechanics of writing - punctuation, capital letters.
Vocabulary: Technical vocabulary from across technical branches (20) GRE Vocabulary (20) (Antonyms and Synonyms, Word applications) Verbal reasoning and sequencing of words.
Grammar: Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countables and uncountables; singular and plural basic sentence structures; simple question form - wh-questions; word order in sentences.
Pronunciation: Vowels, Consonants, Plural markers and their realizations

Unit 2:

Lesson-1: Nehru's letter to his daughter Indira on her birthday from "**Infotech English**", Maruthi Publications

Lesson-2: Bosom Friend by Hira Bansode from "**The Individual Society",** Pearson Publications.(Non-detailed)

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts, both in speaking and writing.

Speaking: Discussion in pairs/ small groups on specific topics followed by short structured talks. Functional English: Greetings and leave takings.**Reading**: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions.

Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary Analogies (20 words) (Antonyms and Synonyms, Word applications)

Grammar: Use of articles and zero article; prepositions.

Pronunciation: Past tense markers, word stress-di-syllabic words

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Unit 3:

Lesson-1: Stephen Hawking-Positivity 'Benchmark' from "**Infotech English**", Maruthi Publications

Lesson-2: Shakespeare's Sister by Virginia Woolf from "**The Individual Society",** Pearson Publications.(Non-detailed**)**

Listening: Listening for global comprehension and summarizing what is listened to, both in speaking and writing.
Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed.Functional English:Complaining and Apologizing.
Reading: Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension.Critical reading.

Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. Letter writing-types, format and principles of letter writing.E-mail etiquette, Writing CV's.

Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Association, sequencing of words

Grammar: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.

Pronunciation: word stress-poly-syllabic words.

Unit 4:

Lesson-1: Liking a Tree, Unbowed: Wangari Maathai-biography from "**Infotech English**", Maruthi Publications

Lesson-2: Telephone Conversation-Wole Soyinka from "**The Individual Society",** Pearson Publications**.**(Non-detailed)

Listening: Making predictions while listening to conversations/ transactional dialogues without video (only audio); listening to audio-visual texts.

Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.Functional English: Permissions, Requesting, Inviting.

Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicative process or display complicated data.
Reading for Writing: Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables.Writing SOP, writing for media.
Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Cloze Encounters.

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Grammar: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms

Pronunciation: Contrastive Stress

Unit 5:
Lesson-1: Stay Hungry-Stay foolish from "**Infotech English**", Maruthi Publications

Lesson-2: Still I Rise by Maya Angelou from "**The Individual Society",** Pearson Publications.(Non-detailed)

Listening: Identifying key terms, understanding concepts and interpreting the concepts both in speaking and writing.

Speaking: Formal oral presentations on topics from academic contexts - without the use of PPT slides.Functional English: Suggesting/Opinion giving.
Reading: Reading for comprehension. RAP StrategyIntensive reading and Extensive reading techniques.
Reading for Writing: Writing academic proposals- writing research articles: format and style.
Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Coherence, matching emotions.

Grammar: Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)

Pronunciation: Stress in compound words
Prescribed text books for theory for Semester-I:

1. "**Infotech English**", Maruthi Publications. (Detailed)

2."**The Individual Society",** Pearson Publications.(Non-detailed)

Prescribed text book for Laboratory for Semesters-I & II:

1. "**Infotech English**", Maruthi Publications. (with Compact Disc)

Reference Books:

- Bailey, Stephen. *Academic writing: A handbook for international students*. Routledge, 2014.
- Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking.* Heinley ELT; 2nd Edition, 2018.
- Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
- Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012.

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I Year - I Semester		L	T	P	C
		3	0	0	3
MATHEMATICS-I					

Course Objectives:

- This course will illuminate the students in the concepts of calculus.
- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

Course Outcomes:

At the end of the course, the student will be able to

- Utilize mean value theorems to real life problems (L3)
- Solve the differential equations related to various engineering fields (L3)
- Familiarize with functions of several variables which is useful in optimization (L3)
- Apply double integration techniques in evaluating areas bounded by region (L3)
- Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional and 3-dimensional coordinate systems (L5)

UNIT I: Sequences, Series and Mean value theorems: (10 hrs)
Sequences and Series: Convergences and divergence – Ratio test – Comparison tests – Integral test – Cauchy's root test – Alternate series – Leibnitz's rule.
Mean Value Theorems (without proofs): Rolle's Theorem – Lagrange's mean value theorem – Cauchy's mean value theorem – Taylor's and Maclaurin's theorems with remainders.

UNIT II: Differential equations of first order and first degree: (10 hrs)
Linear differential equations – Bernoulli's equations – Exact equations and equations reducible to exact form.
Applications: Newton's Law of cooling – Law of natural growth and decay – Orthogonal trajectories – Electrical circuits.

UNIT III: Linear differential equations of higher order: (10 hrs)
Non-homogeneous equations of higher order with constant coefficients – with non-homogeneous term of the type e^{ax}, sin ax, cos ax, polynomials in x^n, e^{ax} V(x) and x^nV(x) – Method of Variation of parameters.
Applications: LCR circuit, Simple Harmonic motion.

UNIT IV: Partial differentiation: (10 hrs)
Introduction – Homogeneous function – Euler's theorem – Total derivative – Chain rule – Jacobian – Functional dependence – Taylor's and Mc Laurent's series expansion of functions of two variables.
Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints).

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UNIT V: Multiple integrals: (8 hrs)
Double and Triple integrals – Change of order of integration – Change of variables.
Applications: Finding Areas and Volumes.

Text Books:

1) B. S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2) B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:

1) Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India.
2) Joel Hass, Christopher Heil and Maurice D. Weir, Thomas calculus, 14th Edition, Pearson.
3) Lawrence Turyn, Advanced Engineering Mathematics, CRC Press, 2013.
4) Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford University Press.

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I Year - I Semester		L	T	P	C
		3	0	0	3
APPLIED CHEMISTRY					

Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the available resources.

COURSE OBJECTIVES

- ***Importance*** of usage of plastics in household appliances and composites (FRP) in aerospace and automotive industries.
- ***Outline*** the basics for the construction of electrochemical cells, batteries and fuel cells. Understand the mechanism of corrosion and how it can be prevented.
- ***Explain*** the preparation of semiconductors and nanomaterials, engineering applications of nanomaterials, superconductors and liquid crystals.
- ***Recall*** the increase in demand for power and hence alternative sources of power are studied due to depleting sources of fossil fuels. Advanced instrumental techniques are introduced.
- ***Outline*** the basics of computational chemistry and molecular switches

UNIT I: POLYMER TECHNOLOGY **8 hrs**

Polymerisation:- Introduction, methods of polymerization (emulsion and suspension), mechanical properties.

Plastics: Compounding, fabrication (compression, injection, blown film and extrusion), preparation, properties and applications (PVC, polycarbonates and Bakelite), mention some examples of plastic materials used in electronic gadgets, recycling of e-plastic waste (waste to wealth).

Elastomers:- Introduction, preparation, properties and applications (Buna S, thiokol and polyurethanes).

Composite materials: Fiber reinforced plastics, conducting polymers, biodegradable polymers, biopolymers, biomedical polymers.

Course Outcomes: ***At the end of this unit, the students will be able to***

- ***Analyze*** the different types of composite plastic materials and ***interpret***the mechanism of conduction in conducting polymers.

UNIT II: ELECTROCHEMICAL CELLS AND CORROSION **10 hrs**

Single electrode potential, electrochemical series and uses of series, standard hydrogen electrode, calomel electrode, construction of glass electrode, batteries (Dry cell, Li ion battery and zinc air cells), fuel cells (H_2-O_2, CH_3OH-O_2, phosphoric acid and molten carbonate).

Corrosion:-Definition, theories of corrosion (chemical and electrochemical), galvanic corrosion, differential aeration corrosion, stress corrosion, galvanic series, factors influencing rate of corrosion, corrosion control (proper designing and cathodic protection), Protective coatings (surface preparation, cathodic coatings, anodic coatings, electroplating and electroless plating [nickel]), Paints (constituents, functions and special paints).

Course Outcomes: ***At the end of this unit, the students will be able to***

- ***Utilize*** the theory of construction of electrodes, batteries and fuel cells in redesigning new engineering products and c***ategorize*** the reasons for corrosion and study methods to control corrosion.

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UNIT III: MATERIAL CHEMISTRY **10 hrs**

Part I ***: Non-elementalsemiconducting materials****:-* Stoichiometric, controlled valency & chalcogen photo/semiconductors-preparation of semiconductors (distillation, zone refining, Czochralski crystal pulling, epitaxy, diffusion, ion implantation) - Semiconductor devices (p-n junction diode as rectifier, junction transistor).

Insulators &magnetic materials: electrical insulators-ferro and ferri magnetism-Hall effect and its applications.

Part II:

Nano materials:- Introduction, sol-gel method, characterization by (Brunauer Emmet Teller [BET]), (scanning electron microscopy [SEM]) and (transmission electron microscopy [TEM]), applications of graphene and fullerenes, carbon nanotubes (types, preparation and applications)

Liquid crystals:- Introduction-types-applications.

Super conductors:-Type –I, Type II-characteristics and applications

Course Outcomes: ***At the end of this unit, the students will be able to***

- ***Synthesize*** nanomaterials for modern advances of engineering technology.
- ***Summarize the*** preparation of semiconductors; analyze the applications of liquid crystals and superconductors.

UNIT IV:
SPECTROSCOPIC TECHNIQUES &NON-CONVENTIONAL ENERGY SOURCES
10 hrs

Part A: **SPECTROSCOPIC TECHNIQUES**

Electromagnetic spectrum-UV (laws of absorption, instrumentation, theory of electronic spectroscopy, Frank-condon principle, chromophores and auxochromes, intensity shifts, applications), FT-IR [instrumentation and differentiation of sp, sp^2, sp^3 and IR stretching of functional groups (alcohols, carbonyls, amines) applications], magnetic resonance imaging and CT scan (procedure & applications).

Part B*:* NON-CONVENTIONAL ENERGY SOURCES

Design, working, schematic diagram, advantages and disadvantages of photovoltaic cell, hydropower, geothermal power, tidal and wave power, ocean thermal energy conversion.

Course Outcomes: ***At the end of this unit, the students will be able to***

- ***Analyze*** the principles of different analytical instruments and their applications.
- ***Design*** models for energy by different natural sources.

UNIT V: ADVANCED CONCEPTS/TOPICS IN CHEMISTRY **8 hrs**

Computational chemistry: Introduction to computational chemistry, molecular modelling and docking studies

Molecular switches**:** characteristics of molecular motors and machines, Rotaxanes and Catenanes as artificial molecular machines, prototypes – linear motions in rotaxanes, an acid-base controlled molecular shuttle, a molecular elevator, an autonomous light-powered molecular motor

Course Outcomes: ***At the end of this unit, the students will be able to***

- ***Obtain*** the knowledge of computational chemistry and molecular machines

Standard Books:

1. P.C. Jain and M. Jain "**Engineering Chemistry**", 15/e, Dhanpat Rai & Sons, Delhi, (Latest edition).
2. Shikha Agarwal, "**Engineering Chemistry**", Cambridge University Press, New Delhi, (2019).
3. S.S. Dara, "**A Textbook of Engineering Chemistry**", S.Chand & Co, (2010).
4. Shashi Chawla, "Engineering Chemistry", Dhanpat Rai Publicating Co. (Latest edition).

Reference:

1. K. Sesha Maheshwaramma and Mridula Chugh, "**Engineering Chemistry**", Pearson India Edn.
2. O.G. Palana, "**Engineering Chemistry**", Tata McGraw Hill Education Private Limited, (2009).
3. CNR Rao and JM Honig (Eds) "**Preparation and characterization of materials**" Academic press, New York (latest edition)
4. B. S. Murthy, P. Shankar and others, "**Textbook of Nanoscience and Nanotechnology**", University press (latest edition)



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I Year - I Semester		L	T	P	C
		3	0	0	3
PROGRAMMING FOR PROBLEM SOLVING USING C					

COURSE OBJECTIVES:
The objectives of Programming for Problem Solving Using C are

- To learn about the computer systems, computing environments, developing ofacomputer program and Structure of aCProgram
- To gain knowledge of the operators, selection, control statements and repetition inC
- To learn about the design concepts of arrays, strings, enumerated structure andunion types. To learn abouttheirusage.
- To assimilate about pointers, dynamic memory allocation and know the significance of Preprocessor.
- To assimilate about File I/O and significanceoffunctions

UNIT I
Introduction to Computers: Creating and running Programs, Computer Numbering System, Storing Integers, Storing Real Numbers
Introduction to the C Language: Background, C Programs, Identifiers, Types, Variable, Constants, Input/output, Programming Examples, Scope, Storage Classes and Type Qualifiers. **Structure of a C Program:** Expressions Precedence and Associativity, Side Effects, Evaluating Expressions, Type Conversion Statements, Simple Programs, Command Line Arguments.

UNIT II
Bitwise Operators: Exact Size Integer Types, Logical Bitwise Operators, Shift Operators. **Selection & Making Decisions:** Logical Data and Operators, Two Way Selection, Multiway Selection, More Standard Functions
Repetition: Concept of Loop, Pretest and Post-test Loops, Initialization and Updating, Event and Counter Controlled Loops, Loops in C, Other Statements Related to Looping, Looping Applications, Programming Examples

UNIT III
Arrays: Concepts, Using Array in C,ArrayApplication, Two DimensionalArrays, Multidimensional Arrays, Programming Example –CalculateAverages
Strings: String Concepts, C String, String Input / Output Functions, Arrays of Strings, String Manipulation Functions String/ Data Conversion, A Programming Example – Morse Code
Enumerated, Structure, and Union: The Type Definition (Type-def), Enumerated Types, Structure, Unions, and Programming Application

UNIT IV
Pointers: Introduction, Pointers to pointers, Compatibility, L value and R value
Pointer Applications: Arrays, and Pointers, Pointer Arithmetic and Arrays, Memory Allocation Function, Array of Pointers, Programming Application
Processor Commands: Processor Commands



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UNIT V

Functions: Designing, Structured Programs, Function in C, User Defined Functions, Inter-Function Communication, Standard Functions, Passing Array to Functions, Passing Pointers to Functions, Recursion

Text Input / Output: Files, Streams, Standard Library Input / Output Functions, Formatting Input / Output Functions, Character Input / Output Functions

Binary Input / Output: Text versus Binary Streams, Standard Library, Functions for Files,Converting File Type.

TEXT BOOKS:

1. Programming for Problem Solving, Behrouz A. Forouzan, Richard F.Gilberg, CENGAGE
2. The C Programming Language, Brian W.Kernighan, Dennis M. Ritchie,2e,Pearson

REFERENCES:

1. Computer Fundamentals and Programming, Sumithabha Das, McGrawHill
2. Programming in C, Ashok N. Kamthane, AmitKamthane,Pearson
3. Computer Fundamentals and Programming in C, PradipDey, ManasGhosh,OXFORD

COURSE OUTCOMES:

Upon the completion of the course the student will learn

- To write algorithms and to draw flowcharts forsolvingproblems
- To convert flowcharts/algorithms to C Programs, compile anddebugprograms
- To use different operators, data types and write programs that use two-way/ multi-way selection
- To select the best loop construct for agivenproblem
- To design and implement programs to analyze the differentpointerapplications
- To decompose a problem into functions and to develop modularreusablecode
- To apply FileI/Ooperations.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

I Year - I Semester		L	T	P	C
		2	0	2	3
ENGINEERING DRAWING					

Course Objective:

Engineering drawing being the principal method of communication for engineers, the objective is to introduce the students, the techniques of constructing the various types of polygons, curves and scales. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.

Unit I

Objective: To introduce the students to use drawing instruments and to draw polygons, Engg. Curves.

Polygons: Constructing regular polygons by general methods, inscribing and describing polygons on circles.

Curves: Parabola, Ellipse and Hyperbola by general and special methods, cycloids, involutes, tangents & normals for the curves.

Scales: Plain scales, diagonal scales and vernier scales

Unit II

Objective: To introduce the students to use orthographic projections, projections of points & simple lines. To make the students draw the projections of the lines inclined to both the planes.

Orthographic Projections: Reference plane, importance of reference lines, projections of points in various quadrants, projections of lines, line parallel to both the planes, line parallel to one plane and inclined to other plane.

Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclination and traces.

Unit III

Objective: The objective is to make the students draw the projections of the plane inclined toboth the planes.

Projections of planes: regular planes perpendicular/parallel to one reference plane and inclined to the other reference plane; inclined to both the reference planes.

Unit IV

Objective: The objective is to make the students draw the projections of the various types of solids in different positions inclined to one of the planes.

Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to both the planes.

Unit V

Objective: The objective is to represent the object in 3D view through isometric views. The student will be able to represent and convert the isometric view to orthographic view and vice versa.

Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

Computer Aided Design, Drawing practice using Auto CAD, Creating 2D&3D drawings of objects using Auto CAD

Note: In the End Examination there will be no question from CAD.



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TEXT BOOKS:

1. Engineering Drawing by N.D. Butt, Chariot Publications
2. Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill Publishers

REFERENCE BOOKS:

1. Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers
2. Engineering Graphics for Degree by K.C. John, PHI Publishers
3. Engineering Graphics by PI Varghese, McGrawHill Publishers
4. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age

Course Outcome: The student will learn how to visualize 2D & 3D objects.

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I Year - I Semester		L	T	P	C
		0	0	3	1.5
ENGLISH COMMUNICATION SKILLS LABORATORY					

TOPICS

UNIT I:
Vowels, Consonants, Pronunciation, Phonetic Transcription, Common Errors in Pronunciation,

UNIT II:
Word stress-di-syllabic words, poly-syllabic words, weak and strong forms, contrastive stress (Homographs)

UNIT III:
Stress in compound words,rhythm, intonation,accent neutralisation.

UNIT IV:
Listening to short audio texts and identifying the context and specific pieces of information toanswer a series of questions in speaking.

UNIT V:
Newspapers reading;Understanding and identifying key terms and structures useful for writing reports.

Prescribed text book: "**Infotech English**", Maruthi Publications.

References:
1. Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL.
2. English Pronunciation in use- Mark Hancock, Cambridge University Press.
3. English Phonetics and Phonology-Peter Roach, Cambridge University Press.
4. English Pronunciation in use- Mark Hewings, Cambridge University Press.
5. English Pronunciation Dictionary- Daniel Jones, Cambridge University Press.
6. English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications.

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I Year - I Semester		L	T	P	C
		0	0	3	1.5

APPLIED CHEMISTRY LAB

Introduction to Chemistry laboratory – Molarity, normality, primary, secondary standard solutions, volumetric titrations, quantitative analysis

1. Determination of HCl using standard Na_2CO_3 solution.
2. Determination of alkalinity of a sample containing Na_2CO_3 and NaOH.
3. Determination of Mn^{+2} using standard oxalic acid solution.
4. Determination of ferrous iron using standard $K_2Cr_2O_7$ solution.
5. Determination of Cu^{+2} using standard hypo solution.
6. Determination of temporary and permanent hardness of water using standard EDTA solution.
7. Determination of Fe^{+3} by a colorimetric method.
8. Determination of the concentration of acetic acid using sodium hydroxide (pH-metry method).
9. Determination of iso-electric point of amino acids using pH-metry method/conductometric method.
10. Determination of the concentration of strong acid vs strong base (by conductometric method).
11. Determination of strong acid vs strong base (by potentiometric method).
12. Determination of Mg^{+2} presentin an antacid.
13. Determination of $CaCO_3$ present in an egg shell.
14. Estimation of Vitamin C.
15. Determination of phosphoric content in soft drinks.
16. Adsorption of acetic acid by charcoal.
17. Preparation of nylon-6, 6 and Bakelite (demonstration only).

Of the above experiments at-least 10 assessment experiments should be completed in a semester.

Outcomes: The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

Reference Books

1. A Textbook of Quantitative Analysis, Arthur J. Vogel.



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I Year - I Semester		L	T	P	C
		0	0	3	1.5
PROGRAMMING FOR PROBLEM SOLVING USING C LAB					

Course Objectives:

1) Apply the principles of C language inproblemsolving.
2) To design flowcharts, algorithms and knowing how todebugprograms.
3) To design & develop of C programs using arrays, strings pointers&functions.
4) To review the file operations,preprocessorcommands.

Exercise 1:

1. Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five andfourcharacters.
2. Write a C program to compute the perimeter and area of a rectangle with a heightof 7 inches and width of5inches.
3. Write a C program to displaymultiplevariables.

Exercise 2:

1. Write a C program to calculate the distance between thetwopoints.
2. Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrongvalues".

Exercise 3:

1. Write a C program to convert a string to alonginteger.
2. Write a program in C which is a Menu-Driven Program to compute the area of the variousgeometricalshape.
3. Write a C program to calculate the factorial of agivennumber.

Exercise 4:

1. Write a program in C to display the n terms of even natural number andtheirsum.
2. Write a program in C to display the n terms of harmonic series and their sum. 1 + 1/2 + 1/3 + 1/4 + 1/5 ...1/nterms.
3. Write a C program to check whether a given number is an Armstrong numberornot.

Exercise 5:

1. Write a program in C to print all unique elements inanarray.
2. Write a program in C to separate odd and even integers inseparatearrays.
3. Write a program in C to sort elements of array inascendingorder.

Exercise 6:

1. Write a program in C for multiplication of two squareMatrices.
2. Write a program in C to find transpose of agivenmatrix.

Exercise 7:

1. Write a program in C to search an element in a row wise and column wise sorted matrix.
2. Write a program in C to print individual characters of string inreverseorder.



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Exercise 8:

1. Write a program in C to compare two strings without using string libraryfunctions.
2. Write a program in C to copy one string toanotherstring.

Exercise 9:

1. Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
2. Write a program in C to demonstrate how to handle the pointers intheprogram.

Exercise 10:

1. Write a program in C to demonstrate the use of & (address of) and *(value at address)operator.
2. rite a program in C to add two numbersusingpointers.

Exercise 11:

1. Write a program in C to add numbers using callbyreference.
2. Write a program in C to find the largest element using DynamicMemoryAllocation.

Exercise 12:

1. Write a program in C to swap elements using callbyreference.
2. Write a program in C to count the number of vowels and consonants in a string using apointer.

Exercise 13:

1. Write a program in C to show how a functionreturningpointer.
2. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc()function.

Exercise 14:

1. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc( ) function. Understand the difference between the abovetwoprograms
2. Write a program in C to convert decimal number to binary number usingthefunction.

Exercise 15:

1. Write a program in C to check whether a number is a prime number or not using the function.
2. Write a program in C to get the largest element of an array usingthefunction.

Exercise 16:

1. Write a program in C to append multiple lines at the end of atextfile.
2. Write a program in C to copy a file inanothername.
3. Write a program in C to remove a file fromthedisk.

Course Outcomes:

By the end of the Lab, the student

1) Gains Knowledge on various concepts of aClanguage.
2) Able to draw flowcharts andwritealgorithms.
3) Able design and development of C problemsolvingskills.
4) Able to design and develop modularprogrammingskills.
5) Able to trace and debugaprogram

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I Year - II Semester		L	T	P	C
		3	0	0	3
MATHEMATICS-II					

Course Objectives:

- To instruct the concept of Matrices in solving linear algebraic equations
- To elucidate the different numerical methods to solve nonlinear algebraic equations
- To disseminate the use of different numerical techniques for carrying out numerical integration.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

Course Outcomes: At the end of the course, the student will be able to

- develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6)
- solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel (L3)
- evaluate the approximate roots of polynomial and transcendental equations by different algorithms (L5)
- apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals (L3)
- apply numerical integral techniques to different Engineering problems (L3)
- apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations (L3)

UNIT – I: Solving systems of linear equations, Eigen values and Eigen vectors: (10hrs)
Rank of a matrix by echelon form and normal form – Solving system of homogeneous and non-homogeneous linear equations – Gauss Eliminationmethod – Eigen values and Eigen vectors and properties (article-2.14 in text book-1).

Unit – II: Cayley–Hamilton theorem and Quadratic forms: (10hrs)
Cayley-Hamilton theorem (without proof) – Applications – Finding the inverse and power of a matrix by Cayley-Hamilton theorem – Reduction to Diagonal form – Quadratic forms and nature of the quadratic forms – Reduction of quadratic form to canonical forms by orthogonal transformation. Singular values of a matrix, singular value decomposition (text book-3).

UNIT – III: Iterative methods: (8 hrs)
Introduction– Bisection method–Secant method – Method of false position– Iteration method – Newton-Raphson method (One variable and simultaneous Equations) – Jacobi and Gauss-Seidel methods for solving system of equations numerically.

UNIT – IV: Interpolation: (10 hrs)
Introduction– Errors in polynomial interpolation – Finite differences– Forward differences– Backward differences –Central differences – Relations between operators – Newton's forward and backward formulae for interpolation – Interpolation with unequal intervals – Lagrange's interpolation formula– Newton's divide difference formula.

UNIT – V: Numerical differentiation and integration, Solution of ordinary differential equations with initial conditions: (10 hrs)

Numerical differentiation using interpolating polynomial – Trapezoidal rule– Simpson's $1/3^{rd}$ and $3/8^{th}$ rule– Solution of initial value problems by Taylor's series– Picard's method of successive approximations– Euler's method – Runge-Kutta method (second and fourth order).

Text Books:

1. **B. S. Grewal,** Higher Engineering Mathematics, 44^{th} Edition, Khanna Publishers.
2. **B. V. Ramana,**Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.
3. **David Poole,** Linear Algebra- A modern introduction, 4^{th} Edition, Cengage.

Reference Books:

1. **Steven C. Chapra,** Applied Numerical Methods with MATLAB for Engineering and Science,Tata Mc. Graw Hill Education.
2. **M. K. Jain, S.R.K. Iyengar and R.K. Jain,** Numerical Methods for Scientific and Engineering Computation, New Age International Publications.
3. **Lawrence Turyn,** Advanced Engineering Mathematics, CRC Press.

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I Year - II Semester		L	T	P	C
		3	0	0	3
APPLIED PHYSICS					

Unit-I: Wave Optics **12hrs**

Interference: Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Colors in thin films- Newton's Rings- Determination of wavelength and refractive index.

Diffraction: Introduction - Fresnel and Fraunhofer diffraction - Fraunhofer diffraction due to single slit, double slit - N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating(Qualitative).

Polarization: Introduction-Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol's Prism -Half wave and Quarter wave plates.

Unit Outcomes:

The students will be able to

- **Explain** the need of coherent sources and the conditions for sustained interference(L2)
- **Identify** engineering applications of interference(L3)
- **Analyze** the differences between interference and diffraction with applications(L4)
- **Illustrate** the concept of polarization of light and its applications(L2)
- **Classify** ordinary polarized light and extraordinary polarized light(L2)

Unit-II: Lasers andFiberoptics ***8hrs***

Lasers: Introduction – Characteristics of laser – Spontaneous and Stimulated emissions of radiation – Einstein's coefficients – Population inversion – Lasing action - Pumping mechanisms – Ruby laser – He-Ne laser - Applications of lasers.

Fiber optics: Introduction –Principle of optical fiber- Acceptance Angle - Numerical Aperture - Classification of optical fibers based on refractive index profile and modes – Propagation of electromagnetic wave through optical fibers - Applications.

Unit Outcomes:

The students will be able to

- **Understand** the basic concepts of LASER light Sources(L2)
- **Apply** the concepts to learn the types of lasers(L3)
- **Identifies** the Engineering applications of lasers(L2)
- **Explain** the working principle of optical fibers(L2)
- **Classify** optical fibers based on refractive index profile and mode of propagation(L2)
- **Identify** the applications of optical fibers in various fields(L2)



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Unit III: Quantum Mechanics, Free Electron Theory andBand theory 10hrs

Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory– Equation for electrical conductivity based on quantum free electron theory- Fermi-Dirac distribution- Density of states (3D) - Fermi energy.

Band theory of Solids: Bloch's Theorem (Qualitative) - Kronig - Penney model (Qualitative)- E vs K diagram - v vs K diagram - effective mass of electron – Classification of crystalline solids–concept of hole.

Unit Outcomes:

The students will be able to

- **Explain** the concept of dual nature of matter(L2)
- **Understand** the significance of wave function(L2)
- **Interpret** the concepts of classical and quantum free electron theories(L2)
- **Explain** the importance of K-Pmodel
- **Classify** the materials based on band theory(L2)
- **Apply** the concept of effective mass of electron(L3)

Unit-IV: Dielectric andMagneticMaterials 8hrs

DielectricMaterials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility and Dielectric constant - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field- Clausius- Mossotti equation-Piezoelectricity.

Magnetic Materials: Introduction - Magnetic dipole moment -Magnetization- Magnetic susceptibility and permeability - Origin of permanent magnetic moment - Classificationof
magnetic materials: Dia, para, Ferro, antiferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials- Eddy currents- Engineering applications.

Unit Outcomes:

The students will be able to

- **Explain** the concept of dielectric constant and polarization in dielectric materials(L2)
- **Summarize** various types of polarization of dielectrics(L2)
- **Interpret** Lorentz field and Claussius- Mosotti relation indielectrics(L2)
- **Classify** the magnetic materials based on susceptibility and their temperature dependence (L2)
- **Explain** the applications of dielectric and magnetic materials(L2)
- **Apply** the concept of magnetism to magnetic data storage devices(L3)

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Unit – V: SemiconductorsandSuperconductors ***10hrs***

Semiconductors: Introduction- Intrinsic semiconductors – Density of charge carriers – Electrical conductivity – Fermi level – extrinsic semiconductors – density of charge carriers – dependence of Fermi energy on carrier concentration and temperature - Drift and diffusion currents – Einstein's equation- Hall effect – Hall coefficient –Applications of Hall effect.
Superconductors: Introduction – Properties of superconductors – Meissner effect – Type I and Type II superconductors – BCS theory (Qualitative) – Josephson effects (AC and DC) – SQUIDs – High T_c superconductors – Applications ofsuperconductors.

Unit Outcomes:
The students will be able to

- **Classify** the energy bands of semiconductors(L2)
- **Interpret** the direct and indirect band gap semiconductors(L2)
- **Identify** the type of semiconductor using Hall effect(L2)
- **Identify** applications of semiconductors in electronic devices(L2)
- **Classify** superconductors based on Meissner's effect(L2)
- **Explain** Meissner's effect, BCS theory & Josephson effect in superconductors(L2)

Text books:

1. M. N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy" A Text book ofEngineering Physics"- S.Chand Publications, 11th Edition2019.
2. Engineering Physics" by D.K.Bhattacharya and Poonam Tandon, Oxford press(2015).
3. Applied Physics by P.K.Palanisamy SciTechpublications.

Reference Books:

1. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley&Sons
2. Engineering Physics by M.R.Srinivasan, New Age international publishers(2009).
3. Shatendra Sharma, Jyotsna Sharma, " Engineering Physics", Pearson Education,2018
4. Engineering Physics - Sanjay D. Jain, D. Sahasrabudhe and Girish, UniversityPress
5. Semiconductor physics and devices- Basic principle – Donald A, Neamen, Mc GrawHill
6. B.K. Pandey and S. Chaturvedi, Engineering Physics, CengageLearning

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I Year - II Semester		L	T	P	C
		2	0	2	3
OBJECT ORIENTED PROGRAMMING THROUGH JAVA					

Course Objectives:

This subject will help to improve

- the analytical skills of object orientedprogramming
- Overall development of problem solving and criticalanalysis.
- Formal introduction to Java programminglanguage

Course Outcomes:

On successful completion of this course, the student should be able to:

- Show competence in the use of the Java programming language in the development of small to medium- sized application programs that demonstrate professionally acceptable coding and performancestandard
- Illustrate the basic principles of the object-orientedprogramming
- Demonstrate an introductory understanding ofgraphical user interfaces, multithreaded programming, and event-drivenprogramming.

Unit I

Introduction to Java : Basics of Java programming, Data types, Variables, Operators, Control structures including selection, Looping, Java methods, Overloading, Math class, Arrays in java.

Objects and Classes : Basics of objects and classes in java, Constructors, Finalizer, Visibility modifiers, Methods and objects, Inbuilt classes like String, Character, StringBuffer, File, this reference.

Unit II

Inheritance and Polymorphism : Inheritance in java, Super and sub class, Overriding, Object class, Polymorphism, Dynamic binding, Generic programming, Casting objects, Instance of operator, Abstract class, Interface in java, Package in java, UTILpackage.

Unit III

Event and GUI programming : Event handling in java, Event types, Mouse and key events, GUI Basics, Panels, Frames, Layout Managers: Flow Layout, Border Layout, Grid Layout, GUI components like Buttons, Check Boxes, Radio Buttons, Labels, Text Fields, Text Areas, Combo Boxes, Lists, Scroll Bars, Sliders, Windows, Menus, Dialog Box, Applet and its life cycle, Introduction to swing, Creating a swing applet, swing controls and components.

Unit IV

I/O programming: Text and Binary I/O, Binary I/O classes, Object I/O, Random Access Files. Event driven model, handling events

Unit V

Multithreading in java: Thread life cycle and methods, Runnable interface, Thread synchronization, Exception handling with try-catch-finally, Collections in java, Introduction to JavaBeans and Network Programming.



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Text Books:

1) Introduction to Java Programming (Comprehensive Version), Daniel Liang, Seventh Edition,Pearson.
2) Programming in Java, SachinMalhotra&SaurabhChaudhary, Oxford University Press.

Reference Books:

1) Murach's Beginning Java 2, Doug Lowe, Joel Murach and Andrea Steelman,SPD.
2) Core Java Volume-I Fundamentals, Eight Edition, Horstmann& Cornell, Pearson Education.
3) The Complete Reference, Java 2 (Fourth Edition), Herbert Schild,TMH.
   Java Programming, D. S. Malik, CengageLearning.

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I Year - II Semester		L	T	P	C
		3	0	0	3
NETWORK ANALYSIS					

UNIT – I

Introduction to Electrical Circuits : Network elements classification, Electric charge and current, Electric energy and potential, Resistance parameter – series and parallel combination, Inductance parameter – series and parallel combination, Capacitance parameter – series and parallel combination. Energy sources: Ideal, Non-ideal, Independent and dependent sources, Source transformation, Kirchoff's laws, Mesh analysis and Nodal analysis problem solving with resistances only including dependent sources also. (Text Books: 1,2,3, Reference Books: 3)

Fundamentals and Network Topology: Definitions of terms associated with periodic functions: Time period, Angular velocity and frequency, RMS value, Average value, Form factor and peak factor- problem solving, Phase angle, Phasor representation, Addition and subtraction of phasors, mathematical representation of sinusoidal quantities, explanation with relevant theory, problem solving. Principal of Duality withexamples.

Network Topology: Definitions of branch, node, tree, planar, non-planar graph, incidence matrix, basic tie set schedule, basic cut set schedule. (Text Books: 2,3, Reference Books: 3)

UNIT – II

Transients: First order differential equations, Definition of time constants, R-L circuit, R-C circuit with DC excitation, Evaluating initial conditions procedure, second order differential equations, homogeneous, non-homogenous, problem solving using R-L-C elements with DC excitation and AC excitation, Response as related to s-plane rotation of roots. Solutions using Laplace transform method. (Text Books: 1,2,3, Reference Books: 1,3)

UNIT – III

Steady State Analysis of A.C Circuits: Impedance concept, phase angle, series R-L, R-C, R-L- C circuits problem solving. Complex impedance and phasor notation for R-L, R-C, R-L-C problem solving using mesh and nodal analysis, Star-Delta conversion, problem solving. (Text Books: 1,2, Reference Books: 3)

Coupled Circuits : Coupled Circuits: Self inductance, Mutual inductance, Coefficient of coupling, analysis of coupled circuits, Natural current, Dot rule of coupled circuits, Conductively coupled equivalent circuits- problem solving.

UNIT – IV

Resonance: Introduction, Definition of Q, Series resonance, Bandwidth of series resonance, Parallel resonance, Condition for maximum impedance, current in anti resonance, Bandwidth ofparallel resonance, general case-resistance present in both branches, anti resonance at all frequencies. (Text Books:2,3, Reference Books: 3)

Network Theorems: Thevinin's, Norton's, Milliman's, Reciprocity, Compensation, Substitution, Superposition,Max Power Transfer, Tellegens- problem solving using dependent sources also. (Text Books: 1,2,3, ReferenceBooks:2)



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UNIT – V

Two-port Networks: Relationship of two port networks, Z-parameters, Y-parameters, Transmission line parameters, h-parameters, Inverse h-parameters, Inverse Transmission line parameters, Relationship between parameter sets, Parallel connection of two port networks, Cascading of two port networks, series connection of two port networks, problem solving including dependent sources also. (Text Books: 1,2, Reference Books: 1,3)

TEXT BOOKS:

1. Network Analysis – ME Van Valkenburg, Prentice Hall of India, 3rdEdition,2000.
2. Network Analysis by K.Satya Prasad and S Sivanagaraju,CengageLearning
3. Electric Circuit Analysis by Hayt andKimmarle,TMH

REFERENCES:

1. Network lines and Fields by John. D. Ryder 2nd edition, Asiapublishinghouse.
2. Basic Circuit Analysis by DR Cunninghan, Jaico Publishers.
3. Network Analysis and Filter Design by Chadha,UmeshPublications.

COURSE OBJECTIVES:

- To understand the basic concepts on RLC circuits.
- To know the behavior of the steady states and transients states inRLCcircuits.
- To know the basic Laplace transforms techniques inperiods'waveforms.
- To understand the two portnetworkparameters.
- To understand the properties of LC networksandfilters.

COURSE OUTCOME:

- gain the knowledge on basic networkelements.
- will analyze the RLC circuits behaviorindetailed.
- analyze the performance of periodicwaveforms.
- gain the knowledge in characteristics of two port network parameters (Z,Y,ABCD,h&g).
- analyze the filter design concepts in realworldapplications.

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I Year - II Semester		L	T	P	C
		3	0	0	3
BASIC ELECTRICAL ENGINEERING					

Preamble:
This course covers various topics related to principle of operation and performance of various electrical machines.

Course Educational Objectives:
- To understand the principle of operation, constructional details andoperational characteristics ofDCgenerators.
- To understand the principle of operation, characteristics of DC motor. Methodsof starting and speed control methods ofDCmotors.
- To learn the constructional details, principle of operation and performanceof transformers.
- To study the principle of operation, construction and details ofsynchronousmachines.
- To learn the principle of operation, constructional details, performance, torque – slip characteristics and starting methods of 3-phaseinductionmotors.

Unit I
DC Machines
Principle of operation of DC generator – emf equation – types of DC machines – torque equation of DC motor – applications – three point starter - losses and efficiency - swinburne's test - speed control methods – OCC of DC generator- Brake test on DC Shunt motor-numerical problems

Unit II
Transformers
Principle of operation of single phase transformer constructional features – EMF equation – Losses and efficiency of transformer- regulation of transformer – OC & SC tests predetermination of efficiency and regulations – Sumpner's test-NumericalProblems.

Unit III
Synchronous Generators
Principle of operation and construction of alternators – types of alternators Regulation of alternator by synchronous impedance method-EMF equation of three phase alternator

Synchronous Motors
Construction of three phase synchronous motor - operating principle –equivalent circuit of synchronous motor.

Unit IV
Induction Machine: Principle of operation and construction of three-phase induction motors – slip ring and squirrel cage motors – slip-torque characteristics – efficiency calculation – starting methods-Brake test on 3-Phase Induction Motor.

Unit V
Special Machines: Principle of operation and construction - single phase induction motor - shaded pole motors – capacitor motors and AC servomotor.

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Course Outcomes:

- Able to explain the operation of DC generator and analyze the characteristics of DC generator.
- Able to explain the principle of operation of DC motor and analyze theircharacteristics. Acquire the skills to analyze the starting and speed control methods ofDCmotors.
- Ability to analyze the performance and speed – torque characteristics of a3-phase induction motor and understand starting methods of 3-phaseinductionmotor.
- Able to explain the operation ofSynchronousMachines
- Capability to understand the operation of variousspecialmachines.

TEXT BOOKS*:*

1. Principles of Electrical Machines by V.K. Mehta &Rohit Mehta,S.Chandpublications
2. Theory & performance of Electrical Machines by J.B.Guptha, S.K.Kataria&Sons

REFERENCE BOOKS*:*

1.Basic Electrical Engineering by M.S.Naidu and S.Kamakshiah,TMH Publications
2.Fundamentals of Electrical Engineering by Rajendra Prasad, PHI Publications, 2nd edition
3. Basic Electrical Engineering by Nagsarkar,Sukhija, Oxford Publications, 2nd edition

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I Year - II Semester		L	T	P	C
		0	0	3	1.5
ELECTRONIC WORKSHOP LAB					

I. Identificationofcomponents
II. Laboratoryequipment
III. Solderingpractice
IV. PCBLayout
V. TestingofComponents
VI. CRO

I. Identificationofcomponents:

- Resistors:- Types of Resistors, Value of Resistance using colorcode,DRBS.
- Capacitors:- Types of capacitors, value of capacitance using colorcode,DCBS.
- Inductors:- Types ofInductors,DLB
- Rheostats:- Types of Rheostats, Types ofpotentiometers,Relays.
- Switches:- TypesofSwitches.
- Cables: TypesofCables.
- Types ofInstrumentsused.

Identification of active elements.

(Two Terminal, Three Terminal Devices)

- (SC diode, Zenerdiode,D.AC)
- Three Terminal Devices: BJT, UJT, SCR, FET,MOSFET,TRIAC.
- Digital and Analog ICs. (TO and Flat packages) ICregulatorstypes.
- Testing of above components usingMultimeter.

II. LaboratoryEquipment:

A) Meters:-

- Types of Voltmeters, Types of Ammeters both AnalogandDigital.
- Types of Multi meters (Analog&Digital)
- AVO Meters.
- FETinputVoltmeter.

B) Laboratory Function Generators andAudioOscillators.
C) PowerSupplies.
D) RFgenerators.
E) Different TypesofTransformers. (Power, AF, RF,etc.)

III. ***Solderingpractice***

Tools kit including soldering iron
Tools Kit:

- Insulatednoseplayer
- Insulatedcuttingplayer
- Screw driverkit
- Electricaltester
- Soldering iron,Lead,Flex

IV. ***PCB layoutandDesign.***

Materials required, centimeter graph sheets, marker.

V. ***Testing of Components.***

Active and Passive Components

VI. ***CRO***

Acquaintance with CRO
Measurements on CRO

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I Year - II Semester		L	T	P	C
		0	0	3	1.5
BASIC ELECTRICAL ENGINEERING LAB					

Learning Objectives:

- To plot the magnetizing characteristics ofDC shunt generator and understand the mechanism ofself-excitation.
- To control the speed ofDCmotors.
- To determine and predetermine the performance ofDCmachines.
- To predetermine the efficiency and regulation of transformers and assesstheirperformance.
- To analyse performance of three phaseinductionmotor.
- To understand the significance of regulation of an alternators using synchronousimpedance method.

Any ten of the following experiments are to be conducted

1. Magnetization characteristics of D.C. Shunt generator.
2. Speed control of D.C.shuntmotor.
3. Brake test on DCshuntmotor.
4. Swinburne's test onDCmachine
5. Load test on DCshuntgenerator
6. Load test on DCseriesgenerator.
7. Separation of losses iun DCShuntmotor
8. OC & SC tests onsingle-phasetransformer
9. Sumpner's test on singlephasetransformer
10. Brake test on 3-phase Inductionmotor.
11. Regulation of alternator by synchronousimpedancemethod.

Learning Outcomes:

The student should be able to:

- Determine and predetermine the performance of DC machinesandtransformers.
- Control the DC shunt machines.
- Compute the performance of1-phasetransformer.
- Perform tests on 3-phase induction motor and alternator to determinetheirperformance characteristics.

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(Any 10 of the following listed experiments)

I Year - II Semester		L	T	P	C
		0	0	3	1.5
APPLIED PHYSICS LABORATORY					

List of Applied Physics Experiments

1. Determination of thickness of thin object by wedgemethod.
2. Determination of radius of curvature of a given plano convex lens by Newton'srings.
3. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
4. Determination of dispersive power of theprism.
5. Determination of dielectric constant using charging and dischargingmethod.
6. Study the variation of B versus H by magnetizing the magnetic material (B-Hcurve).
7. Determination of numerical aperture and acceptance angle of an opticalfiber.
8. Determination of wavelength of Laser light using diffractiongrating.
9. Estimation of Planck's constant using photoelectriceffect.
10. Determination of the resistivity of semiconductor by four probemethod.
11. To determine the energy gap of a semiconductor using p-n junctiondiode.
12. Magnetic field along the axis of a current carrying circular coil by Stewart & Gee's Method
13. Determination of Hall voltage and Hall coefficient of a given semiconductor usingHall Effect.
14. Measurement of resistance of a semiconductor with varyingtemperature.
15. Resistivity of a Superconductor using four probe method & Meissnereffect.

References:

S. Balasubramanian, M.N. Srinivasan "A Text Book of Practical Physics"- S Chand Publishers,2017.

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I Year - II Semester		L	T	P	C
		3	0	0	0
ENVIRONMENTAL SCIENCE					

Course Objective:

Engineering drawing being the principal method of communication for engineers, the objective is to introduce the students, the techniques of constructing the various types of polygons, curves and scales. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.

Unit I

Objective: To introduce the students to use drawing instruments and to draw polygons, Engg. Curves.
Polygons: Constructing regular polygons by general methods, inscribing and describing polygons on circles.
Curves: Parabola, Ellipse and Hyperbola by general and special methods, cycloids, involutes, tangents &normals for the curves.
Scales: Plain scales, diagonal scales and vernier scales

Unit II

Objective: To introduce the students to use orthographic projections, projections of points & simple lines. To make the students draw the projections of the lines inclined to both the planes.
Orthographic Projections: Reference plane, importance of reference lines, projections of points in various quadrants, projections of lines, line parallel to both the planes, line parallel to one plane and inclined to other plane.
Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclination and traces.

Unit III

Objective: The objective is to make the students draw the projections of the plane inclined toboth the planes.
Projections of planes: regular planes perpendicular/parallel to one reference plane and inclined to the other reference plane; inclined to both the reference planes.

Unit IV

Objective: The objective is to make the students draw the projections of the various types of solids in different positions inclined to one of the planes.
Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to both the planes.

Unit V

Objective: The objective is to represent the object in 3D view through isometric views. The student will be able to represent and convert the isometric view to orthographic view and vice versa.

Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.
Computer Aided Design, Drawing practice using Auto CAD, Creating 2D&3D drawings of objects using Auto CAD

Note: In the End Examination there will be no question from CAD.

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TEXT BOOKS:
1. Engineering Drawing by N.D. Butt, Chariot Publications
2. Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill Publishers

REFERENCE BOOKS:
1. Engineering Drawing by K.L.Narayana& P. Kannaiah, Scitech Publishers
2. Engineering Graphics for Degree by K.C. John, PHI Publishers
3. Engineering Graphics by PI Varghese, McGrawHill Publishers
4. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age

Course Outcome: The student will learn how to visualize 2D & 3D objects.

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II Year-I Semester		L	T	P	C
		3	1	0	3
ELECTRONIC DEVICES AND CIRCUITS					

CourseObjectives:

Themain objectives ofthis courseare

- To learn and understand the basic concepts of semi conductor physics.
- Study the physical phenomena such as conduction, transport mechanism and electrical characteristics of different diodes.
- To learn and understand the application of diodes as rectifiers with their operation and characteristics with and without filters are discussed.
- Acquire knowledge about the principle of working and operation of Bipolar Junction Transistor and Field Effect Transistor and their characteristics.
- To learn and understand the purpose of transist or biasing and its significance.
- Small signal equivalent circuit analysis of BJT and FET transist or amplifiers and compare different configurations.

UNIT-I: Review of Semiconductor Physics: Hall effect, continuity equation, law of junction,FermiDiracfunction, Fermilevel in intrinsic andextrinsicSemiconductors

Junction Diode Characteristics : energy band diagram of PN junction Diode, Open circuited p-n junction, Biased p-n junction, p-n junction diode, current components in PN junction Diode,diodeequation,V-ICharacteristics,temperaturedependenceonV-Icharacteristics,Diioderesistance,Diodecapacitance.

UNIT-II:
SpecialSemiconductorDevices:ZenerDiode,Breakdownmechanisms,Zenerdiodeapplications, LED,VaractorDiode,Photodiode,TunnelDiode,UJT,PN-PNDiode,SCR.Construction,operation and V-Icharacteristics.
Rectifiers and Filters: Basic Rectifier setup**,** half wave rectifier, full wave rectifier, bridgerectifier, derivations of characteristics of rectifiers, rectifier circuits-operation, input and outputwaveforms, Filters, Inductor filter(Series inductor), Capacitor filter(Stunt inductor), π- Filter,comparisonof various filtercircuits in terms ofripple factors.

UNIT-III: Transistor Characteristics:
BJT: Junctiontransistor,transistorcurrentcomponents,transistorequation,transistorconfigurations, transistor as an amplifier, characteristics of transistor in Common Base, CommonEmitter and Common Collector configurations, Ebers-Moll model of a transistor, punch through/reachthrough, Photo transistor,typical transistor junction voltagevalues.
FET: FET types, construction, operation, characteristicsμ, g_m, $r_d$parameters, MOSFET-types, construction, operation, characteristics, comparisonbetween JFETand MOSFET.

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UNIT- IV: Transistor Biasing and Thermal Stabilization : Need for biasing, operating point,load line analysis, BJT biasing- methods, basic stability, fixed bias, collector to base bias,

selfbias,StabilizationagainstvariationsinV_{BE},Ic,andβ,Stabilityfactors,(S,S$'$,S$''$),Biascompensation,Thermalrunaway, Thermal stability.

FETBiasing-methodsandstabilization.

UNIT-V: Small Signal Low Frequency Transistor Amplifier Models:
BJT: Two port network, Transistor hybrid model, determination of h-parameters, conversion ofh-parameters, generalized analysis of transistor amplifier model using h-parameters, Analysis ofCB, CE and CC amplifiers using exact and approximate analysis, Comparison of transistoramplifiers.
FET: Generalized analysis of small signal model, Analysis of CG, CS and CD amplifiers,comparisonofFETamplifiers.

TextBooks:

1. Electronic Devices and Circuits-J.Millman, C.Halkias, TataMc-GrawHill, Second Edition, 2007
2. Electronic Devices and Circuits-K. Lal Kishore, BS Publications, Fourth Edition, 2016.
3. Electronics devices & circuit theory-Robert L.Boylestad and Loui Nashelsky, Pearson / Prenticehall, tenthedition, 2009

References:

1. Integrated Electronics-J. Millman, C. Halkias,Tata Mc-Graw Hill, Second Edition,2009
2. 2.Electronic Devices and Integrated Circuits – B.P. Singh, Rekha , Pearson publications
3. 3.ElectronicDevicesandCircuits-Salivahanan,Kumar,Vallavaraj,TataMc-GrawHill, 4th Edition,2008.

CourseOutcomes:
Atthe endofthiscourse thestudent willbe ableto

- Applythebasicconceptsofsemiconductorphysics.
- Understandthe formationofp-njunctionandhowitcanbeusedasap-njunctionas diodeindifferentmodes ofoperation.
- Knowtheconstruction,workingprincipleofrectifierswithandwithoutfilterswithrelevant expressions andnecessarycomparisons.
- Understandtheconstruction,principleofoperationoftransistors,BJTandFETwiththeirV-Icharacteristicsindifferentconfigurations.
- Know the need of transistor biasing, various biasing techniques for BJT and FETandstabilization concepts with necessaryexpressions.
- Performtheanalysisofsmallsignallowfrequencytransistoramplifiercircuitsusing BJT and FET indifferentconfigurations

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II Year - I Semester		L	T	P	C
		3	1	0	3
SWITCHING THEORYAND LOGIC DESIGN					

Course Objectives:

- To solve a typical number base conversion and analyze new error codingtechniques.
- Theorems and functions of Boolean algebra and behavior of logicgates.
- To optimize logic gates for digital circuits using varioustechniques.
- Boolean function simplification using Karnaugh maps and Quine-McCluskeymethods.
- To understand concepts of combinationalcircuits.
- To develop advanced sequentialcircuits.

UNIT – I

REVIEW OF NUMBER SYSTEMS & CODES:

Representation of numbers of different radix, conversation from one radix to another radix, r-1's compliments and r's compliments of signed members.Gray code ,4 bit codes; BCD, Excess-3, 2421, 84-2-1 code etc. Error detection & correction codes: parity checking, even parity, odd parity, Hamming code.

BOOLEAN THEOREMS AND LOGIC OPERATIONS:

Boolean theorems, principle of complementation & duality, De-morgan theorems.Logic operations ; Basic logic operations -NOT, OR, AND, Universal Logic operations, EX-OR, EX- NOR operations.Standard SOP and POS Forms, NAND-NAND and NOR-NOR realizations, Realization of three level logic circuits. Study the pin diagram and obtain truth table for the following relevant ICs 7400,7402,7404,7408,7432,7486.

UNIT – II

MINIMIZATION TECHNIQUES:

Minimization and realization of switching functions usingBoolean theorems, K-Map (up to 6 variables)and tabular method(Quine-mccluskey method) with only four variables and single function.

COMBINATIONAL LOGIC CIRCUITS DESIGN:

Design of Half adder, full adder, half subtractor, full subtractor, applications of full adders; 4-bit adder-subtractor circuit, BCD adder circuit, Excess 3 adder circuit and carry look-a-head adder circuit, Design code converts using Karnaugh method and draw the complete circuit diagrams.

UNIT – III

COMBINATIONAL LOGIC CIRCUITS DESIGN USING MSI &LSI :

Design of encoder ,decoder, multiplexer and de-multiplexers, Implementation of higher order circuits using lower order circuits . Realization of Boolean functions using decoders and multiplexers.Design of Priority encoder, 4-bit digital comparator and seven segment decoder. . Study the relevant ICs pin diagrams and their functions 7442,7447,7485,74154.

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INTRODUCTION OF PLD's :

PLDs:PROM, PAL, PLA -Basics structures, realization of Boolean functions, Programming table.

UNIT – IV

SEQUENTIAL CIRCUITS I:

Classification of sequential circuits (synchronous and asynchronous) , operation of NAND & NOR Latches and flip-flops; truth tables and excitation tables of RS flip-flop, JK flip-flop, T flip-flop, D flip-flop with reset and clear terminals. Conversion from one flip-flop toanother flip- flop. Design of 5ripple counters, design of synchronous counters, Johnson counter, ring counter. Design of registers - Buffer register, control buffer register, shift register, bi-directional shift register, universal shift, register.

Study the following relevant ICs and their relevant functions 7474,7475,7476,7490,7493,74121.

UNIT – V

SEQUENTIAL CIRCUITS II :

Finite state machine; state diagrams, state tables, reduction of state tables.Analysis of clocked sequential circuits Mealy to Moore conversion and vice-versa.Realization of sequence generator,Design of Clocked Sequential Circuit to detect the given sequence (with overlapping orwithoutoverlapping).

TEXT BOOKS:

1. Switching and finite automata theory Zvi.KOHAVI,Niraj.K.Jha 3rdEdition,Cambridge UniversityPress,2009
2. Digital Design by M.MorrisMano,Michael D Ciletti,4th editionPHIpublication,2008
3. Switching theory and logic design by Hill and Peterson**,**Mc-Graw Hill TMH edition, 2012.

REFERENCES:

1. Fundamentalsof Logic Design by Charles H. Roth Jr,JaicoPublishers,2006
2. Digital electronics by R S Sedha.S.Chand &companylimited,2010
3. Switching Theory and Logic Design by A. AnandKumar,PHI Learningpvtltd,2016.
4. Digital logic applications and design by John M Yarbough, Cengagelearning,2006.
5. TTL 74-Seriesdatabook.

Course Outcomes:

- Classify different number systems and apply to generatevariouscodes.
- Use the concept of Boolean algebra in minimization ofswitchingfunctions
- Design different types of combinationallogiccircuits.
- Apply knowledge of flip-flops in designing of Registersandcounters
- The operation and design methodology for synchronous sequential circuitsand algorithmic statemachines.
- Produce innovative designs by modifying the traditionaldesign techniques.

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II Year-I Semester		L	T	P	C
		3	1	0	3
SIGNALS AND SYSTEMS					

CourseObjectives:

Themain objectives of thiscoursearegiven below:

- Tostudyabout signalsand systems.
- ToanalyzethespectralcharacteristicsofsignalusingFourierseriesandFouriertransforms.
- Tounderstandthecharacteristicsofsystems.
- Tointroducetheconceptofsampling process
- Toknowvarious transformtechniquestoanalyzethesignals andsystems.

UNIT- I: INTRODUCTION: Definition of Signals and Systems, Classification of Signals, Classification of Systems, Operations on signals: time-shifting, time-scaling, amplitude-shifting, amplitude-scaling. Problems on classification and characteristics of Signals and Systems. Complex exponential and sinusoidal signals, Singularity functions and related functions: impulse function, step function signum function and ramp function. Analogy between vectors and signals, orthogonal signal space, Signal approximation using orthogonalfunctions, Mean square error, closed or complete set of orthogonal functions, Orthogonality incomplex functions. Related problems.

UNIT–II: FOURIER SERIES AND FOURIER TRANSFORM:

Fourier series representation of continuous time periodic signals, properties of Fourier series, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Relationbetween Trigonometric and Exponential Fourier series, Complex Fourier spectrum. Deriving Fourier transform from Fourier series, Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms, Fourier transforms involving impulse function and Signum function. Introduction to Hilbert Transform, Related problems.

UNIT-III: ANALYSIS OF LINEAR SYSTEMS: Introduction**,** Linear system, impulseresponse, Response of a linear system, Linear time invariant (LTI) system, Linear time variant (LTV)system, Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Transfer function of a LTIsystem, Related problems. Filter characteristics of linear systems. Distortion less transmission through asystem, Signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Poly-Wiener criterion for physical realization, relationship between bandwidthand risetime.

UNIT–IV:
CORRELATION: Auto-correlation and cross-correlation of functions, properties of correlation function, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation between Convolution and correlation, Detection of periodic signals in the presence of noise by correlation, Extraction ofsignal from noise by filtering.
SAMPLINGTHEOREM: Graphical and analytical proof for Band Limited Signals, impulse sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, effect of under sampling –Aliasing, Introduction to Band Pass sampling, Relatedproblems.

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UNIT–V:

LAPLACE TRANSFORMS: Introduction**,** Concept of region of convergence (ROC) forLaplace transforms, constraints on ROC for various classes of signals, Properties of L.T's,Inverse Laplace transform, Relation betweenL.T's, and F.T. of a signal. Laplace transformofcertain signals usingwaveform synthesis.

Z–TRANSFORMS: Concept of Z-Transform of a discrete sequence. Region of convergence in Z-Transform, constraints on ROC for various classes of signals, Inverse Z-transform, properties of Z-transforms. Distinction between Laplace, Fourierand Z transforms.

TEXTBOOKS:

1. Signals, Systems&Communications-B.P.Lathi, BS Publications, 2003.
2. Signals and Systems-A.V. Oppenheim, A.S. Willsky and S.H. Nawab,PHI, 2ndEdn, 1997
3. Signals & Systems-Simon Haykinand Van Veen, Wiley, 2ndEdition, 2007

REFERENCEBOOKS:

1. PrinciplesofLinearSystemsandSignals–BPLathi,OxfordUniversityPress,2015
2. SignalsandSystems–TK Rawat,Oxford University press,2011

CourseOutcomes: At the end of this course the student will able to:

- Differentiate the various classifications of signals and systems
- Analyze the frequency domain representation of signals using Fourier concepts
- Classify the systems based on their properties and determine the response ofLTISystems.
- Know the sampling process and various types of sampling techniques.
- Apply Laplace and z-transforms to analyze signals and Systems (continuous&discrete).

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II Year-I Semester		L	T	P	C
		3	1	0	3

RANDOM VARIABLES AND STOCHASTIC PROCESSES

Course Objectives:

- To give students an introduction to elementary probability theory, in preparation to learn the concepts of statistical analysis, random variables and stochastic processes.
- To mathematically model therand omphenomena with the help of probability theory Concepts.
- To introduce the important concepts of random variables and stochastic processes.
- To analyze the LTI systems with stationary random process as input.

UNIT I

THE RANDOM VARIABLE: Introduction, Review of Probability Theory, Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete, Continuous andMixed Random Variables, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Conditional Distribution, Conditional Density, Properties.

UNIT II

OPERATIONONONERANDOMVARIABLE-EXPECTATIONS: Introduction,

Expected Value of a Random Variable, Function of a Random Variable, Moments about theOrigin, Central Moments, Variance and Skew, Chebychev's Inequality, Characteristic Function,MomentGeneratingFunction,TransformationsofaRandomVariable:MonotonicTransformationsforaContinuousRandomVariable,Non-monotonicTransformationsofContinuousRandom Variable.

UNIT III

MULTIPLERANDOMVARIABLES: Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem: Unequal Distribution,Equal Distributions.

OPERATIONS ON MULTIPLE RANDOM VARIABLES: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: TwoRandom Variables case, N Random Variables case, Properties, Transformations of Multiple RandomVariables, Linear Transformations of Gaussian Random Variables.

UNITIV

RANDOM PROCESSES –TEMPORAL CHARACTERISTICS: The Random Process Concept, Classification of Processes, Deterministic and Non deterministic Processes, Distribution and Density Functions, Concept of Stationarity and Statistical Independence. First-Order

Stationary Processes, Second-orderand Wide-Sense Stationarity, Nth-orderandStrict- Sense Stationarity, Time Averages and Ergodicity, Autocorrelation Function and its Properties, Cross-Correlation Function and its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process.

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UNITV

RANDOM PROCESSES -SPECTRAL CHARACTERISTICS: The Power Density Spectrum: Properties, Relationship between Power Density Spectrum and Auto correlation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Density Spectrum and Cross-Correlation Function.

LINEAR SYSTEMS WITH RANDOM INPUTS: Random Signal Response of Linear Systems: System Response – Convolution, Mean and Mean-squared Value of System Response, Auto correlation Function of Response, Cross-Correlation Functions of Input and Output, Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectra of Input and Output, Bandpass, Band-Limited and Narrow band Processes, Properties.

TEXTBOOKS:

1. Probability, Random Variables & Random SignalPrinciples, Peyton Z.Peebles, TMH, 4^{th}Edition, 2001.
2. Probability, Random Variables and Stochastic Processes, Athanasios Papoulis and S.Unnikrisha, PHI,4^{th} Edition, 2002.
3. Probability and Random Processes with Applications to Signal Processing, Henry Starkand John W.Woods, Pearson Education, 3^{rd}Edition, 2001.

REFERANCE BOOKS:

1. Schaum's Outline of Probability, Random Variables, and Random Processes, 1997.
2. An Introduction to Random Signals and Communication Theory, B.P.Lathi, International Textbook, 1968.
3. Probability Theory and Random Processes, P. Ramesh Babu, McGrawHill,2015.

CourseOutcomes:

After completion of the course, the student will be able to

- Mathematically modelther and omphenomena and solve simple probabilistic problems.
- Identify different types of random variables and compute statistical averages of the serandom variables.
- Characterize the random processes in the time and frequency domains.
- Analyze the LTI systems with random inputs.

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II Year – I Semester		L	T	P	C
		3	1	0	3
MATHEMATICS-III					

CourseObjectives:

- Tofamiliarizethetechniques inpartialdifferential equations
- Tofurnishthelearnerswithbasicconceptsandtechniquesat plustwoleveltoleadthemintoadvanced level byhandling various realworldapplications.

CourseOutcomes: Attheend of the course, the student will be able to

- Interpret the physical meaning of different operators such as gradient, curland divergence (L5)
- Estimate the work done against a field, circulation and fluxusing vector calculus (L5)
- Apply the Laplace transform for solving differential equations (L3)
- Find or compute the Fourier series of periodic signals (L3)
- Knowandbeable to apply integral expressions for the forwards and inverse Fourier transform to arrange of non-periodic wave forms (L3)
- Identify solution methods for partial differential equations that model physical processes (L3)

Unit–I: Vector calculus: (10hrs)

Vector Differentiation: Gradient –Directional derivative–Divergence–Curl–Scalar Potential. Vector Integration: Line integral–Workdone–Area–Surfaceandvolumeintegrals–Vector integral theorems: Greens, Stokes and Gauss Divergencetheorems (without proof).

Unit–II: Laplace Transforms: (10hrs)

Laplace transforms of standard functions – Shifting theorems – Transforms of derivatives and integrals – Unit step function – Dirac's delta function – Inverse Laplace transforms– Convolution theorem (with out proof).

Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.

Unit–III: Fourier series and Fourier Transforms: (10hrs)

Fourier Series: Introduction – Periodic functions – Fourier series of periodic function –Dirichlet's conditions – Even and odd functions – Change of interval – Half-range sineandcosine series.

FourierTransforms: Fourier integral theorem (without proof) –Fourier sine and cosine integrals –Sine and cosine transforms –Properties–inversetrans forms –Finite Fourier transforms.



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Unit–IV: PDE of first order: **(8hrs)**

Formation of partial differential equations byelimination of arbitrary constants and arbitrary functions – Solutions of first order linear (Lag range) equation and nonlinear (standardtypes) equations.

UNITV:SecondorderPDEand Applications: **(10hrs)**

Second order PDE: Solutions of line arpartial differential equations with constantco efficient –RHS term of the typee^{axby}, sin(ax □by), cos(ax □by), x^m y^n.

Applications of PDE: Method of separation of Variables–Solution of One dimensional Wave, Heat and two-dimensional Laplace equation.

TextBooks:

1. B.S.Grewal, **Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.**
2. **B.V.Ramana,** Higher Engineering Mathematics, 2007 Edition, Tata Mc.Graw Hill Education.

ReferenceBooks:

1. **ErwinKreyszig,** Advanced Engineering Mathematics, 10thEdition, Wiley-India.
2. **Dean. G. Duffy,** Advanced Engineering Mathematics with MATLAB, 3rdEdition, CRC Press.
3. **Peter O'Neil,** Advanced Engineering Mathematics, Cengage.
4. **Srimantha Pal, SCBhunia,** Engineering Mathematics, Oxford University Press.

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II Year - I Semester		L	T	P	C
		0	0	3	1.5
OOPS THROUGH JAVA LAB					

Course Outcomes: At the end of the course, students will be able to

		Knowledge Level (K)#
CO1	Identify classes, objects, members of a class and the relationship amongthemneeded for aspecificproblem	K3
CO2	Implementprogramstodistinguishdifferentformsofinheritance	K4
CO3	Createpackagesandtoreusethem	K3
CO4	DevelopprogramsusingExceptionHandlingmechanism	K3
CO5	Developmultithreaded applicationusingsynchronizationconcept.	K6
CO6	DesignGUIbased applicationsusingSwings andAWT.	K6

Listofprogramstobeexecuted:

1. The Fibonacci sequence is defined by the following rule. The first 2 values in the sequence are 1, 1.Every subsequent value is the sum of the 2 values preceding it. Write a Java Program that uses bothrecursive and non-recursivefunctionsto print thenthvalueof theFibonacci sequence.
2. Write a Java Program that prompts the user for an integer and then prints out all the prime numbers uptothat integer.
3. Writeajavaprogramtoimplement callbyvalue andcall byreferencemechanisms.
4. WriteaJavaProgram thatchecks whether agivenstringis apalindromeornot.
5. WriteaJavaProgramtocheckthecompatibilityformultiplication,ifcompatiblemultiplytwomatricesand find its transpose.
6. WriteaJavaprogram toimplementconstructor overloadingandmethodoverloading.
7. WriteaJavaProgram thatillustrates howruntimepolymorphismis achieved.
8. WriteaJavaProgramthat illustratestheuseof superkeyword.
9. WriteaJavaProgramtocreateanddemonstrate packages.
10. Write a Java Program, using String Tokenizer class, which reads a line of integers and then displayseachinteger and the sumof all integers.
11. Write a Java Program that reads on file name form the user then displays information about whetherthe file exists, whether the file is readable/ writable, the type of file and the length of the file in bytesanddisplay thecontent of theusing FileInputStream class.
12. WriteaJavaProgramthatdisplays thenumber of characters,linesand wordsinatext/textfile.
13. Write a Java Program to implement a Queue, using user defined Exception Handling (also make use ofthrow, throws).



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14. Write a Java Program that creates 3 threads by extending Thread class. First thread displays “Good Morning” every 1 sec, the second thread displays “Hello” every 2 seconds and the third displays“Welcome”every 3 seconds. (Repeat thesamebyimplementing Runnable).
15. WriteaJavaProgram demonstratingthe lifecycleofathread.
16. Writean Appletthat displaysthe contentofa file.
17. Write a Java Program that works as a simple calculator. Use a gridlay out to arrange buttons for the digits and for the +-*?% operations. Add atext field to display the result
18. Writea Java Program for handling mouse events, keyboard events.
19. Write a Java Program that allows user to draw lines, rectangles and ovals.
20. Write a Java Program that lets users create Piecharts. Design your own user interface (with Swings & AWT).

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		0	0	3	1.5
ELECTRONIC DEVICES AND CIRCUITS LAB					

Note: The students are required to perform the experiment to obtain the V-I characteristics and to determine the relevant parameters from the obtained graphs.

List of Experiments: (Minimum of Ten Experiments has to be performed)

1. P-N Junction Diode Characteristics
   Part A: Germanium Diode (Forward bias& Reverse bias)
   Part B: Silicon Diode (Forward Bias only)
2. Zener Diode Characteristics
3. Part A: V-I Characteristics
   Part B: Zener Diode as Voltage Regulator
4. Rectifiers (without and with c-filter)
   Part A: Half-wave Rectifier
   Part B: Full-wave Rectifier
5. BJT Characteristics (CE Configuration)
   PartA: Input Characteristics
   Part B: Output Characteristics
6. FET Characteristics (CS Configuration)
   Part A: Drain Characteristics
   Part B: Transfer Characteristics
7. SCR Characteristics
8. UJT Characteristics
9. Transistor Biasing
10. CRO Operation and its Measurements
11. BJT-CE Amplifier
12. Emitter Follower-CC Amplifier
13. FET-CS Amplifier

Equipmentrequired:

1. Regulated Power supplies
2. Analog/Digital Storage Oscillo scopes
3. Analog/Digital Function Generators
4. Digital Multi-meters
5. Decade Résistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analogor Digital)
8. Voltmeters (Analogor Digital)
9. Active & Passive Electronic Components

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II Year - I Semester		L	T	P	C
		0	0	3	1.5
SWITCHING THEORY AND LOGIC DESIGN LAB					

List of Experiments: (Minimum of Twelve Experiments has to be performed)

1. Verification of truth tables of Logic gates
   Two input (i) OR (ii) AND (iii) NOR (iv) NAND (v) Exclusive OR
   (vi) Exclusive NOR
2. Design a simple combinational circuit with four variables and obtain minimal SOP expression and verify the truth table using Digital Trainer Kit
3. Verification of functional table of 3 to 8 line Decoder/De-multiplexer
4. 4 variable logic function verification using 8 to1 multiplexer.
5. Design full adder circuit and verify its functional table.
6. Verification of functional tables of
   (i) JK Edge triggered Flip–Flop (ii) JK Master Slav Flip–Flop (iii) DFlip-Flop
7. Design a four bit ring counter using D Flip–Flops/JK Flip Flop and verify output
8. Design a four bit Johnson's counter using D Flip-Flops/JK Flip Flops and verify output
9. Verify the operation of 4-bit Universal Shift Register for different Modes of operation.
10. Draw the circuit diagram of MOD-8 ripple counter and construct a circuit using T- Flip-Flops and Test it with a low frequency clock and Sketch the output wave forms.
11. Design MOD–8 synchronous counter using T Flip- Flop and verify the result and Sketch the output wave forms.
12. (a) Draw the circuit diagram of a single bit comparator and test the output
    (b) Construct 7 Segment Display Circuit Using Decoder and 7 Segment LED and test it.

ADDon Experiments:

1. Design BCD Adder Circuit and Test the Same using Relevant IC
2. Design Excess-3 to 9-Complement convertor using only four Full Adders and test the Circuit.
3. Design an Experimental model to demonstrate the operation of 74154 De-Multiplexer using LEDs for outputs.

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II Year - I Semester		L	T	P	C
		0	0	4	2
PYTHON LAB (SKILL ORIENTED COURSE)					

COURSE OUTCOMES:
At the end of the course the student shall be able to
CO1: Know comprehensions, generators in python.CO2: Know exception handling inpython
CO3: Know file I/O
CO4: Understand various data types like lists, tuples, strings etc
CO5: Know the usage of various pre-defined functions on the above data types

PROGRAMMES:

1. a. Write a program to get the list of even numbers upto a given number.

b. Write a program to get the ASCII distance between two characters.

c. Write a program to get the binary form of a given number.

d. Write a program to convert base 36 to octal.

2. a. Write a program to get the number of vowels in the input string (No control flow allowed)

b. Write a program to check whether a given number has even number of 1's in its binary representation (No control flow, thenumbercanbein any base)
c. Write a program to sort given list of strings in the order of their vowel counts.

3. a. Write a program to return the top 'n' most frequently occurring chars and their respective counts. E.g. aaaaaabbbbcccc, 2 should return [(a5) (b 4)]
b. Write a program to convert a given number into a given base.

Note: Convert the given number into a string in the given base. Valid baseis 2<=base <=36 Raise exceptions similar to how int ("XX", YY) does (play in the console to find what errors it raises). Handle negative numbers just like binand oct do.
4. a. Write a program to convert a given iterable into a list. (Using iterator)

b. Write a program to implement user defined map() function.

Note: This function implements a map. It goes through the iterable and applies funcon each of the elements and returns a list of results.
Don't use a for loop or the built-in map function. Use exceptions, while loop and iter.

c. Write a program to generate an infinite number of even numbers (Use generator)

d. Write a program to get a list of even numbers from a given list of numbers. (use only comprehensions)

5. Write a program to implement round robin. Note: This routine to take a variable number of sequences and return elements from them in round robin till each sequence is exhausted. I fone of the input sequences is infinite, this is also infinite.

e.g if input is [1,2,3], (4,5) -> yield 1,4,2,5,3 one after the other. Use exception control

and comprehensions to write elegant code.

Hint: This requires you to use understand variable arguments, lists, listcopy, comprehensions, iterators, generators, exception handling, control flow etc.

6. a. Write a program to sort words in a file and put them in another file. The output file

shouldhave only lower case words, so any upper case words from source must be lowered.

(Handle exceptions)

b. Write a program return a list in which the duplicates are removed and the items are sorted

from a given input list of strings.

7. a. Write a programto test whether given strings are anagrams are not.

b. Write a program to implement left binary search.

Note: Left binary search returns the left mostel ement when a search key repeats.

Fore.gif inputis [1,2,3,3,4,4,5] and I search 3, it should return 2 as index 2 is the left most

occurrence of 3.

8. a. writea class Person with attributes name, age, weight (kgs), height (ft) and takes

them through the constructor and exposes a method get_bmi_result() which returns

one of "underweight", "healthy", "obese"

b. Write a program to convert the passed in positive integer number into its prime

factorization form.

Note: If number = a1 ^ p1 * a2 ^ p2 ... where a1, a2 are primes and p1, p2 are powers >=1

then were present that using lists and tuples in pythonas [(a1,p1),(a2,p2), ...]

e.g.[(2,1),(5,1)] is the correct prime factorization of 10

Text book:

1. Mark Lutz & David Ascher, "Learning Python", Oreilly Publications, 5th edition

Web reference:

1. docs.python.com

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II Year - II Semester		L	T	P	C
		3	1	0	3
ELECTRONIC CIRCUIT ANALYSIS					

Course Objectives:

The main objectives of this course are:

- To learn hybrid-piparameters a thigh frequency and compare with low frequency parameters.
- Learn and understand the purpose of cascading of single stage amplifiers and derive the overall voltage gain.
- Analyze the effect of negative feedback on amplifier characteristics and derive the characteristics.
- Learn and understand the basic principle of oscillator circuits and perform the analysis of different oscillator circuits.
- Compare and analyze different Power amplifiers like Class A, Class B, Class C, Class AB and other types of amplifiers.
- Analyze different types of tuned amplifier circuits.

UNIT-I Small Signal High Frequency Transistor Amplifier models:
BJT: Transistor at high frequencies, Hybrid- π common emitter transistor model, Hybrid πconductance, Hybrid π capacitances, validity of hybrid π model,determination of high-frequency parameters in terms of low-frequency parameters , CE short circuit current gain,current gain with resistive load, cut-off frequencies, frequency response and gain bandwidthproduct.
FET: Analysis of common Source and common drain Amplifier circuits at high frequencies.

UNIT-II
Multistage Amplifiers: Classification of amplifiers, methods of coupling**, c**ascaded transistor amplifier and its analysis, analysis of two stage RC coupled amplifier, high inputresistance transistor amplifier circuits and their analysis-Darlington pair amplifier, Cascode amplifier, Boot-strap emitter follower, Differential amplifier using BJT.

UNIT-III
Feedback Amplifiers: Feedback principle and concept, types of feedback, classification of amplifiers, feedback topologies, Characteristics of negative feedback amplifiers, Generalized analysis of feedback amplifiers, Performance comparison of feedback amplifiers, Method of analysis of feedback amplifiers.

Unit-IV
Oscillators: Oscillator principle, condition for oscillations, types of oscillators, RC-phaseshiftandWienbridgeoscillatorswithBJTandFETandtheiranalysis,Generalized analysis of LC Oscillators, Hartley and Colpitt's oscillators using BJT, Frequency and amplitude stability of oscillators.

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UNIT-V

Power Amplifiers: Classification of amplifiers(A to H), Class A power Amplifiers,Class B Push-pull amplifiers, Complementary symmetry push pull amplifier, Class ABpoweramplifier,Class-Cpoweramplifier, Thermal stabilityandHeat sinks.

Tuned Amplifiers: Introduction, Q-Factor, small signal tuned amplifier, capacitancesingletuned amplifier, doubletuned amplifiers, , staggeredtunedamplifiers

TextBooks:

1. Integrated Electronics- J.Millman and C.C.Halkias, Tata McGraw-Hill, 1972.
2. Electronic Devices and CircuitsTheory –Robert L.Boylestad and Louis Nashelsky, Pearson/PrenticeHall, TenthEdition, 2009.
3. Electronic Devices and Integrated Circuits – B.P. Singh, Rekha, Pearson publications, 2006

References:

1. Electronic Circuit Analysis and Design –Donald A.Neaman, McGrawHill, 2010.
2. Micro electronic Circuits-Sedra A.S. and K.C. Smith, Oxford University Press, Sixth Edition, 2011.
3. Electronic Circuit Analysis-B.V.Rao, K.R.Rajeswari, P.C.R.Pantulu, K.B.R.Murthy, PearsonPublications.

Course Outcomes:

At the end of this course the student can able to

- Design and analysis of small signal high frequency transistor amplifier using BJT and FET.
- Design and analysis of multistage amplifiers using BJT and FET and Differential amplifier using BJT.
- Derive the expressions for frequency of oscillation and condition for oscillation of RC and LC oscillators and their amplitude and frequency stability concept.
- Know the classification of the power and tuned amplifiers and their analysis with performance comparison

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II Year – II Semester		L	T	P	C
		3	1	0	3
DIGITAL IC DESIGN					

OBJECTIVES

The main objectives of this course are:

• Introduction of digital logic families and inter facing concepts for digital design is considered.

• VHDL fundamentals were discussed to modeling the digital system design blocks.

• Design and implementation of combinational and sequential digital logic circuits is explained.

Outcomes:

At the end of this course the student can able to:

• Understand the structure of commercially available digital integrated circuit families.

• Learn the IEEE Standard 1076 Hardware Description Language (VHDL).

• Model complex digital systems at several levels of abstractions, behavioral, structural, and rapid system prototyping.

• Analyze and design basic digital circuits with combinatorial and sequential logic circuits using VHDL.

UNIT-I

Hardware Description Languages.

VHDL: Introduction to VHDL, entity declaration, architecture, data-flow, behavioral and structural style ofmodelings,datatypes,dataobjects,configurationdeclaration,package,generic,operatorsandidentifiers,PROCESS,IF, CASE & LOOPstatements, VHDL libraries.

Verilog HDL: Introduction to Verilog HDL, data types, data operators,module statement, wire statement, if-elsestatement, case-endcasestatement,Verilog syntax and semantics(qualitative approach)

UNIT-II

Combinational Logic Design: Parallel binary adder, carry look ahead adder, BCD adder, Multiplexers anddemultiplexers and their use in combinational logic design, ALU, digital comparators, parity generators, codeconverters, priority encoders. (Qualitative approach of designing and modeling the mentioned combinationallogiccircuits with relevant digital ICs using HDL)

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UNIT-III

Sequential Logic Design: Registers, applications of shift registers, ripple or a synchronous counters, synchronous counters, synchronous and a synchronous sequential circuits, hazards in sequential circuits. (Qualitative approach of designing and modeling the mentioned sequential logic circuits with relevant digital ICs using HDL)

UNIT-IV

Combinational MOS Logic Circuits: Introduction, MOS logic circuits with depletion nMOS loads: two-inputNOR gate, generalized NOR structure with multiple inputs, transient analysis of NOR gate, two-input NANDgate, generalized NAND structure with multiple inputs, transient analysis of NAND gate, CMOS logic circuits:CMOS NOR2 gate, CMOS NAND2 gate,complex logic circuits, complex CMOS logic gates, AOI and OAIgates, Pseudo-nMOS gates, CMOS full-adder circuit,CMOS transmission gates (Pass Gates), complementarypass-transistorlogic.

UNIT-V

Sequential MOS Logic Circuits: Introduction, behavior bistable elements, SR latch circuit, clocked latch andflip-flop circuits: clocked SR latch, clocked JK latch, master-slave flip-flop, CMOS D-latch and Edge-triggeredflip-flop,Schmitt trigger circuit, basic principlesof pass transistor circuits.

TEXTBOOKS

1. Modern Digital Electronics–R.P.Jain-Fourth Edition–Tata McGraw Hill Education Private Limited, 2010.
2. CMOS Digital Integrated Circuits-Analysis and Design–Sung-MoKang & Yusuf Leblebici-Tata McGraw Hill Publishing Company Limited, 2006.
3. VHDL/VerilogPrimer - J.Bhasker, Pearson Education/PHI, 3rd Edition.

REFERENCES

1. Digital Design Principles & Practices-John F.Wakerly, PHI/Pearson Education Asia, 3rd Edition, 2005.
2. Fundamentals of Digital Logic with VHDL Design - Stephen Brown, Zvonko Vranesic, McGraw Hill, 3rd Edition.

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II Year-II Semester		L	T	P	C
		3	0	0	3
ANALOG COMMUNICATIONS					

Course Objectives:

Students undergoing this course are expected to

- Familiarize with the fundamentals of analog communication systems.
- Familiarize with various techniques for analog modulation and demodulation of signals.
- Distinguish the figure of merits of various analog modulation methods.
- Develop the ability to classify and understand various functional blocks of radio transmitters and receivers.
- Familiarize with basic techniques for generating and demodulating various pulse modulated signals.

UNIT I

AMPLITUDE MODULATION : Introduction to communication system, Need for modulation,Frequency Division Multiplexing , Amplitude Modulation, Definition, Time domain and frequencydomain description, single tone modulation, power relations in AM waves, Generation of AMwaves, square law Modulator, Switching modulator, Detection of AM Waves; Square law detector,Envelopedetector.

UNIT II

DSB & SSB MODULATION: Double side band suppressed carrier modulators, time domain and frequency domain description, Generation of DSBSC Waves, Balanced Modulators, Ring Modulator, Coherent detection of DSB-SC Modulated waves, COSTAS Loop. Frequency domaindescription, Frequency discrimination method for generation of AM SSB Modulated Wave, Time domain description, Phase discrimination method for generating AMSSB Modulated waves. Demodulation of SSB Waves, Vestigial side band modulation: Frequency description, Generation of VSB Modulated wave, Time domain description, Envelope detection of a VSB Wave pulse Carrier, Comparison of AM Techniques, Applications of different AM Systems, FDM.

UNIT III

ANGLE MODULATION: Basicconcepts, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrowband FM, Wideband FM,Constant Average Power, Transmission bandwidth of FM Wave- Generation of FM Waves, Detection of FM Waves: Balanced Frequency discriminator, Zero crossing detector, Phase lockedloop. Comparison of FM & AM.

UNIT IV

TRANSMITTERS & RECEIVERS: Radio Transmitter - Classification of Transmitter, AM Transmitter, Effect of feedback on performance of AM Transmitter, FM Transmitter –Variable reactance type and phase modulated FM Transmitter, frequency stability in FM Transmitter. **Radio Receiver** - Receiver Types - Tuned radio frequency receiver, Super heterodyne receiver, RF section and Characteristics - Frequency changingand tracking, Intermediate frequency, AGC, FM Receiver, Comparison with AM Receiver, Amplitude limiting. Communication Receivers, extensions of super heterodyne principle and additional circuits.



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UNITV

NOISE: Review of noise and noise sources, noise figure**,** Noise in Analog communication Systems, Noise in DSB & SSB System, Noise in AM System, Noise in Angle Modulation Systems, Threshold effect in Angle Modulation System, Pre-emphasis & de-emphasis **PULSE MODULATION:** Types of Pulse modulation, PAM (Single polarity, double polarity) PWM: Generation & demodulation of PWM, PPM, Generation and demodulation of PPM, Time Division Multiplexing, TDM Vs FDM

TEXTBOOKS:

1. Principles of Communication Systems–HTaub&D.Schilling, GautamSahe, TMH, 3rd Edition, 2007.
2. Principles of Communication Systems-Simon Haykin, John Wiley, 2nd Edition, 2007.
3. Modern Digital and Analog Communication Systems –B.P.Lathi, Zhi Ding, Hari Mohan Gupta, Oxford University Press, 4th Edition, 2017

REFERENCES:

1. Electronics & Communication System– George Kennedyand Bernard Davis, TMH 2004.
2. Communication Systems–R.P.Singh, SP Sapre, Second Edition TMH, 2007.
3. Electronic Communication systems–Tomasi, Pearson, fourth Edition, 2007.

Course Outcomes:

After undergoing the course, students will be able to

- Differentiate various Analog modulation and demodulation schemes and their spectral characteristics
- Analyze noise characteristics of various analog modulation methods
- Analyze various functional blocks of radiotransmitters and receivers
- Design simple analog systems for various modulation techniques

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II Year-II Semester		L	T	P	C
		3	1	0	3
LINEAR CONTROL SYSTEMS					

Course objectives:

- To introduce the concepts of open loop and closed loop systems, mathematical models of mechanical and electrical systems, and concepts of feedback
- To study the characteristics of the given system in terms of the transfer function and introducing various approaches to reduce the overall system for necessary analysis
- To develop the acquaintance in analyzing the system response in time-do main and frequency domain in terms of various performance indices
- Toanalyzethesystem in terms of absolute stability and relative stability by different approaches
- To design different control systems for different applications as per given specifications
- To introduce the concepts of state variable analysis, design and also the concepts of controllability and observability.

UNIT I - INTRODUCTION

Concepts of System, Control Systems: Open Loop and closed loop control systems and their differences. Different examples of control systems, Feed-Back Characteristics, Effects of feedback. Mathematical models, Differential equations, Impulse Response and transfer functions. Translational and Rotational mechanical systems

UNIT II – TRANSFER FUNCTION REPRESENTATION

Transfer Function of DC Servo motor - AC Servo motor- Synchro-transmitter and Receiver, Block diagram representation of systems considering electrical systems as examples –Block diagram algebra–Representation by Signal flowgraph-Reduction using mason's gain formula.

TIME RESPONSE ANALYSIS

Standard test signals – Time response of first order systems – Characteristic Equation of Feedback controlsystems, Transient response of second order systems – Time domain specifications – Steady state response - Steady stateerrors and error constants.

UNIT III – STABILITY ANALYSIS IN S-DOMAIN

The concept of stability – Routh's stability criterion – qualitative stability and conditional stability – limitations of Routh's stability100

Root Locus Technique:

The root locus concept - construction of root loci-effects of adding poles and zeros to G(s) H(s) on the root loci.

UNIT IV

Frequency response analysis: Introduction, Correlation between time and frequency response, PolarPlots, BodePlots,Nyquist Stability Criterion

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UNIT V – CLASSICAL CONTROL DESIGN TECHNIQUES

Compensation techniques – Lag, Lead, Lead-Lag Controllers design infrequency Domain, PIDControllers. State Space Analysis of Continuous Systems Concepts of state, state variables andstate model, derivation ofstate models from block diagrams, Diagonalization- Solving the Timeinvariant state Equations- State Transition Matrix and it's Properties – Concepts of ControllabilityandObservability.

TEXT BOOKS:

1. Automatic Control Systems 8th edition– by B.C.Kuo – Johnwiley and son's, 2003.
2. Control Systems Engineering –by I. J.Nagrathand M.Gopal, New Age International (P) Limited, Publishers, 2nd edition, 2007
3. Modern Control Engineering–by Katsuhiko Ogata–Pearson Publications, 5th edition, 2015.

REFERENCE BOOKS:

1. Control Systems by A.Nagoorkani, RB Apublications, 3 edition, 2017.
2. Control Systems by A.Anandkumar, PHI, 2 Edition, 2014.

Course Outcomes:

- This course introduces the concepts of feedback and its advantages to various control systems
- The performance metrics to design the control system intime-domain and frequency domain are introduced.
- Control systems for various applications can be designed using time-domain and frequency domain analysis.
- In addition to the conventional approach, the state space approach for the analysis of control systems is also introduced.

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II Year - II Semester		L	T	P	C
		3	0	0	3
MANAGEMENT AND ORGANISATIONAL BEHAVIOUR					

Course Objectives:

- To familiarize with the process of management, principles, leadership styles and basic concepts on Organization.
- To provide conceptua l knowledge on functional management that ison Human resource management and Marketing management.
- To provide basic insight into select contemporary management practices and Strategic Management.
- To learn theories of motivation and alsodeals with individual behavior, their personality and perception of individuals.
- To understand about organizations groups that affect the climate of an entire organizations which helps employees instress management.

Unit - I

Introduction: Management and organizational concepts of management and organization- Nature and Importance of Management, Functions of Management, System approach to Management- Taylor's Scientific Management Theory, Fayol's Principles of Management, Leadership Styles, Social responsibilities of Management. Designing Organizational Structures: Basic concepts related to Organization - Departmentation and Decentralization, MBO, Processandconcepts.

Unit - II

Functional Management: Human Resource Management (HRM) Concepts of HRM, Basic functions of HR Manager: Manpower planning, Recruitment, Selection, Training and Development, Wage and Salary Administration Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating.- Marketing Management: Concepts of Marketing, Marketing mix elements and marketing strategies.

Unit - III

Strategic Management: Strategic Management and Contemporary Strategic Issues: Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Environmental Scanning, Value Chain Analysis, SWOT Analysis, Steps in Strategy Formulation and implementation, Generic Strategy alternatives. Bench Marking and Balanced Score Card as Contemporary Business Strategies.

Unit - IV

Individual Behavior: Perception – Perceptual process – Impression management – Personality development – Socialization – Attitude – Process – Formation – Positive attitude – Change – Learning – Learning organizations – Reinforcement Motivation – Process – Motives – Theories of Motivation: Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation

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Unit - V

Group Dynamics: Types of Groups, Stagesof Group Development, Group Behaviour and Group Performance Factors, Organizational conflicts: Reasons for Conflicts, Consequences of Conflictsin Organization, Types of Conflicts, Strategies for Managing Conflicts, Organizational ClimateandCulture, Stress, Causesand effects,copingstrategies of stress.

ReferenceBooks:

1. Subba Rao P., *Organizational Behaviour,* Himalaya Publishing House, Mumbai.
2. Fred Luthans *Organizational Behaviour*, TMH, NewDelhi.
3. Robins, Stephen P., *Fundamentals of Management,* Pearson, India.
4. Kotler Philip & Keller Kevin Lane: Marketing Mangement 12/e, PHI, 2007
5. Koontz & Weihrich: *Essentials of Management*, 6/e, TMH, 2007
6. Kanishka Bedi, *Production and Operations Management*, Oxford University Press, 2007.

Course Outcomes:

- After completion of the Course the student will acquire the knowledge on management functions, global leadership and organizational structure.
- Will familiarize with the concepts of functional management that is HR Mand Marketing of new product developments.
- The learnerisable to think in strategically through contemporary management practices.
- The learner can develop positive attitude through personality development and can equip with motivational theories.
- The student can attain the group performance and grievance handling in managing the organizational culture.

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II Year – II Semester		L	T	P	C
		0	0	3	1.5
ELECTRONIC CIRCUIT ANALYSIS LAB					

Note: The students are required to design the circuit and perform the simulation using Multisim/ Equivalent Industrial Standard Licensed simulation software tool**.** Further they are required to verify the result using necessary hardware equipment.

List of Experiments: (Minimum of Ten Experiments has to be performed)

1. Determination of fTofa given transistor.
2. Voltage-Series Feedback Amplifier
3. Current-Shunt Feedback Amplifier
4. RC Phase Shift/Wien Bridge Oscillator
5. Hartley/Colpitt's Oscillator
6. Two Stage RC Coupled Amplifier
7. Darlington Pair Amplifier
8. Boots trapped Emitter Follower
9. Class A Series-fed Power Amplifier
10. Transformer-coupled Class A Power Amplifier
11. Class B Push-Pull Power Amplifier
12. Complementary Symmetry Class B Push-Pull Power Amplifier
13. Single Tuned Voltage Amplifier
14. Double Tuned Voltage Amplifier

Equipment required: Software:

i. Multisim/Equivalent Industrial Standard Licensed simulation software tool.
ii. Computer Systems with required specifications

HardwareRequired:

1. Regulated Power supplies
2. Analog/Digital Storage Oscillo scopes
3. Analog/Digital Function Generators
4. Digital Multimeters
5. Decade Résistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)
9. Active & Passive Electronic Components

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II Year-II Semester		L	T	P	C
		0	0	3	1.5
ANALOG COMMUNICATIONS LAB					

List of Experiments:

(Twelve experiments to be done- **The students have to calculate the relevant parameters**) – (a. Hardware, b. MATLAB Simulink, c. MATLAB Communication tool box)

A. Amplitude Modulation - Modulation & Demodulation
B. AM – DSBSC - Modulation & Demodulation
C. Spectrum Analysis of Modulated signal using Spectrum Analyzer
D. Diode Detector
E. Pre-emphasis & De-emphasis
F. Frequency Modulation–Modulation & Demodulation
G. AGC Circuits
H. Verification of Sampling Theorem
I. Pulse Amplitude Modulation & Demodulation
J. PWM, PPM–Modulation & Demodulation
K. PLLIC-565 as FM demodulator
L. Radio receiver characteristics
M. Radio Receiver/TV Receiver Demokits or Trainees.

Note: All the above experiments are to be executed/completed using hardware boards and also to be simulated on Mat lab.

Equipment& Software required: Software:

i) Computer Systems with latest specifications
ii) Connected in LAN (Optional)
iii) Operating system (Windows/Linuxsoftware)
iv) Simulations software (Simulink & MATLAB)

Equipment:

1. RPS - 0 –30V
2. CRO - 0– 20M Hz.
3. Function Generators - 0 – 1 MHz
4. Components and Bread boards
5. Multimeters and other meters
6. Spectrum Analyzer

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II Year – II Semester		L	T	P	C
		0	0	3	1.5
DIGITAL IC DESIGN LAB					

Note: The students are required to design and draw the internal logical structure of the following Digital Integrated Circuits and to develop VHDL/Verilog HDL Source code, perform simulation using relevant simulator and analyze the obtained simulation results using necessary synthesizer. All the experiments are required to verify and implement the logical operations on the latest FPGA Hardware in the Laboratory.

List of Experiments: (Minimum of Ten Experiments has to be performed)

1. Realization of Logic Gates

2. Design of Full Adderusing 3 modeling systems

3. 3 to 8 Decoder-74138

4. 8 to 3 Encoder (with and without parity)

5. 8x1Multiplexer-74151 and 2x4De-multiplexer-74155

6. 4-Bit comparator-7485

7. D Flip-Flop-7474

8. Decade counter -7490

9. Shift registers-7495

10. 8-bit serialin-parallel out and parallel in-serial out

11. Fast In & Fast Out (FIFO)

12. MAC (Multiplier &Accumulator)

13. ALU Design.

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II Year – II Semester		L	T	P	C
		0	0	4	2
SOFT SKILLS (SKILL ORIENTED COURSE)					

Course Outcomes:
At the end of the Course, the Student will be able to:
CO1 Use language fluently, accurately and appropriately indebates and group discussions CO2 Use their skills of listening comprehension to communicate effectively incross-cultural contexts.
CO3 Learn and use new vocabulary.
CO 4 Write resumes, project reports and reviews.
CO5 Exhibit interview skills and develop soft skills.

1. Group Discussion–dynamics of group discussion, Lateral thinking, Brain storming.
2. Interview Skills– concept and process, pre-interview planning, opening strategies, answering strategies, interview through teleand video-conferencing.
3. Meetings-making meeting effective, chairing a meeting, decision-making, seeking opinions, interrupting and handling interruptions, clarifications, closure, Negotiation skills.
4. Listening comprehension – Achieving ability to comprehend material delivered at relatively fastspeed; comprehending spoken material in Standard Indian English, British English, and American English.
5. Cross-Cultural Communication / Non-Verbal Communication, Problems of Language, Lack of Language equivalency/ difficulties in using English.
6. Vocabulary building, Creativity in using Advertisements, Case Studies etc.
7. Personality Development: Decision-Making, Problem Solving, Goal Setting, Time Management & Positive Thinking.
8. Resume writing –structure and presentation, planning, defining the career objective.
9. Writing Skills–Letter writing, Email etiquette; Essays for competitive examinations,Analyzing news paper articles.
10. Technical Report Writing/Project Proposals–Types of format sand styles, subject matter–organization, clarity,
11. Coherence and style, planning, data-collection, tools, analysis- Progress and Project Reports.



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REFERENCES:

1. M.Ashraf Rizvi, "Effective Technical Communication", Tata McGraw-Hill PublishingCompany Ltd. 2005.
2. Andrea J.Rutherford, "Basic Communication Skills for Technology", 2nd Edition, PearsonEducation, 2007.
3. Meenakshi Raman & Sangeeta Sharma, "Technical Communication", Oxford University Press,2011.
4. DELTA 'skey to the Next Generation TOEFL Test: "Advanced Skill Practice," New Age

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		L	T	P	C
III Year – I Semester		**3**	**0**	**0**	**3**

ANALOG ICS AND APPLICATIONS

Unit – I
OP-Amp Block Diagram (Symbolic Representation), Characteristics of Op-Amp, Ideal and Practical Op-Amp specifications, DC and AC Characteristics, Definitions of Input and Output Off-set voltage and currents slow rate, CMRR, PSRR. Measurements of Op-Amp Parameters, Three-Terminal Voltage Regulators 78xx& 79xx Series, current Booster, adjustable voltage, DualPowerSupplywith78xx&79xx

Unit – II
OP-AMPS Applications: Introduction, Basic Op-Amp Applications, Instrumentation Amplifier, AC Amplifier, V to I and I to V Converter, Sample and Hold Circuit, Log and Antilog Amplifier, Multiplier and Divider, Differentiator, integrator.
Comparators and Waveform Generators: Introduction, Comparator, Square Wave Generator, Monostable Multivibrator, Triangular Wave Generator, Sine Wave Generators.

Unit – III
Active Filters:
Design & Analysis of Butterworth active filters – 1st order, 2nd order LPF, HPF filters. Band pass, Band reject and all pass filters.

Unit – IV
Timers: Introduction to 555 timer, functional diagram, Monostable and Astable operations and applications, Schmitt Trigger.
Phase Locked Loops: Introduction, block schematic, principles and description of individual blocks, 565 PLL, Applications of PLL – frequency multiplication, frequency translation, AM, FM & FSK demodulators. Applications of VCO (566)

Unit – V
Digital To Analog And Analog To Digital Converters: Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, A-D Converters – parallel Comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC.DAC and ADC Specifications.

Text Books:
1. Linear Integrated Circuits – D. Roy Choudhury, New Age International (p) Ltd, 2nd Edition 2003.
2. Operational Amplifiers & Linear Integrated Circuits –Sanjay Sharma ;SK Kataria&Sons;2nd Edition,2010

References:
1. Op-Amps & Linear ICs - Ramakanth A. Gayakwad, PHI, 1993.
2. Operational Amplifiers & Linear ICs – David A Bell, Oxford Uni. Press, 3rd Edition.

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Course Outcomes: At the end of the course, student will be able to

1. Describe the Op-Amp and internal Circuitry: 555 Timer, PLL
2. Discuss the Applications of Operational amplifier: 555 Timer, PLL
3. Design the Active filters using Operational Amplifier
4. Use the Op-Amp in A to D & D to A Converters

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III Year - I Semester		L	T	P	C
		3	0	0	3

ELECTROMAGNETIC WAVES AND TRANSMISSION LINES

UNIT I:

Transmission Lines-I: Types, Parameters, T&π Equivalent Circuits, Transmission Line Equations, Primary&SecondaryConstants,ExpressionsforCharacteristicImpedance,Propagation Constant, Phase and Group Velocities, Infinite Line, Lossless lines, distortion less lines, Illustrative Problems.

UNIT II:

Transmission Lines – II: Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR. Low loss radio frequency lines and UHF Transmission lines, UHF Lines as Circuit Elements; Impedance Transformations, λ/8,λ/4 and λ /2 Lines –. Smith Chart – Construction and Applications, Quarter wave transformer, Single Stub Matching, Illustrative Problems.

UNIT III:

ReviewofCo-ordinateSystems,**Electrostatics:**,Coulomb'sLaw,ElectricFieldIntensity,Electric Flux Density, Gauss Law and Applications, Electric Potential, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Illustrative Problems. Convection and Conduction Currents, Dielectric Constant, Poisson's and Laplace's Equations; Capacitance – Parallel Plate, Coaxial Capacitors, Illustrative Problems

UNIT IV:

Magneto Statics: Biot-Savart Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magneto static Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law, Inductances and Magnetic Energy. Illustrative Problems**,**

Maxwell's Equations (Time Varying Fields): Faraday's Law and Transformer EMF, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Final Forms and Word Statements, Conditions at a Boundary Surface, Illustrative Problems.

UNIT V:

EM Wave Characteristics: Wave Equations for Conducting and Perfect Dielectric Media Uniform Plane Waves – Definition, All Relations Between E & H, Sinusoidal Variations, Wave Propagation in Lossy dielectrics, lossless dielectrics, free space, wave propagation in good conductors, skin depth, Polarization & Types, Illustrative Problems. Reflection and Refraction of Plane Waves – Normal and Oblique Incidences, for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance, Poynting Vector and Poynting Theorem, Illustrative Problems.

TEXTBOOKS:

1. Elements of Electromagnetic–Matthew N.O.Sadiku, Oxford Univ. Press,3rded.,2001.
2. Electromagnetic Waves and Radiating Systems–E.C.Jordan and K.G.Balmain, PHI,2ndEdition,2000.



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REFERENCEBOOKS:

1. Electromagnetic Field Theory and Transmission Lines–SNRaju, Pearson Education 2006
2. Engineering Electromagnetic –William H. Hayt Jr. and John A.Buck, TMH, 7th ed., 2006.
3. Electromagnetic Field Theory and Transmission Lines : G Sasi Bhushana Rao, WileyIndia2013.

Course Outcomes:

At the end of this course the student can able to

1. Determine E and H using various laws and applications of electric & magnetic fields
2. Apply the Maxwell equations to analyze the time varying behavior of EM waves
3. Gain the knowledge in uniform plane wave concept and characteristics of uniform plane wave in various media
4. Calculate Brewster angle, critical angle and total internal reflection
5. Derive and Calculate the expressions for input impedance of transmission lines, reflection coefficient, VSWR etc. using smith chart

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III Year – I Semester		L	T	P	C
		3	0	0	3

DIGITAL COMMUNICATIONS

UNIT I:
PULSE DIGITAL MODULATION: Elements of digital communication systems, advantages of digital communication systems, Elements of PCM: Sampling, Quantization & Coding, Quantization error, Companding in PCM systems. Differential PCM systems (DPCM), Delta modulation, its draw backs, adaptive delta modulation, comparison of PCM and DM systems, noise in PCM and DM systems

UNIT II:
DIGITALMODULATIONTECHNIQUES:Introduction,ASK,FSK,PSK,DPSK,DEPSK,QPSK,M-aryPSK,ASK,FSK,similarityofBFSKandBPSK.

UNIT III:
DATA TRANSMISSION: Base band signal receiver, probability of error, the optimum filter, matched filter, probability of error using matched filter,coherentreception,non-coherentdetectionofFSK,calculationoferrorprobabilityofASK,BPSK,BFSK,QPSK.

UNIT IV:
INFORMATION THEORY: Discrete messages, concept of amount of information and its properties. Average information, Entropy and its properties, Information rate, Mutual information and its properties
SOURCECODING: Introductions,Advantages,Shannon'stheorem,Shanon-Fanocoding,Huffman coding, efficiency calculations, channel capacity of discrete and analog Channels, capacity of a Gaussian channel, bandwidth–S/N trade off.

UNIT V:
LINEAR BLOCKCODES: Introduction, Matrix description of Linear Block codes, Error detection and error correction capabilities of Linear block codes, Hamming codes, Binary cyclic codes, Algebraic structure, encoding, syndrome calculation, BCH Codes.
CONVOLUTIONCODES: Introduction, encoding of convolution codes, time domain approach, transform domain approach. Graphical approach: state, tree and trellisdiagramde coding using Viterbi algorithm.

TEXTBOOKS:
1. Digital communications- Simon Haykin, JohnWiley,2005
2. Digital and Analog Communication Systems -SamShanmugam,JohnWiley,2005.

REFERENCES:
1. Principles of Communication Systems–H.Tauband D. Schilling, TMH,2003
2. Digital Communications–John Proakis, TMH, 1983.
3. Communication Systems Analog & Digital– Singh & Sapre, TMH, 2004.
4. Modern Digital and Analog Communication Systems–B.P.Lathi, ZhiDing, Hari Mohan Gupta, Oxford University Press, 4th Edition, 2017

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Course Outcomes:

After going through this course the student will be able to

1. Analyze the performance of a Digital Communication System for probability of error and are able to design a digital communication system.
2. Analyze various source coding techniques.
3. Compute and analyze Block codes, cyclic codes and convolution codes.
4. Design a coded communication system.

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III Year – I Semester		L	T	P	C
		3	0	0	3
ANTENNA AND WAVE PROPAGATION (PE1)					

UNIT I:

ANTENNA FUNDAMENTALS: Introduction, Radiation Mechanism – single wire, 2 wire, dipoles, Current Distribution on a thin wire antenna. Antenna Parameters - Radiation Patterns, Patterns in Principal Planes, Main Lobe and Side Lobes, Beam widths, Polarization, Beam Area, Radiation Intensity, Beam Efficiency, Directivity, Gain and Resolution, Antenna Apertures, Aperture Efficiency, Effective Height, illustrated Problems.

UNIT II:

THIN LINEAR WIRE ANTENNAS: Retarded Potentials, Radiation from Small Electric Dipole, Quarter wave Monopole and Half wave Dipole – Current Distributions, Evaluation of Field Components, Power Radiated, Radiation Resistance, Beamwidths, Directivity, Effective Area and Effective Height. Natural current distributions, fields and patterns of Thin Linear Center-fed Antennas of different lengths, Radiation Resistance at a point which is not current maximum, Antenna Theorems – Applicability and Proofs for equivalence of directional characteristics, Loop Antennas: Small Loops - Field Components, Comparison of far fields of small loop and short dipole, Concept of short magnetic dipole, D and R_r relations for small loops.

UNIT III:

ANTENNA ARRAYS : 2 element arrays – different cases, Principle of Pattern Multiplication, N element Uniform Linear Arrays – Broadside, End-fire Arrays, EFA with Increased Directivity, Derivation of their characteristics and comparison; Concept of Scanning Arrays. Directivity Relations (no derivations), Related Problems, Binomial Arrays, Effects of Uniform and Non-uniform Amplitude Distributions, Design Relations, Arrays with Parasitic Elements, Yagi-Uda Arrays, Folded Dipoles and their characteristics

UNIT IV:

NON-RESONANT RADIATORS : Introduction, Traveling wave radiators – basic concepts, Long wire antennas –field strength calculations and patterns, Microstrip Antennas-Introduction, Features, Advantages and Limitations, Rectangular Patch Antennas –Geometry and Parameters, Impact of different parameters on characteristics. Broadband Antennas: Helical Antennas – Significance, Geometry, basic properties; Design considerations for monofilar helical antennas in Axial Mode and Normal Modes (Qualitative Treatment).

UNIT V:

VHF, UHF AND MICROWAVE ANTENNAS: Reflector Antennas : Flat Sheet and Corner Reflectors. Paraboloidal Reflectors – Geometry, characteristics, types of feeds, F/D Ratio, Spill Over, Back Lobes, Aperture Blocking, Off-set Feeds, Cassegrain Feeds.
Horn Antennas – Types, Optimum Horns, Design Characteristics of Pyramidal Horns; Lens Antennas – Geometry, Features, Dielectric Lenses and Zoning, Applications, Antenna Measurements – Patterns Required, Set Up, Distance Criterion, Directivity and Gain Measurements (Comparison, Absolute and 3-Antenna Methods).

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WAVE PROPAGATION: Concepts of Propagation – frequency ranges and types of propagations. Sky Wave Propagation – Formation of Ionospheric Layers and their Characteristics, Mechanism of Reflection and Refraction, Critical Frequency, MUF and Skip Distance – Space Wave Propagation – Mechanism, LOS and Radio Horizon.– Radius of Curvature of path, M-curves and Duct Propagation,.

TEXT BOOKS

1. Antennas for All Applications – John D. Kraus and Ronald J. Marhefka, 3rd Edition, TMH, 2003.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd Edition, 2000.

REFERENCES

1. Antenna Theory - C.A. Balanis, John Wiley and Sons, 2nd Edition, 2001.
2. Antennas and Wave Propagation – K.D. Prasad, Satya Prakashan, Tech India Publications, New Delhi, 2001.

Course Outcomes:

After going through this course the student will be able to

1. Identify basic antenna parameters.
2. Design and analyze wire antennas, loop antennas, reflector antennas, lens antennas, horn antennas and micro-strip antennas
3. Quantify the fields radiated by various types of antennas
4. Design and analyze antenna arrays
5. Analyze antenna measurements to assess antenna’s performance
6. Identify the characteristics of radio wave propagation

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III Year – I Semester		L	T	P	C
		3	0	0	3
ELECTRONIC MEASUREMENTS AND INSTRUMENTATION (PE1)					

UNIT I:
Performance characteristics of instruments, Static characteristics: Accuracy, Resolution, Precision, Expected value, Error, Sensitivity. Dynamic Characteristics; speed of response, Fidelity, Lag and Dynamic error, Types of errors in measurements and their analysis, Design of multi-range AC, DC meters (voltmeter &ammeter) and ohmmeter(series &shunt type) using D'arsonval movement. True rms meter.

UNIT II:
Specifications and designing aspects of Signal Generators –AF sine and square wave signal generators, Function Generators, Random noise generators, Arbitrary waveform generators.WaveAnalyzers,HarmonicDistortionAnalyzers,SpectrumAnalyzers,DigitalFourier Analyzers.

UNIT III:
Oscilloscopes-general purpose CROs, block diagram, functions and implementation of various blocks, specifications, various controls and their functions , types of probes used in CROs, Measurement of frequency and phase difference using Lissajous patterns
Special purpose CROs; sampling oscilloscope, analog storage oscilloscope, digital storage oscilloscope

UNIT IV:
Bridge circuits- Wheat stone bridge, measurement of very low resistance, Measurement of inductance- Maxwell's bridge, Anderson bridge. Measurement of capacitance-Schearing Bridge, Wien Bridge, Errors and precautions in using bridges
Q-meter, principle of operation, measurement methods and sources of errors Counters : principle of operation -modes of operation- totalizing mode, frequency mode and time period mode-sources of errors.

UNIT V:
Transducers-active & passive transducers: Resistance, Capacitance, inductance, Strain gauges, LVDT, Piezo Electric transducers.
Measurement of physical parameters temperature, force, pressure, velocity, acceleration and displacement

TEXT BOOKS:
1. Electronic instrumentation, second edition-H.S.Kalsi,TataMcGrawHill,2004.
2. Modern Electronic Instrumentation and Measurement Techniques–A.D.Helfrickand W.D. Cooper, PHI,5th Edition, 2002.

REFERENCES:
1. Electronic Instrumentation & Measurements -DavidA.Bell,PHI,3rdEdition,2013.

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Course Outcomes:

After going through this course the student will be able to

1. Select the instrument to be used based on the requirements.
2. Understand and analyze different signal generators and analyzers.
3. Understand the design of oscilloscopes for different applications.
4. Design different transducers for measurement of different parameters.

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III Year – I Semester		L	T	P	C
		3	0	0	3
COMPUTER ARCHITECTURE & ORGANIZATION (PE1)					

UNIT -I:
Basic Structure Of Computers: Functional unit, Basic Operational concepts, Bus structures, System Software, Performance, The history of computer development.
Machine Instruction and Programs:
Instruction and Instruction Sequencing: Register Transfer Notation, Assembly Language Notation, Basic Instruction Types,

UNIT -II:
Addressing Modes, Basic Input/output Operations, The role of Stacks and Queues in computer programming equation. Component of Instructions: Logic Instructions, shift and Rotate Instructions
Type of Instructions: Arithmetic and Logic Instructions, Branch Instructions, Addressing Modes, Input/output Operations

UNIT -III:
INPUT/OUTPUT ORGANIZATION: Accessing I/O Devices, Interrupts: Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Direct Memory Access,
Buses: Synchronous Bus, Asynchronous Bus, Interface Circuits, Standard I/O Interface: Peripheral Component Interconnect (PCI) Bus, Universal Serial Bus (USB)

UNIT -IV:
The MEMORY SYSTEMS: Basic memory circuits, Memory System Consideration, Read-Only Memory: ROM, PROM, EPROM, EEPROM, Flash Memory,
Cache Memories: Mapping Functions, INTERLEAVING
Secondary Storage: Magnetic Hard Disks, Optical Disks,

UNIT -V:
Processing Unit: Fundamental Concepts: Register Transfers, Performing an Arithmetic Or Logic Operation, Fetching A Word From Memory, Execution of Complete Instruction, Hardwired Control,
Micro programmed Control: Microinstructions, Micro program Sequencing, Wide Branch Addressing Microinstructions with next –Address Field

TEXTBOOKS:
1. Computer Organization, Carl Hamacher, Zvonks Vranesic, Safea Zaky, 5th Edition, McGraw Hill, 2011.
2. Computer Architecture and Organization, John P. Hayes, 3rd Edition, McGraw Hill, 2002.



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REFERENCE BOOKS:

1. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI
2. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition PHI/Pearson, 2012.
3. Fundamentals or Computer Organization and Design, - Sivaraama Dandamudi Springer Int. Edition, 2003.
4. “Computer Organization and Design: The Hardware/Software Interface” by David A. Patterson and John L. Hennessy, 1998.
5. J .P. Hayes, "Computer Architecture and Organization",McGraw-Hill,1998.

Course Outcomes:

After going through this course the student will be able to

1. Students can understand the architecture of modern computer.
2. They can analyze the Performance of a computer using performance equation
3. Understanding of different instruction types.
4. Students can calculate the effective address of an operand by addressing modes
5. They can understand how computer stores positive and negative numbers.
6. Understand the concepts of I/O Organization and Memory systems.

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III Year – I Semester		L	T	P	C
		0	0	3	1.5
ANALOG ICs AND APPLICATIONS LAB					

Minimum Twelve Experiments to be conducted:

1. Study of ICs – IC 741, IC 555, IC 565, IC 566, IC 1496 – functioning, parameters and Specifications
2. OP AMP Applications – Adder, Subtractor, Comparator Circuits.
3. Integrator and Differentiator Circuits using IC 741.
4. Active Filter Applications – LPF, HPF (first order)
5. Active Filter Applications – BPF, Band Reject (Wideband) and Notch Filters.
6. IC 741 Oscillator Circuits – Phase Shift and Wien Bridge Oscillators.
7. Function Generator using OP AMPs.
8. IC 555 Timer – Monostable Operation Circuit.
9. IC 555 Timer – Astable Operation Circuit.
10. Schmitt Trigger Circuits – using IC 741 and IC 555.
11. IC 565 – PLL Applications.
12. IC 566 – VCO Applications.
13. 4 bit DAC using OP AMP.

Equipment required for Laboratories:

1. RPS
2. CRO
3. Function Generator
4. Multi Meters
5. IC Trainer Kits (Optional)
6. Bread Boards
7. Components:- IC741, IC555, IC565, IC1496, IC723, 7805, 7809, 7912 and other essential components.
8. Analog IC Tester

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III Year – I Semester		L	T	P	C
		0	0	3	1.5
DIGITAL COMMUNICATIONS LAB					

List of Experiments: Minimum Twelve Experiments to be conducted:

1. Time division multiplexing.
2. Pulse code modulation.
3. Differential pulse code modulation.
4. Delta modulation.
5. Frequency shift keying.
6. Phase shift keying.
7. Differential phase shift keying.
8. Companding
9. Source Encoder and Decoder
10. Linear Block Code-Encoder and Decoder
11. Binary Cyclic Code-Encoder and Decoder
12. Convolution Code –Encoder and Decoder
13. BCH Codes

Equipment required for Laboratories:

1. RPS-0–30V
2. CRO-0 –20 MHz.
3. FunctionGenerators-0–1MHz
4. RFGenerators-0–1000M Hz./0–100MHz.
5. Rated Voltmeters and Ammeters
6. Lab Experimental kits for Digital Communication
7. Components
8. Bread boards and Multi-meters
9. Spectrum Analyzer

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III Year – I Semester		L	T	P	C
		0	0	4	2
DATA STRUCTURES USING JAVA LAB					

1. Write Java programs that use both recursive and non-recursive functions for implementing the following searching methods:
   (a) Linear search
   (b) Binary search
2. Write Java programs to implement the List ADT using arrays and linked lists.
3. Write Java programs to implement the following using an array.
   (a) Stack ADT
   (b) Queue ADT
4. Write a java program that reads an infix expression, converts the expression to postfix form and then evaluates the postfix expression (use stack ADT).
5. Write Java programs to implement the following using a singly linked list.
   (a) Stack ADT
   (b) Queue ADT
6. Write Java programs to implement the deque (double ended queue) ADT using
   (a) Array
   (b) Doubly linked list.
7. Write a Java program to implement priority queue ADT.
8. Write Java programs that use recursive and non-recursive functions to traverse the given binary tree in
   (a) Preorder
   (b) In order and
   (c) Post order.
9. Write a Java program that displays node values in a level order traversal (Traverse the tree one level at a time, starting at the root node) for a binary tree.
10. Write a Java program that uses recursive functions.
    (a) To create a binary search tree.
    (b) To count the number of leaf nodes.
    (c) To copy the above binary search tree.
11. Write Java programs for the implementation of bfs and dfs for a given graph.
12. Write Java programs for implementing the following sorting methods:
    (a) Bubble sort
    (b) Selection sort
    (c) Insertion sort
    (d) Radix sort
13. Write a Java program for implementing KMP pattern matching algorithm.



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III Year – II Semester		L	T	P	C
		3	1	0	3
MICROPROCESSOR AND MICROCONTROLLERS					

UNIT–I

Introduction: Basic Microprocessor architecture, Harvard and Von Neumann architectures with examples, Microprocessor Unit versus Microcontroller Unit, CISC and RISC architectures.

8086 Architecture: Main features, pin diagram/description, 8086 microprocessor family, internal architecture, bus interfacing unit, execution unit, interrupts and interrupt response, 8086 system timing, minimum mode and maximum mode configuration.

UNIT–II

8086 Programming: Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

UNIT-III

8086 Interfacing: Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheral interface, Interfacing switches and LEDS, Interfacing seven segment displays, software and hardware interrupt applications, Intel 8251 USART architecture and interfacing, Intel 8237a DMA controller, stepper motor, A/D and D/A converters, Need for 8259 programmable interrupt controllers.

UNIT-IV

Intel 8051 MICROCONTROLLER

Architecture, Hardware concepts, Input/output ports and circuits, external memory, counters/timers, serial data input/output, interrupts. Assembly language programming: Instructions, addressing modes, simple programs. Interfacing to 8051: A/D and D/A Convertors, Stepper motor interface, keyboard, LCD Interfacing, Traffic light controls.

UNIT–V

ARM Architectures and Processors: ARM Architecture, ARM Processors Families, ARM Cortex-M Series Family, ARM Cortex-M3 Processor Functional Description, functions and interfaces, Programmers Models, ARM Cortext-M3 programming – Software delay, Programming techniques, Loops, Stack and Stack pointer, subroutines and parameter passing, parallel I/O, Nested Vectored Interrupt Controller – functional description and NVIC programmers' model.

TEXTBOOKS:

1. A.K Ray, K.M.Bhurchandhi, Advanced Microprocessor and Peripherals", Tata McGraw Hill Publications, 2000.
2. The 8051 Microcontrollers and Embedded systems Using Assembly and C, Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; Pearson 2-Edition, 2011.
3. The Definitive Guide to ARM Cortex-M3 and Cortex-M4 Processors by JosephYou.

REFERENCE BOOKS:

1. Embedded Systems Fundamentals with Arm Cortex-M based Microcontrollers: A Practical Approach in English, by Dr. Alexander G. Dean, Published by Arm Education Media, 2017.
2. Microprocessors and Interfacing – Programming and Hardware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited, 3rd Edition, 1994.
3. Cortex -M3 Technical Reference Manual.

Course Outcomes:

At the end of this course the student will be able to:

1. Understand the architecture of microprocessor/ microcontroller and their operation.
2. Demonstrate programming skills in assembly language for processors and Controllers.
3. Analyze various interfacing techniques and apply them for the design of processor / Controller based systems.

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III Year – II Semester		L	T	P	C
		3	0	0	3
VLSI DESIGN					

UNIT-I:
INTRODUCTIONANDBASICELECTRICALPROPERTIESOFMOSCIRCUITS:
VLSI Design Flow, Introduction to IC technology, Fabrication process: nMOS, pMOS and CMOS. Ids versus Vds Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Trans, Output Conductance and Figure of Merit. nMOS Inverter, Pull-up to Pull-down Ratio for nMOS inverter driven by another nMOS inverter, and through one or more pass transistors. Alternative forms of pull-up, The CMOS Inverter, Latch-up in CMOS circuits, Bi-CMOS Inverter, Comparison between CMOS and BiCMOS technology, MOS Layers, Stick Diagrams, Design Rules and Layout, Layout Diagrams for MOS circuits

UNIT-II:
BASIC CIRCUIT CONCEPTS: Sheet Resistance, Sheet Resistance concept applied to MOS transistors and Inverters, Area Capacitance of Layers, Standard unit of capacitance, some area Capacitance Calculations, The Delay Unit, Inverter Delays, driving large capacitive loads, Propagation Delays, Wiring Capacitances, Choice of layers.
SCALING OF MOS CIRCUITS: Scaling models and scaling factors, Scaling factors for device parameters, Limitations of scaling, Limits due to sub threshold currents, Limits on logic levels and supply voltage due to noise and current density. Switch logic, Gate logic.

UNIT-III:
BASIC BUILDING BLOCKS OF ANALOG IC DESIGN: Regions of operation of MOSFET, Modelling of transistor, body bias effect, biasing styles, single stage amplifier with resistive load, single stage amplifier with diode connected load, Common Source amplifier, Common Drain amplifier, Common Gate amplifier, current sources and sinks.

UNIT-IV:
CMOS COMBINATIONAL AND SEQUENTIAL LOGIC CIRCUIT DESIGN:
Static CMOS Design: Complementary CMOS, Rationed Logic, Pass-Transistor Logic.
Dynamic CMOS Design: Dynamic Logic-Basic Principles, Speed and Power Dissipation of Dynamic Logic, Issues in Dynamic Design, Cascading Dynamic Gates, Choosing a Logic Style, Gate Design in the Ultra Deep-Submicron Era, Latch Versus Register, Latch based design, timing decimation, positive feedback, in stability, Meta stability, multiplexer based latches, Master-Slave Based Edge Triggered Register, clock to q delay, setup time, hold time, reduced clock load master slave registers, Clocked CMOS register. Cross coupled NAND and NOR, SR Master Slave register, Storage mechanism, pipelining.

UNIT-V:
FPGA DESIGN: FPGA design flow, Basic FPGA architecture, FPGA Technologies, Introduction to FPGA Families.
INTRODUCTIONTOADVANCEDTECHNOLOGIES: Giga-scale dilemma, Short channel effects, High–k, Metal Gate Technology, Fin-FET, TFET.

TEXTBOOKS:

1. Essentials of VLSI Circuits and Systems – Kamran Eshraghian, Douglas and A.Pucknell and Sholeh Eshraghian, Prentice-Hall of India Private Limited, 2005 Edition.
2. Design of Analog CMOS Integrated Circuits by Behzad Razavi, McGraw Hill, 2003
3. Digital Integrated Circuits, Jan M.Rabaey, Anantha Chandrakasan and Borivoje Nikolic, 2nd edition, 2016.

REFERENCES:

1. "Introduction to VLSI Circuits and Systems", John P.Uyemura, John Wiley&Sons, reprint 2009.
2. Integrated Nano electronics: Nano scale CMOS, Post-CMOS and Allied Nano technologies Vinod Kumar Khanna, Springer India, 1stedition, 2016.
3. Fin-FETs and other multi-gate transistors, Colinge JP, Editor NewYork, Springer, 2008.

Course Outcomes:

At the end of this course the student will be able to:

1. Demonstrate a clear understanding of CMOS fabrication flow and technology scaling.
2. Apply the design Rules and draw layout of a given logic circuit.
3. Design basic building blocks in Analog IC design.
4. Analyze the behavior of amplifier circuits with various loads.
5. Design various CMOS logic circuits for design of Combinational logic circuits.
6. Design MOSFET based logic circuits using various logic styles like static and dynamic CMOS.
7. Design various applications using FPGA.

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III Year – II Semester		L	T	P	C
		3	0	0	3
DIGITAL SIGNAL PROCESSING					

UNIT I

INTRODUCTION: Introduction to Digital Signal Processing: Discrete time signals & sequences, Classification of Discrete time systems , stability of LTI systems, Invertability, Response of LTI systems to arbitrary inputs. Solution of Linear constant coefficient difference equations, Frequency domain representation of discrete time signals and systems, Review of Z-transforms, solution of difference equations using Z-transforms, System function.

UNIT II

DISCRETE FOURIER SERIES &FOURIER TRANSFORMS: Properties of discrete Fourier series, DFS representation of periodic sequences, Discrete Fourier transforms: Properties of DFT, linear filtering methods based on DFT, Fast Fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms, Inverse FFT.

UNIT III

DESIGN OF IIR DIGITAL FILTERS& REALIZATIONS: Analog filter approximations – Butter worth and Chebyshev, Design of IIR Digital filters from analog filters, Design Examples, Analog and Digital frequency transformations. Basic structures of IIR systems, Transposed forms.

UNIT IV

DESIGN OF FIR DIGITAL FILTERS & REALIZATIONS:
Characteristics of FIR Digital Filters, frequency response. Design of FIR Digital Filters using Window Techniques and Frequency Sampling technique, Comparison of IIR & FIR filters, Basic structures of FIR systems, *Lattice structures, Lattice-ladder structures*

UNIT V

INTRODUCTION TO DSP PROCESSORS: Introduction to programmable DSPs: Multiplier and Multiplier Accumulator, Modified bus structures and memory access schemes in P-DSPs ,Multiple Access Memory, Multi ported memory, VLIW architecture, Pipelining, Special addressing modes, On-Chip Peripherals.
Architecture of TMS320C5X: Introduction, Bus Structure, Central Arithmetic Logic Unit, Auxiliary Register ALU, Index Register, Block Move Address Register, Parallel Logic Unit, Memory mapped registers, program controller, some flags in the status registers, On- chip memory, On-chip peripherals

TEXT BOOKS:

1. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G.Manolakis, Pearson Education / PHI, 2007.
2. Discrete Time Signal Processing – A.V.Oppenheim and R.W. Schaffer, PHI



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Reference Books:

1. Digital Signal Processing: Andreas Antoniou, TATA McGraw Hill , 2006
2. DSP Primer - C. Britton Rorabaugh, Tata McGraw Hill, 2005.
3. Digital Signal Processors – Architecture, Programming and Applications, B.Venkataramani, M.Bhaskar, TATA McGraw Hill, 2002

Course Outcomes:

After going through this course the student will be able to

1. Apply the difference equations concept in the analysis of Discrete time systems
2. Use the FFT algorithm for solving the DFT of a given signal
3. Design a Digital filter (FIR&IIR) from the given specifications
4. Realize the FIR and IIR structures from the designed digital filter.
5. Use the Multirate Processing concepts in various applications (eg: Design of phase shifters, Interfacing of digital systems
6. Apply the signal processing concepts on DSP Processor.

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III Year – II Semester		L	T	P	C
		3	0	0	3
MICROWAVE ENGINEERING (PE2)					

UNIT I

MICROWAVE TRANSMISSION LINES: Introduction, Microwave Spectrum and Bands, Applications of Microwaves. Rectangular Waveguides – TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Filter Characteristics, Dominant and Degenerate Modes, Sketches of TE and TM mode fields in the cross-section, Mode Characteristics – Phase and Group Velocities, Wavelengths and Impedance Relations, Impossibility of TEM mode. Related Problems

MICROSTRIP LINES– Introduction, Z_o Relations, Effective Dielectric Constant, Losses, Q factor

UNIT II

MICROWAVE TUBES: Limitations and Losses of conventional tubes at microwave frequencies, Re-entrant Cavities, Microwave tubes – O type and M type classifications, O-type tubes :2 Cavity Klystrons – Structure, Velocity Modulation Process and Applegate Diagram, Bunching Process and Small Signal Theory –, Applications, Reflex Klystrons – Structure, Applegate Diagram and Principle of working, Electronic Admittance; Oscillating Modes and output Characteristics, Electronic and Mechanical Tuning, Applications,

UNIT - III

HELIX TWTS: Significance, Types and Characteristics of Slow Wave Structures; Structure of TWT and Suppression of Oscillations,

M-type Tubes

Introduction, Cross-field effects, Magnetrons – Different Types, 8-Cavity Cylindrical Travelling Wave Magnetron – Hull Cut-off Condition, Modes of Resonance and PI-Mode Operation, Separation of PI-Mode, o/p characteristics

UNIT IV

WAVEGUIDE COMPONENTS AND APPLICATIONS - I: Coupling Mechanisms – Probe, Loop, Aperture types. Waveguide Discontinuities – Waveguide irises, Tuning Screws and Posts, Matched Loads. Waveguide Attenuators – Resistive Card, Rotary Vane types; Waveguide Phase Shifters – Dielectric, Rotary Vane types, Scattering Matrix– Significance, Formulation and Properties, S-Matrix Calculations for – 2 port Junction, E-plane and H-plane Tees, Magic Tee, Hybrid Ring; Directional Couplers – 2Hole, Bethe Hole types, Ferrite Components– Faraday Rotation, S-Matrix Calculations for Gyrator, Isolator, Circulator, Related Problems.

UNIT V

MICROWAVE SOLID STATE DEVICES: Introduction, Classification, Applications. TEDs – Introduction, Gunn Diode – Principle, RWH Theory, Characteristics, Basic Modes of Operation, Oscillation Modes

MICROWAVE MEASUREMENTS: Description of Microwave Bench – Different Blocks and their Features, Precautions; Microwave Power Measurement – Bolometer Method. Measurement of Attenuation, Frequency, Q- factor, Phase shift, VSWR, Impedance Measurement

TEXT BOOKS:

1. Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley, 2nd Edition, 2002.
2. Microwave Engineering- Annapurna Das and Sisir K.Das, Mc Graw Hill Education, 3rd Edition.

REFERENCES:

1. Microwave Devices and Circuits – Samuel Y. Liao, PHI, 3rd Edition,1994.
2. Microwave Engineering – G S N Raju , I K International
3. Microwave and Radar Engineering-M.Kulkarni, Umesh Publications, 3rd Edition

Course Outcomes: After going through this course the student will be able to

1. Design different modes in waveguide structures
2. Calculate S-matrix for various waveguide components and splitting the microwave energy in a desired direction
3. Distinguish between Microwave tubes and Solid State Devices, calculation of efficiency of devices.
4. Measure various microwave parameters using a Microwave test bench

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III Year – II Semester		L	T	P	C
		3	0	0	3
MOBILE & CELLULAR COMMUNICATION (PE2)					

UNIT I

CELLULAR MOBILE RADIO SYSTEMS: Introduction to Cellular Mobile System, uniqueness of mobile radio environment, operation of cellular systems, consideration of the components of Cellular system, Hexagonal shaped cells, Analog and Digital Cellular systems.

CELLULAR CONCEPTS: Evolution of Cellular systems, Concept of frequency reuse, frequency reuse ratio, Number of channels in a cellular system, Cellular traffic: trunking and blocking, Grade of Service; Cellular structures: macro, micro, pico and femto cells; Cell splitting, Cell sectoring.

UNIT II

INTERFERENCE: Types of interferences, Introduction to Co-Channel Interference, real time Co-Channel interference, Co-Channel measurement, Co-channel Interference Reduction Factor, desired C/I from a normal case in a omni-directional Antenna system, design of Antenna system, antenna parameters and their effects, diversity receiver, non-co-channel interference-different types.

UNIT III

FREQUENCY MANAGEMENT AND CHANNEL ASSIGNMENT: Numbering and grouping, setup access and paging channels, channel assignments to cell sites and mobile units: fixed channel and non-fixed channel assignment, channel sharing and borrowing, overlaid cells. **CELL COVERAGE FOR SIGNAL AND TRAFFIC:** Signal reflections in flat and hilly terrain, effect of human made structures, phase difference between direct and reflected paths, straight line path loss slope, general formula for mobile propagation over water and flat open
area, near and long distance propagation, antenna height gain, form of a point to point model.

UNIT IV

HANDOFF STRATEGIES:

Concept of Handoff, types of handoff, handoff initiation, delaying handoff, forced handoff, mobile assigned handoff, intersystem handoff, soft and hard hand offs, vehicle locating methods, dropped call rates and their evaluation.

UNIT V

DIGITAL CELLULAR NETWORKS: GSM architecture, GSM channels, multiple access schemes; TDMA, CDMA, OFDMA.3G and 4G Wireless Standards GSM , GPRS , WCDMA , LTE , Wi-MAX, Introduction to 5G standards.

TEXT BOOKS:

1. Mobile Cellular Telecommunications – W.C.Y. Lee, Tata McGraw Hill, 2nd Edn., 2006.
2. Principles of Mobile Communications – Gordon L. Stuber, Springer International 2nd Edition, 2007.
3. Advanced Wireless Communications-4G By. Savo G Glisic, John Wiley & Sons Publication 2nd Edition

REFERENCES:

1. Wireless Communications – Theodore. S. Rapport, Pearson education, 2nd Edn.,2002.
2. Fundamentals of Wireless Communication By. David Tse and Pramod Viswanath, Cambridge University Press

Course Outcomes:

At the end of this course the student can able to:

1. Identify the limitations of conventional mobile telephone systems; understand the concepts of cellular systems.
2. Understand the frequency management, channel assignment strategies and antennas in cellular systems.
3. Understand the concepts of handoff and architectures of various cellular systems.



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III Year – II Semester		L	T	P	C
		3	0	0	3
EMBEDDED SYSTEMS (PE2)					

UNIT-I

INTRODUCTION: Embedded system-Definition, history of embedded systems, classification of embedded systems, major application areas of embedded systems, purpose of embedded systems, the typical embedded system-core of the embedded system, Memory, Sensors and Actuators, Communication Interface, Embedded firmware, Characteristics of an embedded system, Quality attributes of embedded systems, Application-specific and Domain-Specific examples of an embedded system.

UNIT-II

EMBEDDED HARDWARE DESIGN: Analog and digital electronic components, I/O types and examples, Serial communication devices, Parallel device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real time clock.

UNIT-III

EMBEDDED FIRMWARE DESIGN: Embedded Firmware design approaches, Embedded Firmware development languages, ISR concept, Interrupt sources, Interrupt servicing mechanism, Multiple interrupts, DMA, Device driver programming, Concepts of C versus Embedded C and Compiler versus Cross-compiler.

UNIT-IV

REAL TIME OPERATING SYSTEM: Operating system basics, Types of operating systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling, Threads, Processes and Scheduling, Task communication, Task synchronization.
HARDWARE SOFTWARE CO-DESIGN: Fundamental Issues in Hardware Software Co-Design, Computational models in embedded design, Hardware software Trade-offs, Integration of Hardware and Firmware.

UNIT-V:

EMBEDDED SYSTEM DEVELOPMENT, IMPLEMENTATION AND TESTING: The integrated development environment, Types of files generated on cross-compilation, De-assembler/ De-compiler, Simulators, Emulators and Debugging, Target hardware debugging, Embedded Software development process and tools, Interpreters, Compilers and Linkers, debugging tools, Quality assurance and testing of the design, Testing on host machine, Simulators, Laboratory Tools.

Case Study: digital camera hardware and software architecture, embedded systems in automobile, embedded system for a smart card, mobile phone software for key inputs.

Text Books:

1. Embedded Systems Architecture- By Tammy Noergaard, Elsevier Publications, 2013.
2. Embedded Systems-By Shibu. K.V-Tata McGraw Hill Education Private Limited, 2013.

References:

1. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley Publications, 2013.
2. Embedded Systems-Lyla B.Das-Pearson Publications,2013.

Course Outcomes:

At the end of this course the student can able to:

1. Understand the basic concepts of an embedded system and able to know an embedded system design approach to perform a specific function.
2. The hardware components required for an embedded system and the design approach of an embedded hardware.
3. The various embedded firmware design approaches on embedded environment.
4. Understand how to integrate hardware and firmware of an embedded system using real time operating system.

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III Year – II Semester		L	T	P	C
		3	0	0	3
CMOS ANALOG IC DESIGN (PE2)					

UNIT -I
Basic MOS Device Physics – General Considerations, MOS I/V Characteristics, Second Order effects, MOS Device models. Short Channel Effects and Device Models, Single Stage Amplifiers –Basic Concepts, Common Source Stage, Source Follower, Common Gate Stage, Cascode Stage

UNIT -II:
Differential Amplifiers – Single Ended and Differential Operation, Basic Differential Pair, Common Mode Response, Differential Pair with MOS loads, Gilbert Cell. Passive and Active Current Mirrors– Basic Current Mirrors, Cascode Current Mirrors, Active Current Mirrors

UNIT -III:
Frequency Response of Amplifiers – General Considerations, Common Source Stage, Source Followers, Common Gate Stage, Cascode Stage, Differential Pair, Noise – Types of Noise, Representation of Noise in circuits, Noise in single stage amplifiers, Noise in Differential Pairs

UNIT -IV:
Feedback Amplifiers – General Considerations, Feedback Topologies, Effect of Loading, Operational Amplifiers – General Considerations, One Stage Op Amps, Two Stage Op Amps, Gain Boosting, Common – Mode Feedback, Input Range limitations, Slew Rate, Power Supply Rejection, Noise in Op Amps. Stability and Frequency Compensation

UNIT -V:
Characterization of Comparator, Two-Stage, Open-Loop Comparators, Other Open-Loop Comparators, Improving the Performance of Open-Loop Comparators, Discrete-Time Comparators

Text Books:
1. B.Razavi, “Design of Analog CMOS Integrated Circuits”, 2nd Edition, McGraw Hill Edition2016.
2. Paul. R.Gray&Robert G. Meyer, “Analysis and Design of Analog Integrated Circuits”, Wiley, 5th Edition, 2009.

Reference Books:
1. T. C. Carusone, D. A. Johns & K. Martin, “Analog Integrated Circuit Design”, 2nd Edition, Wiley, 2012.
2. P.E.Allen&D.R. Holberg, “CMOS Analog Circuit Design”, 3rd Edition, Oxford University
Press, 2011.
3. R. Jacob Baker, “CMOS Circuit Design, Layout, and Simulation”, 3rd Edition, Wiley, 2010.

Course Outcomes:

At the end of the course, students will be able to:

1. Design MOSFET based analog integrated circuits.
2. Analyze analog circuits at least to the first order.
3. Appreciate the trade-offs involved in analog integrated circuit design.
4. Understand and appreciate the importance of noise and distortion in analog circuits.
5. Analyze complex engineering problems critically in the domain of analog IC design for conducting research.

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III Year – II Semester		L	T	P	C
		0	0	3	1.5
MICROPROCESSOR AND MICROCONTROLLERS LAB					

List of Experiments:

PART- A: (Minimum of 5 Experiments has to be performed) 8086 Assembly Language Programming and Interfacing

1. Programs for 16 -bit arithmetic operations (using Various Addressing Modes).
   a. Addition of n-BCD numbers.
   b. Multiplication and Division operations.
2. Program for sorting an array.
3. Program for Factorial of given n-numbers.
4. Interfacing ADC to8086
5. Interfacing DAC to8086.
6. Interfacing stepper motor to8086.

PART-B: (Minimum of 5 Experiments has to be performed) 8051 Assembly Language Programming and Interfacing

1. Finding number of 1's and number of 0's in a given 8-bit number
2. Average of n-numbers.
3. Program and verify Timer/ Counter in8051.
4. Interfacing Traffic Light Controller to8051.
5. UART operation in8051
6. Interfacing LCD to8051.

PART-C (Minimum of 2 Experiments has to be performed) Conduct the following experiments using ARM CORTEX M3 PROCESSOR USING KEIL MDK ARM

1. Write an assembly program to multiply of 2 16-bit binary numbers.
2. Write an assembly program to find the sum of first 10 integers numbers.
3. Write a program to toggle LED every second using timer interrupt.

Equipment Required:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. 8086 Microprocessor kits
4. 8051 microcontroller kits
5. ADC module, DAC module
6. Stepper motor module
7. Key board module
8. LED, 7-SegemtUnits
9. Digital Multi-meters
10. ROM/RAM Interface module
11. Bread Board etc.
12. ARM CORTEX M3
13. KEIL MDKARM, Digital Multi-meters

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III Year – II Semester		L	T	P	C
		0	0	3	1.5
VLSI DESIGN LAB					

List of Experiments

PART (A): FPGA Level Implementation (Any Seven Experiments)
Note 1: The students need to develop Verilog /VHDL Source code, perform simulation usingrelevant simulator and analyze the obtained simulation results using necessary Synthesizer
Note 2: All the experiments need to be implemented on the latest FPGA/CPLD Hardware in theLaboratory

1. Realization of Logic gates

   Design and Implementation of the following:

2. 4-bit ripple carry and carry look ahead adder using behavioral, dataflow and structural modeling
3. a) 16:1 mux through 4:1 mux
   b) 3:8 decoder realization through 2:4 decoder
4. 8:3 encoder
5. 8-bit parity generator and checker
6. Flip-Flops
7. 8-bit synchronous up-down counter
8. 4-bit sequence detector through Mealy and Moore state machines.

EDA Tools/Hardware Required:

1. EDA Tool that supports FPGA programming including Xilinx Vivado/Altera(Intel)/Cypress/Equivalent Industry standard tool along with corresponding FPGA hardware.
2. Desktop computer with appropriate Operating System that supports the EDA tools.

PART (B): Back-end Level Design and Implementation (Any Five Experiments)
Note: The students need to design the following experiments at schematic level using CMOSlogic and verify the functionality. Further students need to draw the corresponding layout and verify the functionality including parasites. Available state of the art technology libraries can be used while simulating the designs using Industry standardEDA Tools.

Design and Implementation of the following

1a. Universal Gates
1b. An Inverter
2. Full Adder
3. Full Subtractor
4. Decoder
5. D-Flip-flop

EDA Tools/Hardware Required:

- Mentor Graphics Software / Cadence/Synopsys/Tanner or Equivalent Industry Standard/CAD Tool.
- Desktop computer with appropriate Operating System that supports the EDA tools.

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III Year – II Semester		L	T	P	C
		0	0	3	1.5
DIGITAL SIGNAL PROCESSING LAB					

(Note: Students have to perform at least FOUR experiments from each part.)

PART-A

List of the Experiments

1. Generation of DT signals.
2. Verify the Linear Convolution of two DT signals
   a) Using MATLAB
   b) Using Code Composer Studio(CCS)
3. Verify the Circular Convolution of two DT signals
   a) Using MATLAB
   b) Using Code Composer Studio(CCS)
4. Find the sum of DT sinusoidal signals.
5. Computation of Discrete Fourier Transform(DFT) and Inverse Discrete Fourier Transform (IDFT)
   a) Using MATLAB
   b) Using Code Composer Studio(CCS)
6. Transfer Function Stability Analysis: using pole-zero plot, bode Plot and Nyquist plot.

PART-B

Following Experiments are to be done using a TIDSP Starter Kit**.**

7. Generation of a sinusoidal signal.
8. Linear and circular convolution of DT sequences.
9. Compute N-point DFT of a given DT sequence.
10. Design and implementation of FIR filters.
11. Design and implementation of IIR filters.

PART-C

Following Experiments are to be done using **Cypress FM4 Starter Kit.**

12. Verification of sampling theorem.
13. Implementation of FFT algorithm.
14. Implementation of FIR filters.
15. Implementation of IIR filters.

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III Year – II Semester		L	T	P	C
		1	0	2	2
ARM BASED/ AURDINO BASED PROGRAMMING					

LIST OF EXPERIMENTS:

1. Measure Analog signal from Temperature Sensor
2. Generate PWM output
3. Drive single character generation on Hyper Terminal
4. Drive a given string on Hyper Terminal
5. Full duplex Link establishment using Hyper terminal
6. Drive a given value on a 8 bit DAC consisting of SPI
7. Drive Stepper motor using Analog GPIOs
8. Drive Accelerometer and Display the readings on Hyper Terminal

COMPONENTS/ BOARDS :

1. Arduino Duemilanove Board
2. Arduino Software IDE

Course Outcomes:

At the end of the Course, the Student will be able to:

1. Comprehend Microcontroller-Transducers Interface techniques
2. Establish Serial Communication link with Arduino
3. Analyze basics of SPI interface.
4. Interface Stepper Motor with Arduino
5. Analyze Accelerometer interface techniques

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IV Year – I Semester		L	T	P	C
		3	0	0	3
OPTICAL COMMUNICATION (PE-3)					

UNIT I
Overview of optical fiber communication - Historical development, The general system, advantages of optical fiber communications. Optical fiber wave guides- Introduction, Ray theory transmission, Total Internal Reflection, Acceptance angle, Numerical Aperture, Skew rays, Cylindrical fibers- Modes, V-number, Mode coupling, Step Index fibers, Graded Index fibers, Single mode fibers- Cut off wavelength, Mode Field Diameter, Effective Refractive Index, Related problems.

UNIT II
Fiber materials:- Glass, Halide, Active glass, Chalgenide glass, Plastic optical fibers. Signal distortion in optical fibers-Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses, Information capacity determination, Group delay, Types of Dispersion:- Material dispersion, Wave-guide dispersion, Polarization-Mode dispersion, Intermodal dispersion, Pulse broadening in Graded index fiber, Related problems.

UNIT III
Optical fiber Connectors-Connector types, Single mode fiber connectors, Connector return loss, Fiber Splicing- Splicing techniques, Splicing single mode fibers, Fiber alignment and joint loss- Multimode fiber joints, single mode fiber joints.

UNIT IV
Optical sources- LEDs, Structures, Materials, Quantum efficiency, Power, Modulation, Power bandwidth product. Injection Laser Diodes- Modes, Threshold conditions, External quantum efficiency, Laser diode rate equations, Resonant frequencies, Reliability of LED&ILD, Optical detectors- Physical principles of PIN and APD, Detector response time, Temperature effect on Avalanche gain, Comparison of Photo detectors, Related problems.

UNIT V
Source to fiber power launching - Output patterns, Power coupling, Power launching, Equilibrium Numerical Aperture, Laser diode to fiber coupling, Optical receiver operation- Fundamental receiver operation, Digital signal transmission, error sources, Receiver configuration, Digital receiver performance, Probability of Error, Quantum limit, Analog receivers.

Optical system design - Point-to- point links- Component choice and considerations, Link power budget, Rise time budget with examples, Line coding in Optical links, WDM, Necessity, Principles, Measurement of Attenuation and Dispersion, Eye pattern.

TEXT BOOKS :
1. Optical Fiber Communications – Gerd Keiser, Mc Graw-Hill International edition, 3rd Edition, 2000.
2. Optical Fiber Communications – John M. Senior, PHI, 2nd Edition, 2002.

RERFERENCES:

1. Fiber Optic Communications – D.K. Mynbaev , S.C. Gupta and Lowell L. Scheiner, Pearson Education, 2005.
2. Fiber Optic Communications – Joseph C. Palais, 4th Edition, Pearson Education, 2004.

Course Outcomes:

After going through this course the student will be able to

1. Choose necessary components required in modern optical communications systems .
2. Design and build optical fiber experiments in the laboratory, and learn how to calculate electromagnetic modes in waveguides, the amount of light lost going through an optical system, dispersion of optical fibers.
3. Use different types of photo detectors and optical test equipment to analyze optical fiber and light wave systems.
4. Choose the optical cables for better communication with minimum losses
5. Design, build, and demonstrate optical fiber experiments in the laboratory.

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IV Year – I Semester		L	T	P	C
		3	0	0	3
DIGITAL IMAGE PROCESSING (PE-3)					

UNIT I

Introduction: Introduction to Image Processing, Fundamental steps in digital image processing, components of an image processing system, image sensing and acquisition, image sampling and quantization, some basic relationships between pixels, an introduction to the mathematical tools used in digital image processing.

Image Transforms: Need for image transforms, Discrete Fourier transform (DFT) of one variable, Extension to functions of two variables, some properties of the 2-D Discrete Fourier transform, Importance of Phase, Walsh Transform. Hadamard transform, Haar Transform, Slant transform, Discrete Cosine transform, KL Transform, SVD and Radon Transform, Comparison of different image transforms

UNIT II

Intensity Transformations and Spatial Filtering: Background, Some basic intensity transformation functions, histogram processing, fundamentals of spatial filtering, smoothing spatial filters , sharpening spatial filters, Combining spatial enhancement methods

Filtering in the Frequency Domain: Preliminary concepts, The Basics of filtering in the frequency domain, image smoothing using frequency domain filters, Image Sharpening using frequency domain filters, Selective filtering

UNIT III

Image Restoration and Reconstruction: A model of the image degradation / Restoration process, Noise models, restoration in the presence of noise only-Spatial Filtering, Periodic Noise Reduction by frequency domain filtering, Linear, Position –Invariant Degradations, Estimating the degradation function, Inverse filtering, Minimum mean square error (Wiener) filtering, constrained least squares filtering ,geometric mean filter ,image reconstruction from projections.

UNIT IV

Image compression: Fundamentals, Basic compression methods: Huffman coding, Golomb coding, Arithmetic coding, LZW coding, Run-Length coding, Symbol-Based coding, Bit-Plane coding, Block Transform coding, Predictive coding

Wavelets and Multiresolution Processing: Image pyramids, subband coding, Multiresolution expansions, wavelet transforms in one dimensions & two dimensions, Wavelet coding.

UNIT V

Image segmentation: Fundamentals, point, line, edge detection, thresholding, region –based segmentation.

Morphological Image Processing: Preliminaries, Erosion and dilation, opening and closing, basic morphological algorithms for boundary extraction, thinning, gray-scale morphology, Segmentation using morphological watersheds.

Color image processing: color fundamentals, color models, pseudo color image processing, basics of full color image processing, color transformations, smoothing and sharpening. Image segmentation based on color, noise in color images, color image compression.

Text Books

1. R. C. Gonzalez and R. E. Woods, Digital Image Processing, 3rd edition, Prentice Hall, 2008.
2. Jayaraman, S. Esakkirajan, and T. Veerakumar," Digital Image Processing", Tata McGraw-Hill Education, 2011.

Reference Books

1. Anil K.Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India, 9th Edition, Indian Reprint, 2002.
2. B.Chanda, D.Dutta Majumder, "Digital Image Processing and Analysis", PHI, 2009.

Course Outcomes:

After undergoing the course students will be able to

1. Perform image manipulations and different digital image processing techniques
2. Perform basic operations like – Enhancement, segmentation, compression, Image transforms and restoration techniques on image.
3. Analyze pseudo and full color image processing techniques.
4. Apply various morphological operators on images

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IV Year – I Semester		L	T	P	C
		3	0	0	3
LOW POWER VLSI DESIGN (PE-3)					

UNIT-I: Sources of Power Dissipation
Introduction, Short-Circuit Power Dissipation, Switching Power Dissipation, Dynamic Power for a Complex Gate, Reduced Voltage Swing, Switching Activity, Leakage Power Dissipation, p–n Junction Reverse-Biased Current, Band-to-Band Tunneling Current, Subthreshold Leakage Current, Short-Channel Effects

UNIT 2: Supply Voltage Scaling for Low Power
Device Feature Size Scaling, Constant-Field Scaling, Constant-Voltage Scaling, Architectural-Level Approaches: Parallelism for Low Power, Pipelining for Low Power, Combining Parallelism with Pipelining, Voltage Scaling Using High-Level Transformations: Multilevel Voltage Scaling Challenges in MVS Voltage Scaling Interfaces, Static Timing Analysis Dynamic Voltage and Frequency Scaling

UNIT-3: Switched Capacitance Minimization
Probabilistic Power Analysis: Random logic signals, probability and frequency, probabilistic power analysis techniques, signal entropy, Bus Encoding: Gray Coding, One-Hot Coding, Bus-Inversion, T0 Coding, Clock Gating, Gated-Clock FSMs FSM State Encoding, FSM Partitioning, Precomputation, Glitching Power Minimization

UNIT 4: Leakage Power Minimization
Fabrication of Multiple Threshold Voltages, Multiple Channel Doping, Multiple Oxide CMOS, Multiple Channel Length, Multiple Body Bias, VTCMOS Approach, MTCMOS Approach, Power Gating, Clock Gating Versus Power Gating, Power-Gating Issues, Isolation Strategy, State Retention Strategy, Power-Gating Controller, Power Management, Combining DVFS and Power Management

UNIT 5:Low power clock distribution& Simulation Power Analysis
Low power clock distribution: Power dissipation in clock distribution, single driver versus distributed buffers, Zero skew versus tolerable skew, chip and package co design for clock network.
Simulation Power Analysis: SPICE circuit simulators, gate level logic simulation, capacitive power estimation, architecture level analysis, data correlation analysis of DSP systems, Monte Carlo Simulation
Special Techniques: Power Reduction in Clock networks, CMOS Floating Node, Low Power Bus Delay balancing, and Low Power Techniques for SRAM.

TEXT BOOKS:
1. Low-Power VLSI Circuits and Systems, Ajit Pal, SPRINGER PUBLISHERS
2. PRACTICAL LOW POWER DIGITAL VLSI DESIGN , Gary Yeap Motorola, SPRINGER SCIENCE+BUSINESS MEDIA, LLC.

REFERENCE BOOKS:

1. Low Power CMOS Design – Anantha Chandrakasan, IEEE Press/Wiley International, 1998. 2
2. Massoud Pedram, Jan M. Rabaey , “Low power design methodologies “, Kluwer Academic Publishers.
3. Low Power CMOS VLSI Circuit Design – A. Bellamour, M. I. Elamasri, Kluwer Academic Press, 1995.

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Course Outcomes:

1. Capability to recognize advanced issues in VLSI systems, specific to the deep-submicron silicon Technologies.
2. Students able to understand deep submicron CMOS technology and digital CMOS design styles.
3. To design chips used for battery-powered systems and high performance circuits.
4. Learn the design of various CMOS dynamic logic circuits.
5. Learn the design techniques low voltage and low power CMOS circuits for various applications.
6. Learn the different types of memory circuits and their design.

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IV Year – I Semester		L	T	P	C
		3	0	0	3
SATELLITE COMMUNICATION (PE-4)					

UNIT I

INTRODUCTION: Origin of Satellite Communications, Historical Back-ground, Basic Concepts of Satellite Communications, Frequency allocations for Satellite Services, Applications, Future Trends of Satellite Communications.

ORBITAL MECHANICS AND LAUNCHERS: Orbital Mechanics, Look Angle determination, Orbital perturbations, Orbit determination, launches and launch vehicles, Orbital effects in communication systems performance.

UNIT II

SATELLITE SUB SYSTEMS: Attitude and orbit control system, telemetry, tracking, Command and monitoring, power systems, communication subsystems, Satellite antenna Equipment reliability and Space qualification.

UNIT III

SATELLITE LINK DESIGN: Basic transmission theory, system noise temperature and G/T ratio, Design of down links, up link design, Design of satellite links for specified C/N, System design example.

UNIT IV

MULTIPLE ACCESS: Frequency division multiple access (FDMA) Intermodulation, Calculation of C/N. Time division Multiple Access (TDMA) Frame structure, link design using TDMA, Examples. Satellite Switched TDMA Onboard processing, DAMA, Code Division Multiple access (CDMA),Spread spectrum transmission and reception.
EARTH STATION TECHNOLOGY: Introduction, Transmitters, Receivers, Antennas, Tracking systems,Terrestrial interface, Primary power test methods.

UNIT V

LOW EARTH ORBIT AND GEO-STATIONARY SATELLITE SYSTEMS: Orbit consideration, coverage and frequency considerations, Delay & Throughput considerations, System considerations, Operational NGSO constellation Designs

SATELLITE NAVIGATION & THE GLOBAL POSITIONING SYSTEM: Radio and Satellite
Navigation, GPS Position Location principles, GPS Receivers and codes, Satellite signal acquisition, GPSNavigation Message, GPS signal levels, GPS receiver operation, GPS C/A code accuracy, Differential GPS.

TEXT BOOKS:

1. Satellite Communications – Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 2ndEdition, 2003.
2. Satellite Communications Engineering – Wilbur L. Pritchard, Robert A Nelson and Henri G. Suyderhoud, 2ndEdition, Pearson Publications, 2003.
3. Digital satellite communication by TRI T HA …..TMH



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REFERENCES:

1. Satellite Communications : Design Principles – M. Richharia, BS Publications, 2nd Edition, 2003.
2. Satellite Communication - D.C Agarwal, Khanna Publications, 5th Ed.
3. Fundamentals of Satellite Communications – K.N. Raja Rao, PHI, 2004
4. Satellite Communications – Dennis Roddy, McGraw Hill, 2nd Edition, 1996.

Course Outcomes:

At the end of this course the student can able to:

1. Understand the concepts, applications and subsystems of Satellite communications.
2. Derive the expression for G/T ratio and to solve some analytical problems on satellite link design.
3. Understand the various types of multiple access techniques and architecture of earth station design.
4. Understand the concepts of GPS and its architecture.

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IV Year – I Semester		L	T	P	C
		3	0	0	3
SOFT COMPUTING TECHNIQUES (PE-4)					

UNIT I: Introduction: Approaches to intelligent control, Architecture for intelligent control, Symbolic reasoning system, Rule-based systems, the AI approach, Knowledge representation - Expert systems**.**

UNIT II: Artificial Neural Networks: Concept of Artificial Neural Networks and its basic mathematical model, McCulloch-Pitts neuron model, simple perceptron, Adaline and Madaline, Feed-forward Multilayer Perceptron, Learning and Training the neural network, Data Processing: Scaling, Fourier transformation, principal-component analysis and wavelet transformations, Hopfield network, Self-organizing network and Recurrent network, Neural Network based controller.

UNIT III: Fuzzy Logic System: Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning, Introduction to fuzzy logic modeling and control, Fuzzification, inferencing and defuzzification, Fuzzy knowledge and rule bases, Fuzzy modeling and control schemes for nonlinear systems, Self-organizing fuzzy logic control, Fuzzy logic control for nonlinear time delay system.

UNIT IV: Genetic Algorithm: Basic concept of Genetic algorithm and detail algorithmic steps, Adjustment of free parameters, Solution of typical control problems using genetic algorithm, Concept on some other search techniques like Tabu search and ant D-colony search techniques for solving optimization problems.

UNIT V: Applications: GA application to power system optimization problem, Case studies: Identification and control of linear and nonlinear dynamic systems using MATLAB-Neural Network toolbox, Stability analysis of Neural Network interconnection systems, Implementation of fuzzy logic controller using MATLAB fuzzy-logic toolbox, Stability analysis of fuzzy control systems.

TEXT BOOKS:

1. Introduction to Artificial Neural Systems - Jacek.M.Zurada, Jaico Publishing House, 1999.
2. Neural Networks and Fuzzy Systems - Kosko, B., Prentice-Hall of India Pvt. Ltd., 1994.

REFERENCE BOOKS:

1. Fuzzy Sets, Uncertainty and Information - Klir G.J. &Folger T.A., Prentice-Hall of India Pvt. Ltd., 1993.
2. Fuzzy Set Theory and Its Applications - Zimmerman H.J. Kluwer Academic Publishers, 1994. Introduction to Fuzzy Control - Driankov, Hellendroon, Narosa Publishers.
3. Artificial Neural Networks - Dr. B. Yagananarayana, 1999, PHI, New Delhi.

4. Elements of Artificial Neural Networks - KishanMehrotra, Chelkuri K. Mohan, Sanjay Ranka, Penram International.
5. Artificial Neural Network –Simon Haykin, 2nd Ed., Pearson Education.
6. Introduction Neural Networks Using MATLAB 6.0 - S.N. Shivanandam, S. Sumati, S. N. Deepa,1/e, TMH, New Delhi

Course Outcomes:

1. Develop intelligent systems leveraging the paradigm of soft computing techniques.
2. Implement, evaluate and compare solutions by various soft computing approaches for finding the optimal solutions.
3. Recognize the feasibility of applying a soft computing methodology for a particular problem
4. Design the methodology to solve optimization problems using fuzzy logic, genetic algorithms and neural networks.
5. Design hybrid system to revise the principles of soft computing in various application

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IV Year – I Semester		L	T	P	C
		3	0	0	3
DIGITAL IC DESIGN USING CMOS (PE-4)					

UNIT-I:
MOS Design: Pseudo NMOS Logic – Inverter, Inverter threshold voltage, Output high voltage, Output Low voltage, Gain at gate threshold voltage, Transient response, Rise time, Fall time, Pseudo NMOS logic gates, Transistor equivalency, CMOS Inverter logic.

UNIT-II:
Combinational MOS Logic Circuits: MOS logic circuits with NMOS loads, Primitive CMOS logic gates – NOR & NAND gate, Complex Logic circuits design – Realizing Boolean expressions using NMOS gates and CMOS gates , AOI and OIA gates, CMOS full adder, CMOS transmission gates, Designing with Transmission gates.

UNIT-III:
Sequential MOS Logic Circuits: Behaviour of bistable elements, SR Latch, Clocked latch and flip flop circuits, CMOS D latch and edge triggered flip-flop.

UNIT-IV:
Dynamic Logic Circuits: Basic principle, Voltage Bootstrapping, Synchronous dynamic pass transistor circuits, Dynamic CMOS transmission gate logic, High performance Dynamic CMOS circuits.

UNIT-V:
Interconnect: Capacitive Parasitics, Resistive Parasitics, Inductive Parasitics, Advanced Interconncet Techniques.
Semiconductor Memories: Memory Types, RAM array organization, DRAM – Types, Operation, Leakage currents in DRAM cell and refresh operation, SRAM operation Leakage currents in SRAM cells, Flash Memory- NOR flash and NAND flash.
Designing Memory and Array Structures: Introduction, Memory Classification, Memory Architectures and Building Blocks, The Memory Core, Read Only Memories, Non-volatile Read-Write Memories, Read-Write Memories (RAM), Contents Addressable or Associative Memory (CAM), Memory Peripheral Circuitry, The Address Decoders, Sense Amplifiers, Voltage References, Drivers/Buffers, Timing and Control.

Text Books:
1. Digital Integrated Circuits – A Design Perspective, Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, 2nd Ed., PHI.
2. Digital Integrated Circuit Design – Ken Martin, Oxford University Press, 2011.

References:
1. CMOS Digital Integrated Circuits Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 3rd Ed., 2011.
2. CMOS VLSI Design – Neil H.E Weste, David harris, Ayan Banerjee 3rd Edition, Pearson



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Course Outcomes:
After going through this course the student will be able to

1. Understand the concepts of MOS Design.
2. Design and analysis of Combinational and Sequential MOS Circuits.
3. Extend the Digital IC Design to Different Applications.
4. Understand the Concepts of Semiconductor Memories, Flash Memory, RAM array organization.

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IV Year – I Semester		L	T	P	C
		3	0	0	3
RADAR ENGINEERING (PE-5)					

UNIT–I:

Basics of Radar: Introduction, Maximum Unambiguous Range, simple Radar range Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications. Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Illustrative Problems

Radar Equation : Modified Radar Range Equation, SNR, probability of detection, probability of False Alarm, Integration of Radar Pulses, Radar Cross Section of Targets (simple targets - sphere, cone-sphere), Creeping Wave, Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment), Illustrative Problems.

UNIT–II:

CW and Frequency Modulated Radar : Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar. Illustrative Problems

FM-CW Radar: Range and Doppler Measurement, Block Diagram and Characteristics, FM-CW altimeter, Multiple Frequency CW Radar.

UNIT-III:

MTI and Pulse Doppler Radar: Introduction, Principle, MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation, N^{th} Cancellation Staggered PRFs. Range Gated Doppler Filters. MTI Radar Parameters, Limitations to MTI Performance, MTI versus Pulse Doppler Radar.

UNIT –IV:

Tracking Radar: Tracking with Radar, Sequential Lobing, Conical Scan, Mono pulse Tracking Radar – Amplitude Comparison Mono pulse (one- and two- coordinates), Phase Comparison Mono pulse, Tracking in Range, Acquisition and Scanning Patterns, Comparison of Trackers.

UNIT –V:

Detection of Radar Signals in Noise : Introduction, Matched Filter Receiver – Response Characteristics and Derivation, Correlation detection and Cross-correlation Receiver, Efficiency of Non-matched Filters, Matched Filter with Non-white Noise, Noise Figure and Noise Temperature.

Radar Transmitters & Receivers –Displays – types. Duplexers – Branch type and Balanced type, Circulators as Duplexers. Introduction to Phased Array Antennas – Basic Concepts, Radiation Pattern, Beam Steering and Beam Width changes, Series versus parallel feeds, Applications, Advantages and Limitations. Radomes Modulators, solid state



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TEXT BOOKS:

1. Introduction to Radar Systems – Merrill I. Skolnik, TMH Special Indian Edition, 2nd Ed., 2007.

REFERENCE BOOKS:

1. Radar: Principles, Technology, Applications – Byron Edde, Pearson Education, 2004.
2. Radar Principles – Peebles, Jr., P.Z., Wiley, New York, 1998.
3. Principles of Modern Radar: Basic Principles – Mark A. Richards, James A. Scheer, William A. Holm, Yesdee, 2013
4. Radar Engineering – GSN Raju, IK International.

Course Outcomes:

After going through this course the student will be able to:

1. Derive the radar range equation and to solve some analytical problems.
2. Understand the different types of radars and its applications.
3. Understand the concept of tracking and different tracking techniques.
4. Understand the various components of radar receiver and its performance.

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IV Year – I Semester		L	T	P	C
		3	0	0	3
PATTERN RECOGNITION & MACHINE LEARNING (PE-5)					

Unit I

Introduction to Pattern Recognition: Problems, applications, design cycle, learning and adaptation, examples, Probability Distributions, Parametric Learning - Maximum likelihood and Bayesian Decision Theory- Bays rule, discriminate functions, loss functions and Bayesian error analysis

Unit II

Linear models: Linear Models for Regression, linear regression, logistic regression Linear Models for Classification

Unit III

Neural Network: perception, multi-layer perception, back propagation algorithm, error surfaces, practical techniques for improving back propagation, additional networks and training methods, Adboost, Deep Learning

Unit IV

Linear discriminate functions - decision surfaces, two-category, multi-category, minimum-squared error procedures, the Ho-Kashyap procedures, linear programming algorithms, Support vector machine

Unit V

Algorithm independent machine learning – lack of inherent superiority of any classifier, bias and variance, re-sampling for classifier design, combining classifiers
Unsupervised learning and clustering – k-means clustering, fuzzy k-means clustering, hierarchical clustering

TEXT BOOKS:

1. Richard O. Duda, Peter E. Hart, David G. Stork, “Pattern Classification”, 2nd Edition John Wiley & Sons,2001.
2. Machine learning by Saikat Dutt, S. Chandramouli and A.K.Das Pearso publishing, 2018.

REFERENCE BOOKS:

1. C. Bishop, “Pattern Recognition and Machine Learning”, Springer,2006
2. Trevor Hastie, Robert Tibshirani, Jerome H. Friedman, “The Elements of Statistical Learning”, 2nd Edition, Springer,2009.

Course Outcomes:

At the end of this course, students will be able to

1. Study the parametric and linear models for classification
2. Design neural network and SVM for classification
3. Develop machine independent and unsupervised learning techniques.

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IV Year – I Semester		L	T	P	C
		3	0	0	3
INTERNET OF THINGS (PE-5)					

UNIT I: Introduction to IoT Introduction to IoT, Architectural Overview, Design principles and needed capabilities, Basics of Networking, M2M and IoT Technology Fundamentals- Devices and gateways, Data management, Business processes in IoT, Everything as a Service (XaaS), Role of Cloud in IoT, Security aspects in IoT.

UNIT II: Elements of IoT Hardware Components- Computing- Arduino, Raspberry Pi, ARM Cortex-A class processor, Embedded Devices – ARM Cortex-M class processor, Arm Cortex-M0 Processor Architecture, Block Diagram, Cortex-M0 Processor Instruction Set, ARM and Thumb Instruction Set.

UNIT III: IoT Application Development Communication, IoT Applications, Sensing, Actuation, I/O interfaces. Software Components- Programming API‟s (using Python/Node.js/Arduino) for Communication Protocols-MQTT, ZigBee, CoAP, UDP, TCP, Bluetooth. Bluetooth Smart Connectivity Bluetooth overview, Bluetooth Key Versions, Bluetooth Low Energy (BLE) Protocol, Bluetooth, Low Energy Architecture, PSoC4 BLE architecture and Component Overview.

UNIT IV: Solution framework for IoT applications Implementation of Device integration, Data acquisition and integration, Device data storage Unstructured data storage on cloud/local server, Authentication, authorization of devices.

UNIT V: IoT Case Studies IoT case studies and mini projects based on Industrial automation, Transportation, Agriculture, Healthcare, Home Automation.
Cloud Analytics for IoT Application: Introduction to cloud computing, Difference between Cloud Computing and Fog Computing: The Next Evolution of Cloud Computing, Role of Cloud Computing in IoT, Connecting IoT to cloud, Cloud Storage for IoT Challenge in integration of IoT with Cloud.

Text Books:

1. Raj Kamal, “Internet of Things: Architecture and Design Principles”, 1st Edition, McGraw Hill Education, 2017.
2. The Definitive Guide to the ARM Cortex-M0 by Joseph Yiu,2011.
3. Vijay Madisetti, ArshdeepBahga, Internet of Things, “A Hands on Approach”, University Press, 2015.

References:

1. Cypress Semiconductor/PSoC4 BLE (Bluetooth Low Energy) Product Training Modules.
2. Pethuru Raj and Anupama C. Raman, “The Internet of Things: Enabling Technologies, Platforms, and Use Cases”, CRC Press, 2017.



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Course Outcomes:

The student will be able to:

1. Understand internet of Things and its hardware and software components.
2. Interface I/O devices, sensors & communication modules.
3. Remotely monitor data and control devices.
4. Design real time IoT based applications

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BASICS OF SIGNALS AND SYSTEMS (OE)					

Unit I:
Introduction: Definitions of a signal and a system, classification of signals, basic Operations on signals, elementary signals, Systems viewed as Interconnections of operations, properties of systems.

Unit II:
Time-domain representations for LTI systems: Convolution, impulse response representation, Convolution Sum and Convolution Integral. Properties of impulse response representation, Differential and difference equation Representations, Block diagram representations.

UNIT III:
Frequency-domain representation for signals: Introduction, Discrete-time and continuous-time Fourier series (derivation of series excluded) and their properties. Discrete-time and continuous-time Fourier transforms (derivations of transforms are excluded) and their properties.

Unit IV:
Applications of Fourier representations: Introduction, Frequency response of LTI systems, Fourier transform representation of periodic signals, Fourier transform representation of discrete time signals.

Unit V:
LAPLACE & Z-TRANSFORMS: Introduction**,** Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Properties of L.T's, Inverse Laplace transform, Relation between L.T's, and F.T. of a signal.
Z-Transforms: Introduction, Z-transform, properties of ROC, properties of Z – transforms, inversion Z-transforms. Z-Transform analysis of LTI Systems, unilateral Z-Transform and its application to solve difference equations

TEXT BOOKS:

1. A.V. Oppenheim, A.S. Willsky and S.H. Nawab, "Signals and Systems", Pearson, 2nd Edn.
2. B. P. Lathi, "Linear Systems and Signals", Second Edition, Oxford University Press,
3. Simon Haykin and Van Veen, "Signals & Systems", Wiley, 2nd Edition.

Reference Books:

1. Michel J. Robert, "Fundamentals of Signals and Systems", MGH International Edition, 2008.
2. Ramakrishna Rao,"Signals and Systems", 2008, TMH



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Course Outcomes:

1. Understand linear time invariant systems.
2. Apply the concepts of Fourier series representations to analyze continuous and discrete time periodic signals.
3. Understand and apply the continuous time Fourier transform, discrete time Fourier transform,
4. Apply the concepts of Laplace transform, and z-Transform to the analysis and description of LTI continuous and discrete-time systems

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ELECTRONIC MEASUREMENTS AND INSTRUMENTATION (OE)					

UNIT I

Performance characteristics of instruments, Static characteristics; Accuracy, Resolution, Precision, Expected value, Error, Sensitivity, Dynamic Characteristics, speed of response, Fidelity, Lag and Dynamic error. Types of errors in measurements and their analysis, Design of multi-range AC , DC meters (voltmeter &ammeter) and ohmmeter(series &shunt type) using D'arsonval movement. True rms meter.

UNIT II

Specifications and designing aspects of Signal Generators – AF sine and square wave signal generators, Function Generators, Random noise generators, Arbitrary waveform generators. Wave Analyzers, Harmonic Distortion Analyzers, Spectrum Analyzers, Digital Fourier Analyzers.

UNIT III

Oscilloscopes- general purpose CROs; block diagram , functions and implementation of various blocks, specifications, various controls and their functions , types of probes used in CROs. Measurement of frequency and phase difference using Lissajous patterns, Special purpose CROs; sampling oscilloscope, analog storage oscilloscope, digital storage oscilloscope

UNIT IV

Bridge circuits- Wheat stone bridge, measurement of very low resistance, Measurement of inductance- Maxwell's bridge, Anderson bridge, Measurement of capacitance-Schearing Bridge. Wien Bridge, Errors and precautions in using bridges, Q-meter; principle of operation, measurement methods and sources of errors, Counters: principle of operation -modes of operation- totalizing mode, frequency mode and time period mode- sources of errors.

UNIT V

Transducers- active & passive transducers: Resistance, Capacitance, inductance; Strain gauges, LVDT, Piezo Electric transducers. Measurement of physical parameters temperature, force, pressure, velocity, acceleration and displacement

TEXT BOOKS:

1. Electronic instrumentation, second edition - H.S. Kalsi, Tata McGrawHill, 2004.
2. Modern Electronic Instrumentation and Measurement Techniques – A.D. HelfrickandW.D. Cooper, PHI, 5th Edition, 2002.

REFERENCES:

1. Electronic Instrumentation & Measurements - David A. Bell, PHI, 3rd Edition,2013.
2. Electrical and Electronic Measurement and Instrumentation A.K. Sawhney. Dhanpat Rai & Co, 12thEdition,2002.

Course Outcomes:

The student will be able to

1. Select the instrument to be used based on the requirements.
2. Understand and analyze different signal generators and analyzers.
3. Understand the design of oscilloscopes for different applications.
4. Design different transducers for measurement of different parameters.

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PRINCIPLES OF SIGNAL PROCESSING (OE)					

Unit I:
Discrete Signals and Systems- A Review – Introduction to DFT – Properties of DFT – Circular Convolution – Filtering methods based on DFT – FFT Algorithms –Decimation in time Algorithms, Decimation in frequency Algorithms – Use of FFT in Linear Filtering.

Unit II:
Structures of IIR filters – Analog filter design – Discrete time IIR filter from analog filter – IIR filter design by Impulse Invariance, Bilinear transformation.

Unit III:
Structures of FIR filters – Linear phase FIR filter – Filter design using windowing techniques (Rectangular Window, Hamming Window, Hanning Window), Frequency sampling techniques

Unit IV:
Multirate signal processing: Basic building blocks of multirate DSP, Decimation, Interpolation, Sampling rate conversion by a rational factor, Multistage Sampling Rate Converters.

Unit V:
Adaptive Filters: Introduction, LMS and RLS Adaptation Algorithms, Applications of adaptive filtering to equalization, noise cancellation.

TEXT BOOKS:

1. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G.Manolakis, Pearson Education / PHI, 2007.
2. Discrete Time Signal Processing – A.V.Oppenheim and R.W. Schaffer, PHI

Reference Books:

1. Fundamentals of Digital Signal Processing using Matlab – Robert J. Schilling, Sandra L. Harris,Thomson, 2007.
2. Understanding Digital Signal Processing 2nd Edition by Richard G.Lyons

Course Outcomes:

1. Use the FFT algorithm for solving the DFT of a given signal
2. Design a Digital filter (FIR&IIR) from the given specifications
3. Realize the FIR and IIR structures from the designed digital filter.
4. Use the Multirate Processing concepts in various applications
5. Apply the Adaptive signal processing concepts to various signal processing applications

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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INDUSTRIAL ELECTRONICS (OE)					

UNIT - I
DC Amplifiers: Need for DC amplifiers, DC amplifiers - Drift, Causes, Darlington Emitter Follower, Cascode amplifier, Stabilization, Differential amplifiers - Chopper stabilization, Operational Amplifiers, Ideal specifications of Operational Amplifiers, Instrumentation Amplifiers.

UNIT - II
Regulated Power Supplies: Block diagram, Principle of voltage regulation, Series and Shunt type Linear Voltage Regulators, Protection Techniques - Short Circuit, Over voltage and Thermal Protection. Switched Mode & IC Regulators: Switched Mode voltage regulator, Comparison of Linear and Switched Mode Voltage Regulators, Servo Voltage Stabilizer, monolithic voltage regulators Fixed and Adjustable IC Voltage regulators, 3-terminal Voltage regulators - Current boosting .

UNIT - III SCR and Thyristor: Principles of operation and characteristics of SCR, Triggering of Thyristors, Commutation Techniques of Thyristors - Classes A, B, C, D, E and F, Ratings of SCR.

UNIT - IV Applications of SCR in Power Control: Static circuit breaker, Protection of SCR, Inverters - Classification, Single Phase inverters, Converters –single phase Half wave and Full wave. DIAC, TRIAC and Thyristor Applications: Chopper circuits – Principle, methods and Configurations, DIAC AND TRIAC, TRIACS – Triggering modes, Firing Circuits, Commutation.

UNIT – V Industrial Applications –
I: Industrial timers -Classification, types, Electronic Timers – Classification, RC and Digital timers, Time base Generators. Electric Welding Classification, types and methods of Resistance and ARC wielding, Electronic DC Motor Control. Industrial Applications –
II: High Frequency heating – principle, merits, applications, High frequency Source for Induction heating. Dielectric Heating – principle, material properties, Electrodes and their Coupling to RF generator, Thermal losses and Applications. Ultrasonics – Generation and Applications.

TEXTBOOKS:
1. Industrial and Power Electronics – G. K. Mithal and Maneesha Gupta, Khanna Publishers, 19th Ed., 2003.
2. Integrated Electronics – J. Millman and C.C Halkias, McGraw Hill, 1972

REFERENCE BOOKS:
1. Electronic Devices and circuits – Theodore. H. Bogart, Pearson Education, 6th Edn., 2003.
2. Thyristors and applications – M. Rammurthy, East-West Press, 1977.
3. Integrated Circuits and Semiconductor Devices – Deboo and Burroughs, ISE



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Course Outcomes:

1. Understand the concept of DC amplifiers.
2. Analyze and design different voltage regulators for real time applications
3. Describe the basis of SCR and Thyristor
4. Determine the performance of DIAC and TRIAC
5. Develop real time application using electronics

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CONSUMER ELECTRONICS (OE)					

Unit I:
Audio Systems: Microphones and Loudspeakers: Carbon, moving coil, cordless microphone, Direct radiating and horn loudspeaker, Multi-speaker system, Hi-Fi stereo and dolby system. Concept to fidelity, Noise and different types of distortion in audio system

Unit II:
Digital Audio Fundamentals:
Audio as Data and Signal, Digital Audio Processes Outlined, Time Compression and Expansion.

Unit III:
Television: Basics of Television: Elements of TV communication system, Scanning and its need, Need of synchronizing and blanking pulses, VSB, Composite Video Signal, Colour Television: Primary, secondary colours, Concept of Mixing, Colour Triangle, Camera tube, PAL TV Receiver, NTSC, PAL, SECAM

Unit IV:
Digital Transmission and Reception: Digital satellite television, Direct-To-Home(DTH) satellite television, Introduction to :Video on demand, CCTV, High Definition(HD)-TV. Introduction to Liquid Crystal and LED Screen Televisions Basic block diagram of LCD and LED Television and their comparison

Unit V:
Introduction to different type of domestic/commercial appliances: Operation of Micro-wave oven, Food Processors, Digital Electronic Lock, Vacuum cleaner, Xerox Machine, Scanner

Test Books:
1. Modern Television Practice by R. R. Gulai; New Age International Publishers.
2. Audio Video Systems by R. G. Gupta; McGraw Hill Education System.
3. Audio Video Systems Principles Practices and Troubleshooting by Bali & Bali; Khanna Publishing Company
4. Consumer Electronics by S. P. Bali; Pearson Education, New Delhi

Course Outcomes:
1. Understand the various type of microphones and loud speakers.
2. To identify the various digital and analog signal.
3. Describe the basis of television and composite video signal.
4. Describe the various kind of colour TV standards and system.
5. Compare the various types of digital TV system.
6. Understand the various type of consumer goods.

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FUNDAMENTALS OF MICROPROCESSORS AND MICROCONTROLLERS (OE)					

UNIT I
8085 PROCESSOR
Hardware Architecture, pinouts — Functional Building Blocks of Processor — Memory organization — I/O ports and data transfer concepts,Interrupts.
8086 Architecture: Main features, pin diagram/description, 8086 microprocessor family, internal architecture, interrupts and interrupt response, 8086 system timing, minimum mode and maximum mode configuration

UNIT II
8086 Programming: Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

UNIT-III
8086 Interfacing: Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheral interface, Interfacing switches and LEDS, Interfacing seven segment displays, software and hardware interrupt applications, Intel 8251 USART architecture and interfacing, Intel 8237a DMA controller, stepper motor, A/D and D/A converters, Need for 8259 programmable interrupt controllers.

UNIT IV
8051 MICRO CONTROLLER
Hardware Architecture, pinouts — Functional Building Blocks of Processor — Memory organization — I/O ports and data transfer concepts– Timing Diagram — Interrupts- Data Transfer, Manipulation, Control Algorithms& I/O instructions, Comparison to Programming concepts with 8085.

UNIT V
MICRO CONTROLLER PROGRAMMING & APPLICATIONS
Simple programming exercises- key board and display interface –Control of servo motor stepper motor control- Application to automation systems.

TEXTBOOKS:

1. R.S. Gaonkar, Microprocessor Architecture Programming and Application, with 8085, Wiley Eastern Ltd., New Delhi, 2013.
2. A.K Ray, K.M.Bhurchandhi," Advanced Microprocessor and Peripherals", Tata McGraw Hill Publications, 2000.
3. The 8051 Microcontrollers and Embedded systems Using Assembly and C, Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D.McKinlay; Pearson 2-Edition, 2011.

REFERENCEBOOKS:

1. Microprocessors and Interfacing – Programming and Hardware by Douglas V Hall, SSSP Rao, Tata Mc Graw Hill Education Private Limited,3rdEdition,1994

Course Outcomes:

At the end of this course the student will be able to:

1. Understand the architecture of microprocessor/microcontroller and their operation.
2. Demonstrate programming skills in assembly language for processors and controllers.
3. Analyze various interfacing techniques and apply them for the design of processor/Controller based systems.

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TRANSDUCERS AND SENSORS (OE)					

UNIT – I

Measurements and Instrumentation of Transducers: Measurements – Basic method of measurement – Generalized scheme for measurement systems – Units and standards – Errors – Classification of errors, error analysis – Statistical methods – Sensor – Transducer – Classification of transducers – Basic requirement of transducers.

UNIT – II

Characteristics of Transducers: Static characteristics – Dynamic characteristics – Mathematical model of transducer – Zero, first order and second order transducers – Response to impulse, step, ramp and sinusoidal inputs

UNIT – III

Resistive Transducers: Potentiometer –Loading effect – Strain gauge – Theory, types, temperature compensation – Applications – Torque measurement – Proving Ring – Load Cell – Resistance thermometer – Thermistors materials – Constructions, Characteristics – Hot wire anemometer

UNIT – IV

Inductive and Capacitive Transducer: Self inductive transducer – Mutual inductive transducers – Linear Variable Differential Transformer – LVDT Accelerometer – RVDT – Synchros – Microsyn – Capacitive transducer – Variable Area Type – Variable Air Gap type – Variable Permittivity type – Capacitor microphone.

UNIT- V Miscellaneous Transducers: Piezoelectric transducer – Hall Effect transducers – Smart sensors – Fiber optic sensors – Film sensors – MEMS – Nano sensors, Digital transducers

TEXT BOOKS:

1. Sawhney. A.K, "A Course in Electrical and Electronics Measurements and Instrumentation", 18th Edition, Dhanpat Rai & Company Private Limited, 2007.
2. Patranabis. D, "Sensors and Transducers", Prentice Hall of India, 2003.

REFERENCE BOOKS:

1. Renganathan. S, "Transducer Engineering", Allied Publishers, Chennai, 2003.
2. Doebelin. E.A, "Measurement Systems – Applications and Design", Tata McGraw Hill, New York, 2000
3. John. P, Bentley, "Principles of Measurement Systems", III Edition, Pearson Education, 2000. 4. Murthy. D. V. S, "Transducers and Instrumentation", Prentice Hall of India, 2001.
4. Sensor Technology Hand Book – Jon Wilson, Newne 2004.
5. Instrument Transducers – An Introduction to their Performance and design – by Herman K. P. Neubrat, Oxford University Press



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Course Outcomes:

At the end of the course, a student will be able to:

1. Use concepts in common methods for converting a physical parameter into an electrical quantity
2. Classify and explain with examples of transducers, including those for measurement of temperature, strain, motion, position and light
3. Choose proper sensor comparing different standards and guidelines to make sensitive measurements of physical parameters like pressure, flow, acceleration, etc
4. Predict correctly the expected performance of various sensors
5. Locate different type of sensors used in real life applications and paraphrase their importance
6. Set up testing strategies to evaluate performance characteristics of different types of sensors and transducers
7. develop professional skills in acquiring and applying the knowledge outside the classroom through design of a real-life instrumentation system.

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IOT AND APPLICATIONS (OE)					

UNIT I:

Introduction to IoT: Introduction to IoT, Architectural Overview, Design principles and needed capabilities, Basics of Networking, M2M and IoT Technology Fundamentals- Devices and gateways, Data management, Business processes in IoT, Everything as a Service (XaaS), Role of Cloud in IoT, Security aspects in IoT.

UNIT II:

Elements of IoT: Hardware Components- Computing- Arduino, Raspberry Pi, ARM Cortex-A class processor, Embedded Devices – ARM Cortex-M class processor, Arm Cortex-M0 Processor Architecture, Block Diagram, Cortex-M0 Processor Instruction Set, ARM and Thumb Instruction Set.

UNIT III:

IoT Application Development: Communication, IoT Applications, Sensing, Actuation, I/O interfaces.

Software Components- Programming API's (using Python/Node.js/Arduino) for Communication Protocols-MQTT, ZigBee, CoAP, UDP, TCP, Bluetooth.

Bluetooth Smart Connectivity Bluetooth overview, Bluetooth Key Versions, Bluetooth Low Energy (BLE) Protocol, Bluetooth, Low Energy Architecture, PSoC4 BLE architecture and Component Overview.

UNIT IV:

Solution framework for IoT applications: Implementation of Device integration, Data acquisition and integration, Device data storage- Unstructured data storage on cloud/local server, Authentication, authorization of devices.

UNIT V:

IoT Case Studies: IoT case studies and mini projects based on Industrial automation, Transportation, Agriculture, Healthcare, Home Automation. Cloud Analytics for IoT Application :Introduction to cloud computing, Difference between Cloud Computing and Fog Computing: The Next Evolution of Cloud Computing, Role of Cloud Computing in IoT, Connecting IoT to cloud, Cloud Storage for IoT Challenge in integration of IoT with Cloud.

Text Books:

1. Raj Kamal, "Internet of Things: Architecture and Design Principles", 1st Edition, McGraw Hill Education,2017.
2. The Definitive Guide to the ARM Cortex-M0 by JosephYiu,2011
3. Vijay Madisetti, Arshdeep Bahga, Internet of Things, "A Hands on Approach", UniversityPress,2015

References:

1. CypressSemiconductor/PSoC4BLE(BluetoothLowEnergy)ProductTrainingModules.
2. PethuruRajandAnupamaC.Raman,"TheInternetofThings:EnablingTechnologies,Platforms,andUse Cases",CRCPress,2017.



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Course Outcomes:

The student will be able to:

1. Understand internet of Things and its hardware and software components.
2. Interface I/O devices, sensors & communication modules.
3. Remotely monitor data and control devices.
4. Design real time IoT based applications

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SOFT COMPUTING TECHNIQUES (OE)					

UNIT –I:
Introduction to soft computing: Introduction, Artificial Intelligence, Artificial Neural Networks, Fuzzy systems, Genetic Algorithm and Evolutionary programming, Swarm Intelligent systems, Expert systems, Comparison among Intelligent systems.

UNIT –II:
Artificial Neural Networks: Introduction to Artificial Neural Networks, Classification of ANNS, First generation neural networks, Perceptron network, Adaline, Madaline, Second generation neural networks, Back propagation neural networks, Hopfield Neural Network, Kohonen neural network, Hamming neural network, Radial basis function neural networks, spike neuron models.

UNIT –III:
Fuzzy Logic System: Introduction to fuzzy logic, classical sets and fuzzy sets, fuzzy set operations, fuzzy relations, fuzzy composition, natural language and fuzzy interpretations, fuzzy inference system, fuzzy controllers

UNIT –IV:
Genetic Algorithm: Introduction to Genetic algorithms, Genetic algorithms, procedures of Gas, working of Gas, Travelling sales man problem, Evolutionary programming, working principle of GA Machine learning classifier system

UNIT –V:
Swarm Intelligent system: Introduction to swarm intelligence, back ground, Ant colony system, working of ant colony optimization, Particle swarm intelligent systems, Artificial bee colony system, cuckoo search algorithm..

TEXT BOOKS:

1. Soft computing with MATLAB programming—N.P.Padhy, S.P.Simon, Oxford university press, 2015
2. Neural Networks and Fuzzy Systems - Kosko, B., Prentice-Hall of India Pvt. Ltd., 1994.
3. Introduction to Artificial Neural Systems-Jacek.M.Zurada, Jaico Publishing House,1999

REFERENCE BOOKS:

1. Fuzzy Sets, Uncertainty and Information - Klir G.J. &Folger T.A., Prentice-Hall of IndiaPvt. Ltd., 1993.
2. Fuzzy Set Theory and Its Applications - Zimmerman H.J. Kluwer Academic Publishers, 1994.
3. Introduction to Fuzzy Control - Driankov, Hellendroon, Narosa Publishers.
4. Artificial Neural Networks - Dr. B. Yagananarayana, 1999, PHI, New Delhi.
5. Elements of Artificial Neural Networks - KishanMehrotra, Chelkuri K. Mohan, Sanjay Ranka, Penram International.

6. Artificial Neural Network –Simon Haykin, 2nd Ed., Pearson Education.
7. Introduction Neural Networks Using MATLAB 6.0 - S.N. Shivanandam, S. Sumati, S. N. Deepa,1/e, TMH, New Delhi.

Course Outcomes:

1. Develop intelligent systems leveraging the paradigm of soft computing techniques.
2. Implement, evaluate and compare solutions by various soft computing approaches for finding the optimal solutions.
3. Recognize the feasibility of applying a soft computing methodology for a particular problem
4. Design the methodology to solve optimization problems using fuzzy logic, genetic algorithms and neural networks.
5. Design hybrid system to revise the principles of soft computing in various application

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IC APPLICATIONS (OE)					

Unit I:
Ideal and Practical Op-Amp, Op-amp characteristics-DC and AC Characteristics, General Linear Applications of Op-Amp: Adder, Subtractor, Differentiators and Integrators, Active Filters and Oscillators, Non linear Applications of OPAMP: Comparators, Schmitt Trigger, Multivibrators

Unit II:
Introduction to 555 Timer, Functional Diagram, Monostable and Astable Operations and Applications, Schmitt Trigger, PLL- Introduction, Block Schematic, Principles and Description of individual Blocks of 565, VCO.

Unit III:
Introduction, Basic DAC Techniques - Weighted Resistor Type. R-2R Ladder Type, inverted R-2R Type. Different types of ADCs - Parallel Comparator Type. Counter Type. Successive Approximation Register Type and Dual Slope Type DAC and ADC Specifications.

Unit IV:
Use of TTL-74XX Series & CMOS 40XX Series ICs, TTL ICs - Code Converters, Decoders, Demultiplexers, Encoders, Priority Encoders, multiplexers & their applications. Priority Generators, Arithmetic Circuit ICs-Parallel Binary Adder/Subtractor Using 2's Complement System, Magnitude Comparator Circuits.

Unit V:
Commonly Available 74XX & CMOS 40XX Series ICs - RS, JK.JK Master-Slave. D and T Type Flip-Flops & their Conversions, Synchronous and asynchronous counters. Decade counters. Shift Registers & applications.

TEXT BOOKS:
1. Linear Integrated Circuits -D. Roy Chowdhury, New Age International (p)Ltd, 3" Ed., 2008.
2. Digital Fundamentals - Floyd and Jain, Pearson Education,8th Edition, 2005.

REFERENCE BOOKS:
1. Modern Digital Electronics - RP Jain - 4/e - TMH, 2010.
2. Op-Amps & Linear ICs - Ramakanth A. Gayakwad, PHI, 1987.

Course Outcomes:
1. Analyse the Differential Amplifier with Discrete components
2. Describe the Op-Amp and internal Circuitry: 555 Timer, PLL
3. Discuss the Applications of Operational amplifier: 555 Timer, PLL
4. Design the digital application using digital ICs
5. Use the Op-Amp in A to D & D to A Converters

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PRINCIPLES OF COMMUNICATIONS (OE)					

UNIT-1

Amplitude modulation: Introduction, Amplitude Modulation: Time & Frequency – Domain description, switching modulator, Envelop detector.

Double side band-suppressed carrier modulation: Time and Frequency – Domain description, Ring modulator, Coherent detection, Costas Receiver, Quadrature Carrier Multiplexing.

Single side–band and vestigial sideband methods of modulation: SSB Modulation, VSB Modulation, Frequency Translation, Frequency- Division Multiplexing, Theme Example: VSB Transmission of Analog and Digital Television

UNIT-II

Angle modulation: Basic definitions, Frequency Modulation: Narrow Band FM, Wide Band FM, Transmission bandwidth of FM Signals, Generation of FM Signals, Demodulation of FM Signals, FM Stereo Multiplexing,

UNITIII

Signal Sampling and Analog Pulse Communication: Ideal Sampling, Pulse Amplitude Modulation, Pulse Width Modulation, Pulse Position Modulation. Digital Communication Techniques: Quantization, Digital Transmission of Data, Parallel and Serial Transmission, Data Conversion, Pulse Code Modulation, Delta Modulation.

UNIT-IV

Noise in analog modulation: Introduction, Receiver Model, Noise in DSB-SC receivers, Noise in AM receivers, Threshold effect, Noise in FM receivers, Capture effect, FM threshold effect, FM threshold reduction, Pre-emphasis and De-emphasise in FM.

UNIT-V

Transmission of Binary Data in Communication Systems: Digital Codes, Principles of Digital Transmission, Transmission Efficiency, Modem Concepts and Methods – FSK, BPSK, Error Detection and Correction

Text Books:

1. Principles of Communication Systems – H Taub& D. Schilling, GautamSahe, TMH, 2007, 3rdEdition.
2. Communication Systems – B.P. Lathi, BS Publication,2006.

References:

1. Principles of Communication Systems - Simon Haykin, John Wiley,2ndEdition.
2. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004.
3. Communication Systems– R.P. Singh, SP Sapre, Second Edition TMH,2007.



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Course Outcomes:

At the end of the course, students will be able to:

1. Analyze the performance of analog modulation schemes in time and frequency domains.
2. Analyze the performance of angle modulated signals.
3. Characterize analog signals in time domain as random processes and noise
4. Characterize the influence of channel on analog modulated signals
5. Determine the performance of analog communication systems in terms of SNR
6. Analyze pulse amplitude modulation, pulse position modulation, pulse code modulation and TDM systems.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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BASIC ELECTRONICS (OE)					

Unit I: Semiconductor Basics: Atomic Structure, Semiconductors, Conductors, and Insulators, Covalent Bonds, Conduction in Semiconductors, N-Type and P-Type Semiconductors, Diode, Biasing a Diode, Voltage-Current Characteristic of a Diode, Diode Models.
Diode Applications: Half- Wave Rectifiers, Full-Wave Rectifiers, Power Supply Filters and Regulators.

Unit II: Special-Purpose Diodes: Zener Diodes, Zener Diode Applications, Varactor Diodes, Optical Diodes

Unit III: Bipolar junction Transistors: Transistor Structure, Basic Transistor Operation, Transistor Characteristics and Parameters, Transistor as an Amplifier and Switch

Unit IV: Field-Effect Transistors (FETs): JFET, Characteristics and Parameters, JFET Biasing, MOSFET Characteristics and Parameters

Unit V: Thyristors and Other Devices: Basic 4-Layer Device, The Silicon-Controlled Rectifier, SCR Applications, Unijunction Transistor , IGBT, Phototransistor, Light-Activated SCR, Optical Couplers

Text Books:

1. Electronic Devices conventional current version By Floyd, Seventh Edition, Pearson publications

References:

1. Electronics devices & circuit theory- Robert L.Boylestad and Loui Nashelsky, Pearson/Prentice hall, tenth edition, 2009
2. Electronic Devices and Circuits- J. Millman, C. Halkias, Tata Mc-Graw Hill, SecondEdition,2007

Course Outcomes:

At the end of this course the student will be able to

1. Understand the formation of p-n junction and how it can be used as a p-n junction as diode in different modes of operation.
2. Know the construction, working principle of rectifiers with and without filters with relevant expressions and necessary comparisons.
3. Understand the construction, principle of operation of transistors,

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DATA COMMUNICATIONS (OE)					

UNIT I:
Introduction to Data Communications: Components, Data Representation, Data Flow, Networks-Distributed Processing, Network Criteria, Physical Structures, Network Models, Categories of Networks Interconnection of Networks, The Internet - A Brief History, The Internet Today, Protocol and Standards - Protocols, Standards, Standards Organizations, Internet Standards. Network Models, Layered Tasks, OSI model, Layers in OSI model, TCP/IP Protocol Suite, Addressing Introduction, Wireless Links and Network Characteristics, WiFi: 802.11 Wireless LANs -The 802.11 Architecture,

UNIT II:
Data Link Layer: Links, Access Networks, and LANs- Introduction to the Link Layer, The Services Provided by the Link Layer, Types of errors, Redundancy, Detection vs Correction, Forward error correction Versus Retransmission Error-Detection and Correction Techniques, Parity Checks, Check summing Methods, Cyclic Redundancy Check (CRC) , Framing, Flow Control and Error Control protocols , Noisy less Channels and Noisy Channels, HDLC, Multiple Access Protocols, Random Access ,ALOHA, Controlled access, Channelization Protocols. 802.11 MAC Protocol, IEEE 802.11 Frame.

UNIT III:
The Network Layer: Introduction, Forwarding and Routing, Network Service Models, Virtual Circuit and Datagram Networks-Virtual-Circuit Networks, Datagram Networks, Origins of VC and Datagram Networks, Inside a Router-Input Processing, Switching, Output Processing, Queuing, The Routing Control Plane, The Internet Protocol(IP):Forwarding and Addressing in the Internet-Datagram format, Ipv4 Addressing, Internet Control Message Protocol(ICMP), IPv6

UNIT IV:
Transport Layer: Introduction and Transport Layer Services : Relationship Between Transport and Network Layers, Overview of the Transport Layer in the Internet, Multiplexing and Demultiplexing, Connectionless Transport: UDP -UDP Segment Structure, UDP Checksum, Principles of Reliable Data Transfer-Building a Reliable Data Transfer Protocol, Pipelined Reliable Data Transfer Protocols, Go-Back-N(GBN), Selective Repeat(SR), Connection Oriented Transport: TCP - The TCP Connection, TCP Segment Structure, Round-Trip Time Estimation and Timeout, Reliable Data Transfer, Flow Control, TCP Connection Management, Principles of Congestion Control - The Cause and the Costs of Congestion, Approaches to Congestion Control

UNIT V:
Application Layer: Principles of Networking Applications – Network Application Architectures, Processes Communicating, Transport Services Available to Applications, Transport Services Provided by the File Transfer: FTP,- FTP Commands and Replies, Electronic Mail in the Internet- STMP, Comparison with HTTP, DNS-The Internet's Directory Service – Service Provided by DNS, Overview of How DNS Works, DNS Records and messages.

TEXT BOOKS:

1. Computer Networking A Top-Down Approach – Kurose James F, Keith W, 6thEdition , Pearson,2017.
2. Data Communications and Networking Behrouz A.Forouzan4th Edition McGraw Hill Education,2017.

REFERENCES:

1. Data communication and Networks - Bhusan Trivedi, Oxford university press, 2016
2. Computer Networks -- Andrew S Tanenbaum, 4th Edition, Pearson Education, 2003.
3. Understanding Communications and Networks, 3rd Edition, W.A.Shay, Cengage Learning, 2003.

Course Outcomes:

Upon completing this course, the student will be able to

1. Know the Categories and functions of various Data communication Networks
2. Design and analyze various error detection techniques.
3. Demonstrate the mechanism of routing the data in network layer
4. Know the significance of various Flow control and Congestion control Mechanisms

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DIGITAL LOGIC DESIGN (OE)					

UNIT – I
REVIEW OF NUMBER SYSTEMS & CODES:
Representation of numbers of different radix, conversation from one radix to another radix, r-1's compliments and r's compliments of signed members, Gray code ,4 bit codes; BCD, Excess-3, 2421, 84-2-1 code etc. Error detection & correction codes: parity checking, even parity, odd parity, Hamming code.
BOOLEAN THEOREMS AND LOGIC OPERATIONS:
Boolean theorems, principle of complementation & duality, De-morgan theorems, Logic operations ; Basic logic operations -NOT, OR, AND, Universal Logic operations, EX-OR, EX- NOR operations. Standard SOP and POS Forms, NAND-NAND and NOR-NOR realizations, Realization of three level logic circuits. Study the pin diagram and obtain truth table for the following relevant ICs 7400,7402,7404,7408,7432,7486.

UNIT – II
MINIMIZATION TECHNIQUES:
Minimization and realization of switching functions using Boolean theorems, K-Map (up to 6 variables)and tabular method(Quine-mccluskey method) with only four variables and single function.
COMBINATIONAL LOGIC CIRCUITS DESIGN:
Design of Half adder, full adder, half subtractor, full subtractor, applications of full adders; 4-bit adder-subtractor circuit, BCD adder circuit, Excess 3 adder circuit and carry look-a-head adder circuit, Design code converts using Karnaugh method and draw the complete circuit diagrams.

UNIT – III
COMBINATIONAL LOGIC CIRCUITS DESIGN USING MSI &LSI :
Design of encoder ,decoder, multiplexer and de-multiplexers, Implementation of higher order circuits using lower order circuits . Realization of Boolean functions using decoders and multiplexers, Design of Priority encoder, 4-bit digital comparator and seven segment decoder. . Study the relevant ICs pin diagrams and their functions 7442,7447,7485,74154.
INTRODUCTION OF PLD's :
PLDs: PROM, PAL, PLA -Basics structures, realization of Boolean functions, Programming table.

UNIT – IV
SEQUENTIAL CIRCUITS I:
Classification of sequential circuits (synchronous and asynchronous) , operation of NAND & NOR Latches and flip-flops; truth tables and excitation tables of RS flip-flop, JK flip-flop, T flip-flop, D flip-flop with reset and clear terminals. Conversion from one flip-flop to another flip- flop, Design of 5ripple counters, design of synchronous counters, Johnson counter, ring counter. Design of registers - Buffer register, control buffer register, shift register, bi-directional shift register, universal shift, register, Study the following relevant ICs and their relevant functions 7474,7475,7476,7490,7493,74121.

UNIT – V
SEQUENTIAL CIRCUITS II :
Finite state machine; state diagrams, state tables, reduction of state tables. Analysis of clocked sequential circuits Mealy to Moore conversion and vice-versa, Realization of sequence generator, Design of Clocked Sequential Circuit to detect the given sequence (with overlapping or without overlapping)

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TEXT BOOKS:

1. Switching and finite automata theory Zvi.KOHAVI, Niraj.K. Jha 3rdEdition,Cambridge UniversityPress,2009
2. Digital Design by M.Morris Mano, Michael D Ciletti,4th edition PHIpublication,2008
3. Switching theory and logic design by Hill and Peterson**,** Mc-Graw Hill TMH edition, 2012.

REFERENCES:

1. FundamentalsofLogicDesignbyCharlesH.RothJr,JaicoPublishers,2006
2. DigitalelectronicsbyRSSedha.S.Chand&companylimited,2010
3. SwitchingTheoryandLogicDesignbyA.AnandKumar,PHILearningpvtltd,2016.
4. DigitallogicapplicationsanddesignbyJohnMYarbough,Cengagelearning,2006.
5. TTL74-Seriesdatabook.

Course Outcomes:

1. Classify different number systems and apply togenerate various codes.
2. Use the concept of Boolean algebra in minimization of switching functions
3. Design different types of combination allogic circuits.
4. Apply knowledge offlip-flops in designing of Registers and counters
5. The operation and design methodology for synchronous sequential circuits and algorithmic state machines
6. Produce innovative designs by modifying the traditional design techniques

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REMOTE SENSING AND GIS (OE)					

UNIT – I

Introduction to Photogrammetry: Principles& types of aerial photograph, geometry of vertical aerial photograph, Scale & Height measurement on single vertical aerial photograph, Height measurement based on relief displacement, Fundamentals of stereoscopy, fiducial points, parallax measurement using fiducial line.

UNIT – II

Remote Sensing: Basic concept of remote sensing, Data and Information, Remote sensing data Collection, Remote sensing advantages & Limitations, Remote Sensing process. Electro-magnetic Spectrum, Energy interactions with atmosphere and with earth surface features (soil, water, vegetation), Indian Satellites and Sensors characteristics, Resolution, Map and Image and False color composite, introduction to digital data, elements of visual interpretation techniques.

UNIT – III

Geographic Information Systems: Introduction to GIS; Components of a GIS; Geospatial Data: Spatial Data-Attribute data – Joining Spatial and Attribute data; GIS Operations: Spatial Data Input- Attribute data Management –Data display- Data Exploration- Data Analysis. COORDINATE SYSTEMS: Geographic Coordinate System: Approximation of the Earth, Datum; Map Projections: Types of Map Projections-Map projection parameters

UNIT – IV

Vector Data Model: Representation of simple features- Topology and its importance; coverage and its data structure, Shape file; Data models for composite features Object Based Vector Data Model; Classes and their Relationship; The geobase data model; Geometric representation of Spatial Feature and data structure, Topology rules

UNIT – V

Raster Data Model: Elements of the Raster data model, Types of Raster Data, Raster Data Structure, Data Conversion, Integration of Raster and Vector data. Data Input: Metadata, Conversion of Existing data, creating new data; Remote Sensing data, Field data, Text data, Digitizing, Scanning, on screen digitizing, importance of source map, Data Editing

TEXT BOOKS:

1. Remote Sensing and GIS Lillesand and Kiefer, John Willey 2008.
2. Remote Sensing and GIS B. Bhatta by Oxford Publishers 2015.
3. Introduction to Geographic Information System – Kang-Tsung Chang, McGraw-Hill 2015



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REFERENCES:

1. Concepts & Techniques of GIS by C. P. Lo Albert, K.W. Yonng, Prentice Hall (India) Publications.
2. Principals of Geo physical Information Systems – Peter A Burragh and Rachael A. Mc Donnell, Oxford Publishers 2004.
3. Basics of Remote sensing & GIS by S. Kumar, Laxmi Publications

Course Outcomes: At the end of the course, the student will be able to:

1. Retrieve the information content of remotely sensed data
2. Analyze the energy interactions in the atmosphere and earth surface features
3. Interpret the images for preparation of thematic maps
4. Apply problem specific remote sensing data for engineering applications
5. Analyze spatial and attribute data for solving spatial problems
6. Create GIS and cartographic outputs for presentation

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BIO MEDICAL INSTRUMENTATION (OE)					

UNIT-I

Sources of Bioelectric potentials and Electrodes: Resisting and Action Potentials, Propagation of Action Potentials, The Bioelectric Potentials. Electrodes: Electrode theory, Bio Potential Electrodes, Biochemical Transducers, introduction to bio-medical signals

UNIT-II

The Cardiovascular System: The Heart and Cardiovascular System, The Heart, Blood Pressure, Characteristics of Blood Flow, Heart Sounds, Cardio Vascular Measurements, Electrocardiography, Measurement of Blood Pressure, Measurement of Blood Flow and Cardiac output, Plethysmography, Measurement of Heart Sounds, Event detection, PQRS & T-Waves in ECG, the first & second Heart beats, ECG rhythm analysis, the di-crotic notch in the carotid pulse detection of events and waves, analysis of exercise ECG, analysis of event related potentials, correlation analysis of EEG channels, correlation of muscular contraction.

UNIT- III

Patient Care & Monitory and Measurements in Respiratory System: The elements of Intensive Care Monitory, Diagnosis, Calibration and reparability of Patient Monitoring equipment, other instrumentation for monitoring patients, pace makers, defibrillators, the physiology of respiratory system, tests and instrumentation for mechanics of breathing, respiratory theory equipment, analysis of respiration.

UNIT-IV

Bio telemetry and Instrumentation for the clinical laboratory Introduction to bio telemetry, Physiological parameters adaptable to bio telemetry, the components of bio telemetry system, implantable units, applications of telemetry in patient care – The blood, tests on blood cells, chemical test, automation of chemical tests.

UNIT-V

X-ray and radioisotope instrumentation and electrical safety of medical equipment:
Generation of Ionizing radiation, instrumentation for diagnostic X-rays, special techniques, instrumentation for the medical use of radioisotopes, radiation therapy - Physiological effects of electrical current, shock Hazards from electrical equipment, Methods of accident prevention, Modern Imaging Systems: Tomography, Magnetic resonance Imaging System, Ultrasonic Imaging System, Medical Thermography

TEXT BOOK:

1. Biomedical Instrumentation and Measurements – C. Cromwell, F.J. Weibell, E.A.Pfeiffer – Pearson education.
2. Biomedical signal analysis – Rangaraj, M. Rangayya – Wiley Inter science – John willey & Sons Inc.

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Reference:

1. Hand Book of Bio-Medical Instrumentation – R.S. Khandpur, (TMH)
2. Introduction to Bio-Medical Engineering – Domach, (Pearson)
3. Introduction to Bio-Medical Equipment Technology – Cart, (Pearson)

Course outcomes:

1. Apply principles and concepts of electronics to analyze input and output signals in medical electronics
2. Apply principles and concepts of electronics to design filters for de-noising of medical measurements
3. Recognize different types of transducers, ongoing progress in improving their design, and their application in medical measurements
4. Apply principles and concepts of engineering to quantify and model measurements of biopotentials
5. Apply principles and concepts of sensing and engineering to (i) design diagnostic devices for detection of markers in biofluids, and (ii) be able to evaluate quality of diagnostic devices
6. Apply engineering tools to evaluate parameters needed for point-of-care health screening and mobile-health, and design of appropriate point-of-care diagnostic devices

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POOL-1 (HONOR)		L	T	P	C
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Data Acquisition Systems

UNIT-1
INTRODUCTION: Objective of a DAS, single channel DAS, Multi-channel DAS, Components used in DAS– Converter Characteristics-Resolution-Non-linearity, settling time, Monotonicity.

UNIT-2
ANALOG TO DIGITAL CONVERTERS (ADCS): Classification of A/D Converters, Parallel feed back – Successive approximation – Ramp comparison – Dual slope integration – Voltage to frequency – Voltage to Time – Logarithmic types of ADCS.
NON-LINEAR DATA CONVERTERS (NDC): Basic NDC configurations – Some common NDACS and NADCS – Programmable non-linear ADCS – NADC using optimal sized ROM – High speed hybrid NADC – PLS based NADC – Switched capacitor NDCS.
ADC APPLICATIONS: Data Acquisition systems – Digital signal processing systems – PCM voice communication systems – Test and measurement instruments – Electronic weighing machines.

UNIT-3
DIGITAL TO ANALOG CONVERTERS (DACS): Principles and design of – Parallel R– 2R, Weighted resistor, inverted ladder, D/A decoding – Codes other than ordinary binary.
DATA CONVERTER APPLICATIONS: DAC applications – Digitally programmable V/I sources – Arbitrary waveform generators – Digitally programmable gain amplifiers – Analog multipliers/ dividers – Analog delay lines.

UNIT-4
Monolithic data converters: typical study of monolithic DACS and ADCS. Interfacing of DACS and ADCS to a μP

UNIT-5
Error budget of DACS and ADCS: Error sources, error reduction and noise reduction Techniques in DAS, Error budget analysis of DAS, case study of a DAC and an ADC

TEXT BOOKS:
1. Electronic data converters fundamentals and applications – Dinesh K. Anvekar, B.S. Sonde – Tata McGraw Hill

REFERENCES:
1. Electronic Analog/ Digital conversions – Hermann Schmid – Tata McGraw Hill.
2. E.R. Hanateck, User's Handbook of D/A and A/D converters – Wiley
3. Electronic instrumentation by HS Kalsi- TMH 2 ndEdition, 2004.
4. Data converters by G.B. Clayton

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Course Outcomes:

1. Be able to identity a data acquisition system.
2. Be able to prescribe a sensor type to measure a specific environmental change.
3. Be able to determine what type of amplifier is needed for a specific sensor output.
4. Be familiar with different forms of signal conditioning.
5. Be familiar with different methods of Analog-to-Digital conversion.
6. Be able to identify the type of interface used to get a digital signal into a microprocessor.

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POOL-1 (HONOR)		L	T	P	C
		3	1	0	4
ADAPTIVE CONTROL SYSTEMS					

Unit-1:
Introduction: Definitions, History of adaptive Control, Essential aspects of adaptive control, Classification of adaptive control system: Feedback adaptive controllers, Feed forward adaptive controllers, Why adaptive control?

Unit-2:
Model Reference Adaptive System: Different configuration of model reference adaptive Systems, classification of MRAS, Mathematical description, and Equivalent representation as a nonlinear time-varying system, direct and indirect MRAS.

Unit-3:
Analysis and Design of Model Reference Adaptive Systems: Model reference control with local parametric optimization (Gradient method), MIT rule, MRAS for a first order system, MRAS based on Lyapunov stability theory, Design of a first order MRAS based on stability theory, Hyperstability approach, Monopoli's augmented error approach.

Unit-4:
Self Tuning Regulators: Introduction: The basic idea; process models, disturbance models, General linear difference equation models, model simplification, Different approaches to self-tuning, Recursive Parameter Estimation Methods: The RLS method, extended Least squares, Recursive instrumental variable method; U-D factorization, Covariance resulting, variable data forgetting, Estimation accuracy, Direct and Indirect Self-tuning regulators, Clarke and Gawthrop's Self tuning Controller, Pole Placement approach to self tuning control; Connection between MRAS and STR.

Unit 5:
Gain Scheduling: Introduction, The Principal, Design of Gain Scheduling Regulators, Nonlinear transformations, Applications of gain scheduling Alternatives to Adaptive Control: Why not Adaptive Control? Robust High gain feedback control, Variable Structure schemes, Practical aspects, application and Perspectives on adaptive control.

References Books:

1. B Landau, Adaptive Control - The Model Reference Approach, New York; Marcel Dekker, 1979.
2. K. J. Astrom and B. Wittenmark, Adaptive Control, Addison Wesley Publication Company, 1989.
3. B. Roffel, P. J. Vermeer, P. A. Chin, Simulation and Implementation of self Tuning Controllers, Prentice-Hall, Englewood cliffs, NJ, 1989.
4. R. Isermann, K. Lashmann and D. Marko, Adaptive Control Systems, Printice-Hall International (UK) Ltd. 1992.
5. K. S. Narendra and A. M. Annaswamy, Stable Adaptive Systems



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Course Outcomes:

CO1: Design identifiers and adaptive controllers for linear systems
CO2: Design Adaptive feedback linearizing control systems for nonlinear systems
CO3: Apply the concept of different types of optimal control for solving problems
CO 4 Apply the concept of calculus of variation and principal of optimality for solving problems
CO 5 Apply the concept of Linear Quadratic method for solving problems
CO 6 Apply the concept of adaptive control technique for solving problems



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POOL-1 (HONOR)		L	T	P	C
		3	1	0	4
BIO-MEDICAL INSTRUMENTATION					

UNIT-I

Sources of Bioelectric potentials and Electrodes: Resisting and Action Potentials, Propagation of Action Potentials, The Bioelectric Potentials. Electrodes: Electrode theory, Bio Potential Electrodes, Biochemical Transducers, introduction to bio-medical signals

UNIT-II

The Cardiovascular System: The Heart and Cardiovascular System, The Heart, Blood Pressure, Characteristics of Blood Flow, Heart Sounds, Cardio Vascular Measurements, Electrocardiography, Measurement of Blood Pressure, Measurement of Blood Flow and Cardiac output, Plethysmography, Measurement of Heart Sounds, Event detection, PQRS & T-Waves in ECG, the first & second Heart beats, ECG rhythm analysis, the di-crotic notch in the carotid pulse detection of events and waves, analysis of exercise ECG, analysis of event related Potentials, correlation analysis of EEG channels, correlation of muscular contraction.

UNIT- III

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UNIT-IV

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UNIT-V

X-ray and radioisotope instrumentation and electrical safety of medical equipment: Generation of Ionizing radiation, instrumentation for diagnostic X-rays, special techniques, instrumentation for the medical use of radioisotopes, radiation therapy - Physiological effects of electrical current, shock Hazards from electrical equipment, Methods of accident prevention, Modern Imaging Systems: Tomography, Magnetic resonance Imaging System, Ultrasonic Imaging System, Medical Thermography

TEXT BOOK:

1. Biomedical Instrumentation and Measurements – C. Cromwell, F.J. Weibell, E.A.Pfeiffer – Pearson education.
2. Biomedical signal analysis – Rangaraj, M. Rangayya – Wiley Inter science – John Willey & Sons Inc.

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Reference:

1. Hand Book of Bio-Medical Instrumentation – R.S. Khandpur, (TMH)
2. Introduction to Bio-Medical Engineering – Domach, (Pearson)
3. Introduction to Bio-Medical Equipment Technology – Cart, (Pearson)

Course outcomes:

1. Apply principles and concepts of electronics to analyze input and output signals in medical electronics
2. Apply principles and concepts of electronics to design filters for de-noising of medical measurements
3. Recognize different types of transducers, ongoing progress in improving their design, and their application in medical measurements
4. Apply principles and concepts of engineering to quantify and model measurements of bio potentials
5. Apply principles and concepts of sensing and engineering to (i) design diagnostic devices for detection of markers in bio fluids, and (ii) be able to evaluate quality of diagnostic devices
6. Apply engineering tools to evaluate parameters needed for point-of-care health screening and mobile-health, and design of appropriate point-of-care diagnostic devices



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POOL-1 (HONOR)		L	T	P	C
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DIGITAL CONTROL SYSTEMS					

UNIT –I:
Sampling and Reconstruction: Introduction, sample and hold operations, Sampling theorem, Reconstruction of original sampled signal to continuous-time signal.
The Z – Transforms: Introduction, Linear difference equations, pulse response, Z – transforms, Theorems of Z –Transforms, the inverse Z – transforms, Modified Z- Transforms.
Z-Plane Analysis of Discrete-Time Control System: Z-Transform method for solving difference equations; Pulse transforms function, block diagram analysis of sampled – data systems, mapping between s-plane and z-plane: Primary strips and Complementary Strips.

UNIT –II:
State Space Analysis: State Space Representation of discrete time systems, Pulse Transfer Function Matrix solving discrete time state space equations, State transition matrix and its Properties, Methods for Computation of State Transition Matrix, Discretization of continuous time state – space equations

UNIT –III:
Controllability and Observability: Concepts of Controllability and Observability, Tests for controllability and Observability, Duality between Controllability and Observability, Controllability and Observability conditions for Pulse Transfer Function.
Stability Analysis: Stability Analysis of closed loop systems in the Z-Plane, Jury stablility test – Stability Analysis by use of the Bilinear Transformation and Routh Stability criterion, Stability analysis using Liapunov theorems.

UNIT –IV:
Design of Discrete Time Control System by Conventional Methods: Design of digital control based on the frequency response method – Bilinear Transformation and Design procedure in the W-plane, Lead, Lag and Lead-Lag compensators and digital PID controllers. Design digital control through deadbeat response method.

UNIT –V:
State Feedback Controllers and Observers: Design of state feedback controller through pole placement – Necessary and sufficient conditions, Ackerman's formula, State Observers – Full order and Reduced order observers. Introduction to Kalman filters, State estimation through Kalman filters, introduction to adaptive controls.

TEXT BOOKS:
1. K. Ogata - "Discrete-Time Control systems" - Pearson Education/PHI, 2nd Edition.
2. M.Gopal - "Digital Control and State Variable Methods"- TMH

REFERENCE BOOKS:
1. Kuo - "Digital Control Systems"- Oxford University Press, 2nd Edition, 2003.
2. M. Gopal - "Digital Control Engineering".



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Course outcomes:

1. Design a pure, two-pole system that satisfies specified performance specifications like percent overshoot, peak time, settling time, and DC gain.
2. Calculate the z-plane location of a pair of dominant poles given time-domain performance information like percent overshoot, settling time, and peak time.
3. Create discrete equivalents from given continuous-time systems,
4. Able to Construct a discrete-time difference equation containing input variables and output variables at particular time instances from a system's discrete-time transfer function.
5. Numerically compute the value of any system variable (e.g., state variable or output variable) at any discrete, time instant given initial conditions and input waveforms.

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POOL-1 (HONOR)		L	T	P	C
		3	1	0	4
PROCESS CONTROL INSTRUMENTATION					

UNIT-1
P & ID symbols. Process characteristics: Process load, Process lag, self-regulation. Control system parameters: control lag, dead time, cycling. Discontinuous controller modes: two position, multi position, floating control modes. Continuous controller modes: Mathematical representation and description of P, I, D controller modes. Composite control modes: Mathematical representation and description of PI, PD, PID control modes. Response of control modes to linear, step and square wave error signals.

UNIT-2
Electronic Controller mode implementation: Designing of P, PI, PD, PID using OP amplifiers.

UNIT-3
Pneumatic controller mode implementation: Implementation of P, PI, PD, PID using flapper – nozzle system.

UNIT-4
Final control: Actuators – Electrical & Pneumatic. Control Valves – Quick opening, linear and equal percentage control valves, valve sizing. I to P, P to I converters

UNIT-5
Programmable controllers & Digital Controllers:
Programmable controllers: Ladder Diagram, Programmable controller program from the ladder diagram of simple applications. Digital Controllers**:** Data logging, supervisory control, computer based controller.

Text Book:
1. Process control Instrumentation Technology by Curtis Johnson, 4 th Edition – PHI, Dec, 2000.

Reference Books:
1. Principles of Process control by D. Patranabis- TMH 2 nd Edition, 1996
2. P. Harriott, process control, Tata MoGraw – Hill publishing Co., Ltd., New Delhi, 1984.

Course Outcomes:
- Understand the popular process automation technologies.
- Design and development of different PLC programming for simple process applications.
- Understand the different security design approaches, Engineering and operator interface issues for designing Distributed control system.
- Know the latest communication technologies like HART and Field bus protocol. Mapping of Course Outcome with Programme Outcomes:

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POOL-1 (HONOR)		L	T	P	C
		3	1	0	4
TRANSDUCERS AND SENSORS					

Unit – 1
Introduction: functional elements of an instrument, generalized performance characteristics of instruments – static characteristics, dynamic characteristics.
Zero order, first order, second order instruments – step response, ramp response and impulse response. Response of general form of instruments to periodic input and to transient input Experimental determination of measurement system parameters, loading effects under dynamic conditions

Unit – 2
Transducers for motion and dimensional measurements: Relative displacement, translation and rotational resistive potentiometers, resistance strain guages, LVDT, synchros, capacitance ickups, Piezo-electric transducers, electro-optical devices, nozzle – flapper transducers, digital displacement transducers, ultrasonic transducers.
Magnetic and photoelectric pulse counting methods, relative acceleration measurements, seismic acceleration pickups, calibration of vibration pickups. Gyroscopic sensors

Unit – 3
TRANSDUCERS FOR FORCE MEASUREMENT: Bonded strain guage transducers, Photo-electric transducers, variable reluctance pickup, torque measurement dynamometers.
TRANSDUCERS FOR FLOW MEASUREMENT: Hot wire and hot-film anemometers, Electro-magnetic flow meters, laser Doppler velocimeter
TRANSDUCERS FOR PRESSURE MEASUREMENT: Manometers, elastic transducers, liquid systems, gas systems, very high pressure transducers. Thermal conductivity guages, ionization guages, microphone.

Unit – 4
TRANSDUCERS FOR TEMPERATURE MEASUREMENT: Thermal expansion methods, Thermometers (liquid in glass), pressure thermometers, Thermocouples, Materials configuration and techniques. Resistance thermometers, Thermistors, junction semiconductors, Sensors, Radiation methods, Optical pyrometers, Dynamic response of temperature sensors heat flux Sensors, Transducers for liquid level measurement, humidity, silicon and quartz sensors, fiber optic sensors.

Unit –5
Smart sensors: Introduction, primary sensors, converters, compensation. Recent trends in sensor technology – film sensors, semi conductor IC technology, MEMS, Nano-sensors.

Text Book:
1. Doebelin, E.O., “Measurement systems – Application and Design”, McGraw Hill.
2. D. Patranabis, “Sensors and Transducers”, PHI, 2nd Edition.

Reference:
1. Instrumentation Measurement & Analysis, by B.C. Nakra, K.K. Choudry, (TMH)
2. Transducers and Instrumentation, by D.V.S. Murthy (PHI)



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Course Outcomes:

At the end of the course, a student will be able to:

1. Use concepts in common methods for converting a physical parameter into an electrical quantity
2. Classify and explain with examples of transducers, including those for measurement of temperature, strain, motion, position and light
3. Choose proper sensor comparing different standards and guidelines to make sensitive measurements of physical parameters like pressure, flow, acceleration, etc
4. Predict correctly the expected performance of various sensors
5. Locate different type of sensors used in real life applications and paraphrase their importance
6. Set up testing strategies to evaluate performance characteristics of different types of sensors and transducers
7. develop professional skills in acquiring and applying the knowledge outside the classroom through design of a real-life instrumentation system.

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POOL-1 (HONOR)		L	T	P	C
		3	1	0	4
MEMS					

UNIT I: Overview of MEMS and Microsystems: MEMS and Microsystems, Typical MEMS and Micro-system products, Evolution of Micro-fabrication, Micro-system and Microelectronics, The Multidisciplinary nature of micro-system design and manufacture, Micro-system and Miniaturization. Application of Microsystems in the automotive industry, Application of Microsystems in other industries: Health care industry, Aerospace industry, Industrial products, Consumer products, Telecommunications. Markets for Microsystems

UNIT II: Working Principles of Microsystems: Introduction, Micro-sensors: Acoustic Wave Sensors, Biomedical sensors and Biosensors, Chemical sensors, Pressure sensors, Thermal sensors. Micro actuation: Actuation using thermal forces, shaped memory alloys, Piezoelectric crystals, Electrostatic forces. MEMS with Micro actuators: Micro-grippers, Micro-motors, Micro-valves, Micro-pumps, Micro accelerators, Micro-fluidics.

UNIT III: Scaling Laws in Miniaturization: Introduction to scaling, Scaling in Geometry, Scaling in Rigid-Body Dynamics, Scaling in Electrostatic Forces, Scaling in Electromagnetic Forces, Scaling in Electricity, Scaling in Fluid Mechanics, Scaling in Heat Transfer.
Materials for MEMS and Microsystems: Introduction, Substrates and wafers, Active substrate materials, Silicon as a substrate material. Silicon compounds, Silicon piezo resistors, Gallium Arsenide, Quartz, Piezoelectric crystals, Polymers, Packing materials.
UNIT IV: Micro system Fabrication Process: Photolithography, Ion Implantation, Diffusion, Oxidation, Chemical Vapour Deposition, Physical Vapour Deposition, Deposition by Epitaxy, Etching. Overview of Micro manufacturing and Applications: Bulk Micro manufacturing- any one example of application, Surface Micromachining- any one example of application. LIGA Process- any one example of application

UNIT V: Applications of MEMS-Switching: Introduction, Switch parameters, Basics of switching, Mechanical switches, Electronic switches for RF and microwave applications, Mechanical RF switches, PIN diode RF switches.

Text Books:

1. Tai-Ran Hsu, “MEMS and Microsystems: Design and Manufacture”, Tata McGraw Hill, (2002).
2. Gabriel M. Rebeiz, “RF MEMS Theory, Design and Technology”, Wiley India Pvt Ltd.

Reference Books:

1. Stephen D. Senturia, “Microsystem Design”, Springer International Edition, (2010).
2. Mohamed Gad-el-Hak, “The MEMS Handbook”, CRC Press,(2002).
3. Chang Liu, “Foundations of MEMS”, Second Edition, Pearson Publication.

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Course Outcomes:

1. Understand the basic overview of MEMS and Microsystems with broad category of MEMS& Micro system applications.
2. Understanding the working principles of Microsystems
3. Understand the Scaling Laws in Miniaturization and Materials for MEMS and Microsystems
4. Understand the Micro system Fabrication Process and Analyze the different Micro manufacturing process and Applications.
5. Study and Analyze the different types of RF switches, Various Switching Mechanism and their applications.



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POOL-1 (HONOR)		L	T	P	C
		3	1	0	4

Intelligent and Smart Instrumentation

UNIT I:

Introduction: Definition of intelligent instrumentation, types of instruments, Static Characteristics: Accuracy and Precision, Error, Correction, and Uncertainty, Repeatability, Reproducibility, and Hysteresis,
Sensitivity, Offset, and Dead Band, Resolution and Linearity, Statistical Characteristics, Error Modeling, Dynamic Characteristics, Dynamic Error and Dynamic Sensitivity, Input-Output Impedances, Historical Perspective, Current status, software based instruments.

UNIT II:

Intelligent Sensors: Classification, Smart sensors , Cogent Sensors, Soft or Virtual sensors, Self-Adaptive Sensors, Self-Validating Sensors, VLSI Sensors, Temperature Compensating Intelligent Sensors, Pressure Sensor,Indirect Sensing

UNIT III:

Linearization, Calibration, and Compensation:
Analog Linearization of Positive and Negative Coefficient Resistive Sensors, Higher-Order Linearization, Nonlinear ADC- and Amplifier-Based Linearization, Interpolation, Piecewise Linearization, Microcontroller-Based Linearization, Artificial Neural Network–Based Linearization, Nonlinear
Adaptive Filter–Based Linearization, Sensor Calibration, Conventional Calibration Circuits, Offset Compensation, Error and Drift Compensation, Lead Wire Compensation

UNIT IV:

Sensors with Artificial Intelligence:
Artificial Intelligence, Sensors with Artificial Intelligence, Multidimensional Intelligent Sensors, AI for Prognostic Instrumentation, ANN-Based Intelligent Sensors, Fuzzy Logic–Based Intelligent Sensors

UNIT V:

Intelligent Sensor Standards and Protocols:
IEEE 1451 Standard, STIM, TEDS, NCAP, Network Technologies, LonTalk, CEBUS, J1850 Bus, 1 Signal Logic and Format, MI Bus, Plug-n-Play Smart Sensor Protocol

Text Books:

1. Manabendra Bhuyan, ―Intelligent Instrumentation: Principles and Applications‖ CRC Press,2011.
2. G. C. Barney, ―Intelligent Instrumentation‖, Prentice Hall, 1995.
3. J.B DIXIT, A. yadav Laxmi Publications, Ltd., 01-Sep-2011

Course Outcomes:

1. To develop the design methodologies for measurement and instrumentation of real world problems.
2. To be study the concepts of intelligent sensor devices, their performance characteristics and signal and system dynamics.
3. To address the issues in dealing signal conditioning operations such as calibration, linearization and compensation
4. To use artificial intelligence in sensor signal processing to solve real world problems
5. To deal with interfacing protocols in wireless networking platform.

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POOL-2 (HONOR)		L	T	P	C
		3	1	0	4
VLSI TECHNOLOGY AND DESIGN					

UNIT 1: MOS Transistors
Introduction, The Structure of MOS Transistors, The Fluid Model, The MOS Capacitor, The MOS Transistor, Modes of Operation of MOS Transistors, Electrical Characteristics of MOS Transistors, Threshold Voltage, Transistor Transconductance g_m, Figure of Merit, Body Effect, Channel-Length Modulation, MOS Transistors as a Switch, Transmission Gate

UNIT 2: MOS Fabrication Technology
Introduction, Basic Fabrication Processes, Wafer Fabrication, Oxidation, Mask Generation, Photolithography, Diffusion, Deposition. N-MOS Fabrication Steps, CMOS Fabrication Steps, n-Well Process, p-Well Process, Twin-Tub Process, Latch-Up Problem and Its Prevention, Use of Guard Rings, Use of Trenches, Short-Channel Effects-Channel Length Modulation Effect. Drain-Induced Barrier Lowering, Channel Punch Through, Hot carrier effect, Velocity Saturation Effect

UNIT 3: Layout Design Rules
Scaling Theory, Scalable CMOS Design Rules, CMOS Process Enhancements, Transistors, Interconnects, Circuit Elements, Efficient layout Design techniques

UNIT 4: Combinational Logic Networks
Layouts for logic networks. Delay through networks. Power optimization.Switch logic networks. Combinational logic testing

UNIT 5: Sequential Systems
Memory cells and Arrays, clocking disciplines, sequential circuit Design, Performance Analysis,Power optimization, Design validation and testing.

Text Books:
1. Principals of CMOS VLSI Design-N.H.EWeste, K. Eshraghian, 2nd Edition, Addison Wesley.
2. CMOS Digital Integrated Circuits Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 3rd Ed., 2011.
3. Low-Power VLSI Circuits and Systems, Ajit Pal, SPRINGER PUBLISHERS
4. Modern VLSI Design – Wayne Wolf, 3rd Ed., 1997, Pearson Education.

Reference Books:
1. Digital Integrated Circuit Design – Ken Martin, Oxford University Press, 2011.
2. Digital Integrated Circuits – A Design Perspective, Jan M. Rabaey, Anantha Chandrakasan, BorivojeNikolic, 2nd Ed., PHI.

Course outcomes
At the end of the course the student able to
1. Understand the basics of MOS transistors and also the characteristics of MOS transistors.
2. Learn about the MOS fabrication process and short channel effects.
3. Learn about the basic rules in layout designing.
4. Analyse various combinational logic networks and sequential systems.

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POOL-2 (HONOR)		L	T	P	C
		3	1	0	4
CMOS ANALOG IC DESIGN					

UNIT -I
Basic MOS Device Physics – General Considerations, MOS I/V Characteristics, Second Order effects, MOS Device models. Short Channel Effects and Device Models. Single Stage Amplifiers –Basic Concepts, Common Source Stage, Source Follower, Common Gate Stage, Cascode Stage

UNIT -II:
Differential Amplifiers – Single Ended and Differential Operation, Basic Differential Pair, Common Mode Response, Differential Pair with MOS loads, Gilbert Cell. Passive and Active Current Mirrors– Basic Current Mirrors, Cascode Current Mirrors, Active Current Mirrors.

UNIT -III:
Frequency Response of Amplifiers – General Considerations, Common Source Stage, Source Followers, Common Gate Stage, Cascode Stage, Differential Pair. Noise – Types of Noise, Representation of Noise in circuits, Noise in single stage amplifiers, Noise in Differential Pairs.

UNIT -IV:
Feedback Amplifiers – General Considerations, Feedback Topologies, Effect of Loading. Operational Amplifiers – General Considerations, One Stage Op Amps, Two Stage Op Amps, Gain Boosting, Common – Mode Feedback, Input Range limitations, Slew Rate, Power Supply Rejection, Noise in Op Amps. Stability and Frequency Compensation.

UNIT -V:
Characterization of Comparator, Two-Stage, Open-Loop Comparators, Other Open-Loop Comparators, Improving the Performance of Open-Loop Comparators, Discrete-Time Comparators.

Text Books:

1. B.Razavi, “Design of Analog CMOS Integrated Circuits”, 2nd Edition, McGraw Hill Edition2016.
2. Paul. R.Gray&Robert G. Meyer, “Analysis and Design of Analog Integrated Circuits”, Wiley, 5th Edition, 2009.

Reference Books:

1. T. C. Carusone, D. A. Johns & K. Martin, “Analog Integrated Circuit Design”, 2nd Edition, Wiley, 2012.
2. P.E.Allen &D.R. Holberg, “CMOS Analog Circuit Design”, 3rd Edition, Oxford University Press, 2011.
3. R. Jacob Baker, “CMOS Circuit Design, Layout, and Simulation”, 3rd Edition, Wiley, 2010.
4. Recent literature in Analog IC Design.

Course Outcomes:

At the end of the course, students will be able to:

1. Design MOSFET based analog integrated circuits.
2. Analyze analog circuits at least to the first order.
3. Appreciate the trade-offs involved in analog integrated circuit design.
4. Understand and appreciate the importance of noise and distortion in analog circuits.

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POOL-2 (HONOR)		L	T	P	C
		3	1	0	4
CMOS DIGITAL IC DESIGN					

UNIT-I: MOS Design
Pseudo NMOS Logic – Inverter, Inverter threshold voltage, Output high voltage, Output Low voltage, Gain at gate threshold voltage, Transient response, Rise time, Fall time, Pseudo NMOS logic gates, Transistor equivalency, CMOS Inverter logic.

UNIT-II: Combinational MOS Logic Circuits:
MOS logic circuits with NMOS loads, Primitive CMOS logic gates – NOR & NAND gate, Complex Logic circuits design – Realizing Boolean expressions using NMOS gates and CMOS gates, AOI and OAI gates, CMOS full adder, CMOS transmission gates, Designing with Transmission gates.

UNIT-III: Sequential MOS Logic Circuits
Behaviour of bistable elements, SR Latch, Clocked latch and flip flop circuits, CMOS D latch and edge triggered flip-flop.

UNIT-IV: Dynamic Logic Circuits
Basic principle, Voltage Bootstrapping, Synchronous dynamic pass transistor circuits, Dynamic CMOS transmission gate logic, High performance Dynamic CMOS circuits.

UNIT-V: Semiconductor Memories
Types, RAM array organization, DRAM – Types, Operation, Leakage currents in DRAM cell and refresh operation, SRAM operation Leakage currents in SRAM cells, Flash Memory-NOR flash and NAND flash.

Text Books:
1. Digital Integrated Circuit Design – Ken Martin, Oxford University Press, 2011.
2. CMOS Digital Integrated Circuits Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 3rd Ed., 2011.

Reference Books:
1. Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC Press, 2011
2. Digital Integrated Circuits – A Design Perspective, Jan M. Rabaey, Anantha Chandrakasan Borivoje Nikolic, 2nd Ed., PHI.

Course Outcomes:
At the end of the course, students will be able to:
1. Demonstrate advanced knowledge in Static and dynamic characteristics of CMOS, Alternative CMOS Logics, Estimation of Delay and Power, Adders Design.
2. Classify different semiconductor memories.
3. Analyze, design and implement combinational and sequential MOS logic circuits.
4. Analyze complex engineering problems critically in the domain of digital IC design for conducting research.
5. Solve engineering problems for feasible and optimal solutions in the core area of digital ICs.

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		3	1	0	4
DESIGN OF TESTABILITY					

UNIT-I: Introduction to Testing
Testing Philosophy, Role of Testing, Digital and Analog VLSI Testing, VLSI Technology Trends affecting Testing, Types of Testing, Fault Modeling: Defects, Errors and Faults, Functional Versus Structural Testing, Levels of Fault Models, Single Stuck-at Fault.

UNIT-II: Logic and Fault Simulation
Simulation for Design Verification and Test Evaluation, Modeling Circuits for Simulation, Algorithms for True-value Simulation, Algorithms for Fault Simulation

UNIT -III: Testability Measures
SCOAP Controllability and Observability, High Level Testability Measures, Digital DFT and Scan Design: Ad-Hoc DFT Methods, Scan Design, Partial-Scan Design, Variations of Scan.

UNIT-IV: Built-In Self-Test
The Economic Case for BIST, Random Logic BIST: Definitions, BIST Process, Pattern Generation, Response Compaction, Built-In Logic Block Observers, Test-Per-Clock, Test-Per- Scan BIST Systems, Circular Self Test Path System, Memory BIST, Delay Fault BIST.

UNIT-V: Boundary Scan Standard
Motivation, System Configuration with Boundary Scan: TAP Controller and Port, Boundary Scan Test Instructions, Pin Constraints of the Standard, Boundary Scan Description Language: BDSL Description Components, Pin Descriptions.

TEXT BOOKS:
1. Essentials of Electronic Testing for Digital, Memory and Mixed Signal VLSI Circuits - M.L. Bushnell, V. D. Agrawal, Kluwer Academic Publishers.

REFERENCE BOOKS:
1. Digital Systems and Testable Design - M. Abramovici, M.A.Breuer and A.D Friedman, Jaico Publishing House.
2. Digital Circuits Testing and Testability - P.K. Lala, Academic Press.

Course Outcome:
Students are able to
1. apply the concepts in testing which can help them design a better yield in IC design.
2. tackle the problems associated with testing of semiconductor circuits at earlier design levels so as to significantly reduce the testing costs.
3. analyse the various test generation methods for static & dynamic CMOS circuits.
4. identify the design for testability methods for combinational & sequential CMOS circuits.
5. recognize the BIST techniques for improving testability.

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POOL-2 (HONOR)		L	T	P	C
		3	1	0	4
SYSTEM ON CHIP					

Unit 1:
ASIC: Overview of ASIC types, design strategies, CISC, RISC and NISC approaches for SOC architectural issues and its impact on SoC design methodologies, Application Specific Instruction Processor (ASIP) concepts.

Unit 2:
NISC:NISC Control Words methodology, NISC Applications and Advantages, Architecture Description Languages (ADL) for design and verification of Application Specific Instruction set Processors (ASIP), No-Instruction-Set-computer (NISC)- design flow, modeling NISC architectures and systems, use of Generic Netlist Representation - A formal language for specification, compilation and synthesis of embedded processors.

Unit 3:
Simulation: Different simulation modes, behavioral, functional, static timing, gate level, switch level, transistor/circuit simulation, design of verification vectors, Low power FPGA, Reconfigurable systems, SoC related modeling of data path design and control logic, Minimization of interconnects impact, clock tree design issues.

Unit 4:
Low power SoC design / Digital system: Design synergy, Low power system perspective-power gating, clock gating, adaptive voltage scaling (AVS), Static voltage scaling, Dynamic clock frequency and voltage scaling (DCFS),building block optimization, building block memory, power down techniques, power consumption verification.

Unit 5:
Synthesis: Role and Concept of graph theory and its relevance to synthesizable constructs, Walks, trails paths, connectivity, components, mapping/visualization, nodal and admittance graph. Technology independent and technology dependent approaches for synthesis, optimization constraints, Synthesis report analysis Single core and Multi core systems, dark silicon issues, HDL coding techniques for minimization of power consumption, Fault tolerant designs

Text Books:

1. Hubert Kaeslin, “Digital Integrated Circuit Design: From VLSI Architectures to CMOS
2. Fabrication”, Cambridge University Press, 2008.
3. B. Al Hashimi, “System on chip-Next generation electronics”, The IET, 2006

Reference Books:

1. Rochit Rajsuman, “System-on- a-chip: Design and test”, Advantest America R & D Center,2000
2. P Mishra and N Dutt, “Processor Description Languages”, Morgan Kaufmann, 2008
3. Michael J. Flynn and Wayne Luk, “Computer System Design: System-on-Chip”.



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Course Outcomes: At the end of the course, students will be able to:

1. Identify and formulate a given problem in the framework of SoC based design approaches Design SoC based system for engineering applications
2. Realize impact of SoC on electronic design philosophy and Macro-electronics thereby incline towards entrepreneurship & skill development.

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POOL-2 (HONOR)		L	T	P	C
		3	1	0	4
PROGRAMMABLE LOGIC DEVICES AND ASIC					

Unit I:
INTRODUCTION TO ASICS, CMOS LOGIC, ASIC LIBRARY DESIGN: Types of ASICs - Design flow – CMOS transistors- CMOS Design rules –Combinational logic Cell Sequential logic cell - Transistor as Resistors - Transistor parasitic capacitance – Logical effort - Library cell design – Library architecture.

Unit II:
PROGRAMMABLE ASICS, PROGRAMMABLE ASIC LOGIC CELLS AND PROGRAMMABLE ASIC I/O CELLS: Anti fuse - Static RAM - EPROM and EEPROM technology - PREP benchmarks - Actel ACT - Xilinx LCA – Altera FLEX - Altera MAX DC & AC inputs and outputs - Xilinx I/O blocks.

Unit III:
PROGRAMMABLE ASIC INTERCONNECT, PROGRAMMABLE ASIC 09 DESIGN SOFTWARE AND LOW LEVEL DESIGN: Entry: Actel ACT -Xilinx LCA - Xilinx EPLD - Altera MAX 5000 and 7000 - Altera MAX 9000 - Altera FLEX – Design systems - Logic Synthesis - Half gate ASIC -Low level design language - PLA tools EDIF- CFI design representation.

Unit IV:
SILICON ON CHIP DESIGN: Voice over IP SOC - Intellectual Property – SOC Design challenges- Methodology and design-FPGA to ASIC conversion – Design for integration-SOC verification-Set top box SOC.

Unit V:
PHYSICAL AND LOW POWER DESIGN: Over view of physical design flow- tips and guideline for physical design- modern physical design techniques- power dissipation-low power design techniques and methodologies-low power design tools- tips and guideline for low power design.

Text book:

1. M.J.S. Smith, ―Application Specific Integrated Circuits‖, Pearson Education, 2008
2. Wayne Wolf, ―FPGA-Based System Design‖, Prentice Hall PTR, 2009.
3. Farzad Nekoogar and Faranak Nekoogar, ―From ASICs to SOCs: A Practical Approach‖, Prentice Hall PTR, 2003.

Course Outcomes: At the end of the course, students will be able to
1. Recognize need for programmable devices
2. Describe architecture of programmable devices.
3. Explain programmable methodologies.
4. Recall IC fabrication techniques vis-à-vis CMOS switch
5. Relate design and implementation flow for PLDs
6. low power design techniques and methodologies

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POOL-2 (HONOR)		L	T	P	C
		3	1	0	4

SCRIPTING LANGUAGE

UNIT-I:
Introduction to Scripts and Scripting: Basics of Linux, Origin of Scripting languages, scripting today, Characteristics and uses of scripting languages.
PERL: Introduction to PERL, Names and values, Variables and assignment, Scalar expressions, Control structures, Built-in functions, Collections of Data, working with arrays, Lists and hashes,
Simple input and output, Strings, Patterns and regular expressions, Subroutines, Scripts with arguments

UNIT-II:
Advanced PERL: Finer points of Looping, Subroutines, Using Pack and Unpack, working with files, Type globs, Eval, References, Data structures, Packages, Libraries and modules, Objects, Objects and modules in action, tied variables, interfacing to the operating systems, Security issues

UNIT-III:
TCL: The TCL phenomena, Philosophy, Structure, Syntax, Parser, Variables and data in TCL, Control flow, Data structures, Simple input/output, Procedures, Working with Strings, Patterns, Files and Pipes, Example code.

UNIT-IV:
Advanced TCL: The eval, source, exec and up-level commands, Libraries and packages, Namespaces, trapping errors, Event-driven programs, Making applications 'Internet-aware',' Nuts-and-bolts' internet programming, Security issues, TCL and TK integration.

UNIT-V:
PYTHON: Introduction to PYTHON language, PYTHON-syntax, statements, functions, Built-in functions and Methods, Modules in PYTHON, Exception Handling.

Text Books:
1. The World of Scripting Languages- David Barron, Wiley Student Edition, 2010.
2. PYTHON Web Programming, Steve Holden and David Beazley, New Riders Publications

References:
1. TCL/TK: A Developer's Guide- ClifFlynt, 2003, Morgan Kaufmann Series.
2. Core PYTHON Programming, Chun, Pearson Education, 2006.
3. Learning Perl, Randal L. Schwartz, O' Reilly publications 6th edition 2011.
4. Linux: The Complete Reference", Richard Peterson McGraw Hill Publications, 6th Edition, 2008.

Course Outcomes:
At the end of this course, the student will be able to:
1. Gain fluency in programming with scripting languages
2. Create and run scripts using PERL/TCL/PYTHON in CAD Tools
3. Demonstrate the use of PERL/PYTHON/ TCL in developing system and web applications

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POOL-2 (HONOR)		L	T	P	C
		3	1	0	4
LOW POWER VLSI DESIGN					

UNIT-I: Sources of Power Dissipation
Introduction, Short-Circuit Power Dissipation, Switching Power Dissipation, Dynamic Power for a Complex Gate, Reduced Voltage Swing, Switching Activity, Leakage Power Dissipation, p–n Junction Reverse-Biased Current, Band-to-Band Tunneling Current, Subthreshold Leakage Current, Short-Channel Effects

UNIT 2: Supply Voltage Scaling for Low Power
Device Feature Size Scaling, Constant-Field Scaling, Constant-Voltage Scaling, Architectural-Level Approaches: Parallelism for Low Power, Pipelining for Low Power, Combining Parallelism with Pipelining, Voltage Scaling Using High-Level Transformations: Multilevel Voltage Scaling Challenges in MVS Voltage Scaling Interfaces, Static Timing Analysis Dynamic Voltage and Frequency Scaling

UNIT-3: Switched Capacitance Minimization
Probabilistic Power Analysis: Random logic signals, probability and frequency, probabilistic power analysis techniques, signal entropy, Bus Encoding: Gray Coding, One-Hot Coding, Bus-Inversion, T0 Coding, Clock Gating, Gated-Clock FSMs FSM State Encoding, FSM Partitioning, Precomputation, Glitching Power Minimization

UNIT 4: Leakage Power Minimization
Fabrication of Multiple Threshold Voltages, Multiple Channel Doping, Multiple Oxide CMOS, Multiple Channel Length, Multiple Body Bias, VTCMOS Approach, MTCMOS Approach, Power Gating, Clock Gating Versus Power Gating, Power-Gating Issues, Isolation Strategy, State Retention Strategy, Power-Gating Controller, Power Management, Combining DVFS and Power Management

UNIT 5: Low power clock distribution & Simulation Power Analysis
Low power clock distribution: Power dissipation in clock distribution, single driver versus distributed buffers, Zero skew versus tolerable skew, chip and package co design for clock network.
Simulation Power Analysis: SPICE circuit simulators, gate level logic simulation, capacitive power estimation, architecture level analysis, data correlation analysis of DSP systems, Monte Carlo Simulation

Text Books:
1. Low-Power VLSI Circuits and Systems, Ajit Pal, SPRINGER PUBLISHERS
2. Practical Low Power Digital Vlsi Design , Gary Yeap Motorola, Springer Science Business Media, LLC.

Reference Books:
1. Low Power CMOS Design – Anantha Chandrakasan, IEEE Press/Wiley International, 1998. 2
2. Massoud Pedram, Jan M. Rabaey , “Low power design methodologies “, Kluwer Academic Publishers.

3. Low Power CMOS VLSI Circuit Design – A. Bellamour, M. I. Elamasri, Kluwer Academic Press, 1995.

Course Outcomes:

At the end of the course, students will be able to:

1. Identify the sources of power dissipation in digital IC systems & understand the impact of power on system performance and reliability.
2. Characterize and model power consumption & understand the basic analysis methods.
3. Understand leakage sources and reduction techniques.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

POOL-3 (HONOR)		L	T	P	C
		3	1	0	4
WIRELESS SENSOR NETWORKS					

Unit I
Introduction and overview of sensor network architecture and its applications, sensor network comparison with Ad Hoc Networks, Sensor node architecture with hardware and software details.

Unit II
Hardware: Examples like mica2, micaZ, telosB, cricket, Imote2, tmote, btnode, and Sun SPOT, Software (Operating Systems): tiny OS, MANTIS, Contiki, and RetOS.

Unit III
Programming tools: C, nesC. Performance comparison of wireless sensor networks simulation and experimental platforms like open source (ns-2) and commercial (QualNet, Opnet)

Unit IV
Overview of sensor network protocols (details of atleast 2 important protocol per layer): Physical, MAC and routing/ Network layer protocols, node discovery protocols, multi-hop and cluster based protocols, Fundamentals of 802.15.4, Bluetooth, BLE (Bluetooth low energy), UWB.

Unit V
Data dissemination and processing; differences compared with other database management systems, data storage; query processing. Specialized features: Energy preservation and efficiency; security challenges; fault- tolerance, Issues related to Localization, connectivity and topology, Sensor deployment mechanisms; coverage issues; sensor Web; sensor Grid, Open issues for future research, and Enabling technologies in wireless sensor network.

TEXT BOOKS:
1. H. Karl and A. Willig, “Protocols and Architectures for Wireless Sensor Networks”, John Wiley & Sons, India,2012.
2. C. S. Raghavendra, K. M. Sivalingam, and T. Znati, Editors, “Wireless Sensor Networks”, Springer Verlag, 1st Indian reprint,2010.

REFERENCES:
1. F. Zhao and L. Guibas, “Wireless Sensor Networks: An Information Processing Approach”, Morgan Kaufmann, 1st Indian reprint,2013.
2. YingshuLi, MyT. Thai, Weili Wu, “Wireless sensor Network and Applications”, Springer series on signals and communication technology,2008.

Course Outcomes:
At the end of this course, students will be able to
1. Design wireless sensor network system for different applications under consideration.
2. Understand the hardware details of different types of sensors and select right type of sensor for various applications.
3. Understand radio standards and communication protocols to be used for wireless sensor network based systems and application.
4. Use operating systems and programming languages for wireless sensor nodes, performance of wireless sensor networks systems and platforms.
5. Handle special issues related to sensors like energy conservation and security challenges

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POOL-3 (HONOR)		L	T	P	C
		3	1	0	4
SOFTWARE DEFINED RADIO					

UNIT -I:
Introduction: The Need for Software Radios, What is Software Radio, Characteristics and benefits of software radio- Design Principles of Software Radio, RF Implementation issues- The Purpose of RF Front – End, Dynamic Range- The Principal Challenge of Receiver Design – RF Receiver Front- End Topologies- Enhanced Flexibility of the RF Chain with Software Radios- Importance of the Components to Overall Performance- Transmitter Architectures and Their Issues- Noise and Distortion in the RF Chain, ADC and DAC Distortion.

UNIT -II:
Multi Rate Signal Processing: Introduction- Sample Rate Conversion Principles- Polyphase Filters Digital Filter Banks- Timing Recovery in Digital Receivers Using Multirate Digital Filters.
Digital Generation of Signals: Introduction- Comparison of Direct Digital Synthesis with Analog Signal Synthesis- Approaches to Direct Digital Synthesis- Analysis of Spurious Signals- Spurious Components due to Periodic jitter- Band Pass Signal Generation- Performance of Direct Digital Synthesis Systems- Hybrid DDS-PLL Systems- Applications of direct Digital Synthesis- Generation of Random Sequences- ROM Compression Techniques.

UNIT -III:
Analog to Digital and Digital to Analog Conversion: Parameters of ideal data converters- Parameters of Practical data converters- Analog to Digital and Digital to Analog Conversion- Techniques to improve data converter performance- Common ADC and DAC architectures.

UNIT -IV:
Digital Hardware Choices: Introduction- Key Hardware Elements- DSP Processors- Field Programmable Gate Arrays- Trade-Offs in Using DSPs, FPGAs, and ASICs- Power Management Issues Using a Combination of DSPs, FPGAs, and ASICs.
UNIT -V:
Object – Oriented Representation of Radios and Network Resources: Networks- Object Oriented Programming- Object Brokers- Mobile Application Environments- Joint Tactical Radio System. Case Studies in Software Radio Design: Introduction and Historical Perspective, SPEAK easy- JTRS, Wireless Information Transfer System, SDR-3000 Digital Transceiver Subsystem, Spectrum Ware, CHARIOT

TEXT BOOKS:
1. Software Radio: A Modern Approach to Radio Engineering - Jeffrey H. Reed, 2002, PEA Publication.
2. Software Defined Radio: Enabling Technologies- Walter Tuttle Bee, 2002, Wiley Publications.

REFERENCE BOOKS:
1. Software Defined Radio for 3G - Paul Burns, 2002, Artech House.
2. Software Defined Radio: Architectures, Systems and Functions - Markus Dillinger, KambizMadani, Nancy Alonistioti, 2003, Wiley.
3. Software Radio Architecture: Object Oriented Approaches to wireless System Engineering – Joseph Mitola, III, 2000, John Wiley & Sons.
4. R.F Microelectronics – B. Razavi, 1998, PHI. 5. DSP – A Computer Based Approach – S. K. Mithra, 1998, McGraw-Hill

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COURSE OUTCOMES:

On successful completion of this course the students will be able to

1. Demonstrate advanced knowledge in the evolving paradigm of Software defined radio and technologies for its implementation.
2. Analyze complex problems critically in the domains of Radio frequency implementation issues, Multirate signal processing in SDR, as well as a Smart antenna techniques for better spectrum exploitation for conducting research.
3. Apply appropriate techniques for the development of scientific and technological knowledge in designing software defined radios and their usage for cognitive radio.

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POOL-3 (HONOR)		L	T	P	C
		3	1	0	4
DATA COMMUNICATION &COMPUTER NETWORKS					

UNIT I

Introduction to Data Communications: Components, Data Representation, Data Flow, Networks- Distributed Processing, Network Criteria, Physical Structures, Network Models, Categories of Networks Interconnection of Networks, The Internet - A Brief History, The Internet Today, Protocol and Standards - Protocols, Standards, Standards Organizations, Internet Standards. Network Models, Layered Tasks, OSI model, Layers in OSI model, TCP/IP Protocol Suite, Addressing Introduction, Wireless Links and Network Characteristics, WiFi: 802.11 Wireless LANs -The 802.11 Architecture

UNIT II

Data Link Layer: Links, Access Networks, and LANs- Introduction to the Link Layer, The Services Provided by the Link Layer, Types of errors, Redundancy, Detection vs Correction, Forward error correction Versus Retransmission Error-Detection and Correction Techniques, Parity Checks, Check summing Methods, Cyclic Redundancy Check (CRC) , Framing, Flow Control, and Error Control protocols , Noisy less Channels and Noisy Channels, HDLC, Multiple Access Protocols, Random Access ,ALOHA, Controlled access, Channelization Protocols. 802.11 MAC Protocol, IEEE 802.11 Frame

Unit-III

The Network Layer: Introduction, Forwarding and Routing, Network Service Models, Virtual Circuit and Datagram Networks-Virtual-Circuit Networks, Datagram Networks, Origins of VC and Datagram Networks, Inside a Router-Input Processing, Switching, Output Processing, Queuing, The Routing Control Plane, The Internet Protocol(IP):Forwarding and Addressing in the Internet- Datagram format, Ipv4 Addressing, Internet Control Message Protocol(ICMP), IPv6

Unit-IV

Transport Layer: Introduction and Transport Layer Services : Relationship Between Transport and Network Layers, Overview of the Transport Layer in the Internet, Multiplexing and Demultiplexing, Connectionless Transport: UDP -UDP Segment Structure, UDP Checksum, Principles of Reliable Data Transfer-Building a Reliable Data Transfer Protocol, Pipelined Reliable Data Transfer Protocols, Go- Back-N(GBN), Selective Repeat(SR), Connection Oriented Transport: TCP - The TCP Connection, TCP Segment Structure, Round-Trip Time Estimation and Timeout, Reliable Data Transfer, Flow Control, TCP Connection Management, Principles of Congestion Control - The Cause and the Costs of Congestion, Approaches to Congestion Control-The Cause and the Costs of Congestion, Approaches to Congestion Control

Unit-V

Application Layer: Principles of Networking Applications – Network Application Architectures, Processes Communicating, Transport Services Available to Applications, Transport Services Provided by the File Transfer: FTP,- FTP Commands and Replies, Electronic Mail in the Internet- STMP, Comparison with HTTP, DNS-The Internet's Directory Service – Service Provided by DNS, Overview of How DNS Works, DNS Records and messages.



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TEXTBOOKS:

1. Computer Networking A Top-Down Approach – Kurose James F, Keith W, 6th Edition, Pearson.
2. Data Communications and Networking Behrouz A. Forouzan 4th Edition McGraw-Hill Education

REFERENCES:

1. Data communication and Networks - Bhusan Trivedi, Oxford university press, 2016
2. Computer Networks -- Andrew S Tanenbaum, 4th Edition, Pearson Education
3. Understanding Communications and Networks, 3rd Edition, W. A. Shay, Cengage Learning.

Course Outcomes:

Upon completing this course, the student will be able to

1. Know the Categories and functions of various Data communication Networks
2. Design and analyze various error detection techniques.
3. Demonstrate the mechanism of routing the data in network layer
4. Know the significance of various Flow control and Congestion control Mechanisms
5. Know the Functioning of various Application layer Protocols.

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POOL-3 (HONOR)		L	T	P	C
		3	1	0	4
COGNITIVE RADIO					

Unit I: Introduction to Cognitive Radios: Digital dividend, cognitive radio (CR) architecture, functions of cognitive radio, dynamic spectrum access (DSA), components of cognitive radio, spectrum sensing, spectrum analysis and decision, potential applications of cognitive radio.

Unit II: Sensing: Spectrum sensing, detection of spectrum holes (TVWS), collaborative sensing, geo-location database and spectrum sharing business models (spectrum of commons, real time secondary spectrum market).

Unit III: Optimization Techniques of Dynamic Spectrum Allocation: Linear programming, convex programming, non-linear programming, integer programming, dynamic programming, stochastic programming.

Unit IV: Dynamic Spectrum Access and Management: Spectrum broker, cognitive radio architectures, centralized dynamic spectrum access, distributed dynamic spectrum access, learning algorithms and protocols.

Unit V: Spectrum Trading: Introduction to spectrum trading, classification to spectrum trading, radio resource pricing, brief discussion on economics theories in DSA (utility, auction theory), classification of auctions (single auctions, double auctions, concurrent, sequential).Research Challenges in Cognitive Radio: Network layer and transport layer issues, cross- layer design for cognitive radio networks

TEXT BOOKS:

1. Ekram Hossain, DusitNiyato, Zhu Han, “Dynamic Spectrum Access and Management in Cognitive Radio Networks”, Cambridge University Press,2009.
2. Kwang-Cheng Chen, Ramjee Prasad, “Cognitive radio networks”, John Wiley & Sons Ltd.,2009.

REFERENCE BOOKS

1. Bruce Fette, “Cognitive radio technology”, Elsevier, 2nd edition,2009.
2. HuseyinArslan, “Cognitive Radio, Software Defined Radio, and Adaptive Wireless Systems”, Springer,2007.
3. Francisco Rodrigo Porto Cavalcanti, Soren Andersson, “Optimizing Wireless Communication Systems” Springer,2009.
4. Linda Doyle, “Essentials of Cognitive Radio”, Cambridge University Press,2009

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Course Outcomes: At the end of this course, students will be able to

1. Understand the fundamental concepts of cognitive radio networks.
2. Develop the cognitive radio, as well as techniques for spectrum holes detection that cognitive radio takes advantages in order to exploit it.
3. Understand technologies to allow an efficient use of TVWS for radio communications based on two spectrum sharing business models/policies.
4. Understand fundamental issues regarding dynamic spectrum access, the radio-resource management and trading, as well as a number of optimization techniques for better Spectrum exploitation

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POOL-3 (HONOR)		L	T	P	C
		3	1	0	4
5G COMMUNICATION					

UNIT I:
Overview of 5G Broadband Wireless Communications: Evaluation of mobile technologies 1G to 4G (LTE, LTEA, LTEA Pro) , An Overview of 5G requirements, Regulations for 5G, Spectrum Analysis and Sharing for 5G.

UNIT II:
The 5G wireless Propagation Channels: Channel modeling requirements, propagation scenarios and challenges in the 5G modeling, Channel Models for mm Wave MIMO Systems.

UNIT III:
Transmission and Design Techniques for 5G: Basic requirements of transmission over 5G, Modulation Techniques – Orthogonal frequency division multiplexing (OFDM), generalized frequency division multiplexing (GFDM), filter bank multi-carriers (FBMC) and universal filtered multi-carrier (UFMC), Multiple Accesses Techniques – orthogonal frequency division multiple accesses (OFDMA), generalized frequency division multiple accesses (GFDMA), non-orthogonal multiple accesses (NOMA).

UNIT IV:
Device-to-device (D2D) and machine-to-machine (M2M) type communications – Extension of 4G D2D standardization to 5G, radio resource management for mobile broadband D2D, multi-hop and multi-operator D2D communications

UNIT V:
Millimeter-wave Communications – spectrum regulations, deployment scenarios, beam forming, physical layer techniques, interference and mobility management, Massive MIMO propagation channel models, Channel Estimation in Massive MIMO, Massive MIMO with Imperfect CSI, Multi-Cell Massive MIMO, Pilot Contamination, Spatial Modulation (SM)

Textbooks:

1. Martin Sauter “From GSM From GSM to LTE–Advanced Pro and 5G: An Introduction to Mobile Networks and Mobile Broadband”, Wiley-Blackwell.
2. Afif Osseiran, Jose.F.Monserrat, Patrick Marsch, “Fundamentals of 5G Mobile Networks” , Cambridge University Press.
3. Athanasios G.Kanatos, Konstantina S.Nikita, Panagiotis Mathiopoulos, “New Directions in Wireless Communication Systems from Mobile to 5G”, CRC Press.
4. Theodore S.Rappaport, Robert W.Heath, Robert C.Danials, James N.Murdock “Millimeter Wave Wireless Communications”, Prentice Hall Communications.

References

1. Jonathan Rodriguez, “Fundamentals of 5G Mobile Networks”, John Wiley & Sons.
2. Amitabha Ghosh and Rapeepat Ratasuk “Essentials of LTE and LTE-A”, Cambridge University Press



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Course outcomes: At the end of the course the student will be able to

1. Learn 5G Technology advances and their benefits
2. Learn the key RF, PHY, MAC and air interface changes required to support 5G
3. Learn Device to device communication and millimeter wave communication
4. Implementation options for 5G

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POOL-3 (HONOR)		L	T	P	C
		3	1	0	4
SATELLITE COMMUNICATION					

UNIT I

INTRODUCTION Origin of Satellite Communications, Historical Back-ground, Basic Concepts of Satellite Communications, Frequency allocations for Satellite Services, Applications, Future Trends of Satellite Communications.

ORBITAL MECHANICS AND LAUNCHERS : Orbital Mechanics, Look Angle determination, Orbital perturbations, Orbit determination, launches and launch vehicles, Orbital effects in communication systems performance.

UNIT II

SATELLITE SUB SYSTEMS : Attitude and orbit control system, telemetry, tracking, Command and monitoring, power systems, communication subsystems, Satellite antenna Equipment reliability and Space qualification.

UNIT III

SATELLITE LINK DESIGN : Basic transmission theory, system noise temperature and G/T ratio, Design of down links, up link design, Design of satellite links for specified C/N, System design example.

UNIT IV

MULTIPLE ACCESS: Frequency division multiple access (FDMA) Intermodulation, Calculation of C/N. Time division Multiple Access (TDMA) Frame structure, link design using TDMA, Examples. Satellite Switched TDMA Onboard processing, DAMA, Code Division Multiple access (CDMA), Spread spectrum transmission and reception.
EARTH STATION TECHNOLOGY: Introduction, Transmitters, Receivers, Antennas, Tracking systems,Terrestrial interface, Primary power test methods.

UNIT V

LOW EARTH ORBIT AND GEO-STATIONARY SATELLITE SYSTEMS: Orbit consideration, coverage and frequency considerations, Delay & Throughput considerations, System considerations, Operational NGSO constellation Designs

SATELLITE NAVIGATION & THE GLOBAL POSITIONING SYSTEM: Radio and Satellite
Navigation, GPS Position Location principles, GPS Receivers and codes, Satellite signal acquisition, GPSNavigation Message, GPS signal levels, GPS receiver operation, GPS C/A code accuracy, Differential GPS

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TEXT BOOKS:

1. Satellite Communications – Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 2ndEdition, 2003.
2. Satellite Communications Engineering – Wilbur L. Pritchard, Robert A Nelson and Henri G. Suyderhoud, 2ndEdition, Pearson Publications, 2003.
3. Digital satellite communication by TRI T HA …..TMH

REFERENCES:

1. Satellite Communications : Design Principles – M. Richharia, BS Publications, 2nd Edition, 2003.
2. Satellite Communication - D.C Agarwal, Khanna Publications, 5th Ed.
3. Fundamentals of Satellite Communications – K.N. Raja Rao, PHI, 2004
4. Satellite Communications – Dennis Roddy, McGraw Hill, 2nd Edition, 1996.

Outcomes:
At the end of this course the student can able to:

1. Understand the concepts, applications and subsystems of Satellite communications.
2. Derive the expression for G/T ratio and to solve some analytical problems on satellite link design.
3. Understand the various types of multiple access techniques and architecture of earth station design.
4. Understand the concepts of GPS and its architecture.

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POOL-3 (HONOR)		L	T	P	C
		3	1	0	4
OPTICAL COMMUNICATION					

UNIT I

Overview of optical fiber communication - Historical development, The general system, advantages of optical fiber communications. Optical fiber wave guides- Introduction, Ray theory transmission, Total Internal Reflection, Acceptance angle, Numerical Aperture, Skew rays, Cylindrical fibers- Modes, V-number, Mode coupling, Step Index fibers, Graded Index fibers, Single mode fibers- Cut off wavelength, Mode Field Diameter, Effective Refractive Index, Related problems.

UNIT II

Fiber materials:- Glass, Halide, Active glass, Chalgenide glass, Plastic optical fibers. Signal distortion in optical fibers-Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses, Information capacity determination, Group delay, Types of Dispersion:- Material dispersion, Wave-guide dispersion, Polarization-Mode dispersion, Intermodal dispersion, Pulse broadening in Graded index fiber, Related problems.

UNIT III

. Optical fiber Connectors-Connector types, Single mode fiber connectors, Connector return loss, Fiber Splicing- Splicing techniques, Splicing single mode fibers, Fiber alignment and joint loss- Multimode fiber joints, single mode fiber joints.

UNIT IV

Optical sources- LEDs, Structures, Materials, Quantum efficiency, Power, Modulation, Power bandwidth product. Injection Laser Diodes- Modes, Threshold conditions, External quantum efficiency, Laser diode rate equations, Resonant frequencies, Reliability of LED&ILD, Optical detectors- Physical principles of PIN and APD, Detector response time, Temperature effect on Avalanche gain, Comparison of Photo detectors, Related problems.

UNIT V

Source to fiber power launching - Output patterns, Power coupling, Power launching, Equilibrium Numerical Aperture, Laser diode to fiber coupling, Optical receiver operation-Fundamental receiver operation, Digital signal transmission, error sources, Receiver configuration, Digital receiver performance, Probability of Error, Quantum limit, Analog receivers.

Optical system design - Point-to- point links- Component choice and considerations, Link power budget, Rise time budget with examples, Line coding in Optical links, WDM, Necessity, Principles, Measurement of Attenuation and Dispersion, Eye pattern.

TEXT BOOKS:

1. Optical Fiber Communications – Gerd Keiser, Mc Graw-Hill International edition, 3rd Edition, 2000.
2. Optical Fiber Communications – John M. Senior, PHI, 2nd Edition, 2002.

RERFERENCES:

1. Fiber Optic Communications – D.K. Mynbaev , S.C. Gupta and Lowell L. Scheiner, Pearson Education,2005.
2. Text Book on Optical Fiber Communication and its Applications – S.C.Gupta, PHI, 2005.
3. Fiber Optic Communication Systems – Govind P. Agarwal , John Wiley, 3rd Edition, 2004.
4. Fiber Optic Communications – Joseph C. Palais, 4th Edition, Pearson Education, 2004.

OUTCOMES:

After going through this course the student will be able to

1. Choose necessary components required in modern optical communications systems .
2. Design and build optical fiber experiments in the laboratory, and learn how to calculate electromagnetic modes in waveguides, the amount of light lost going through an optical system, dispersion of optical fibers.
3. Use different types of photo detectors and optical test equipment to analyze optical fiber and light wave systems.
4. Choose the optical cables for better communication with minimum losses
5. Design, build, and demonstrate optical fiber experiments in the laboratory

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POOL-3 (HONOR)		L	T	P	C
		3	1	0	4
GLOBAL NAVIGATIONAL SATELLITE SYSTEMS					

UNIT I:
Introduction, GNSS overview, Global Positioning System, Russian GLONASS system, Galileo satellite system, Chinese BeiDou system, Regional system: Quasi-Zenith Satellite System (QZSS), Navigation with Indian Constellation (NavIC), Augmentations, Markets and Applications.
Fundamentals of satellite Navigation: Concept of Ranging using Time of arrival Measurements: Two-Dimensional Position Determination, Principle of Position Determination via Satellite-Generated Ranging Codes, Fundamentals of satellite orbits: Orbital Mechanics, Constellation Design, Positioning determination using Ranging codes: Determining Satellite-to-User Range,

UNIT II:
Global positioning system: overview: Space Segment Overview, Control Segment Overview, User Segment Overview, Space segment description: GPS Satellite Constellation Description, Space Segment Phased Development, Control segment description: OCS Current Configuration, OCS Transition, OCS Planned Upgrades, User segment: GNSS Receiver Characteristics

UNIT III:
Navigation with Indian Constellation (NavIC): overview, space segment, NavIC control segment, Geodesy and time system, Navigation services, signals, applications and NavIC user equipment.

UNIT – IV:

GNSS Receiver: Acquisition: Single Trial Detector, Tong Search Detector, M of N Search Detector, Combined Tong and M of N Search Detectors, FFT-Based Techniques, Direct Acquisition of GPS Military Signals, Vernier Doppler and Peak Code Search, carrier tracking, code tracking: Carrier Loop Discriminator, sequence of initial receiver operation.

UNIT – V:
GNSS errors: Introduction, Measurement errors: satellite clock error, ephemeris error, relative effects, atmospheric effects, receiver noise and resolution, multipath and shadowing effects, hardware bias errors, Psedorange error budgets.

Text Books:
1. Elliott D. Kaplan, Christopher J. Hegarty, **Understanding GPS/GNSS** principles and applications, third edition, artech house publishers, Boston, 2017

Reference Books:
1. G S Rao, Global Navigational satellite system, Tata McGraw-Hill education private Ltd, New Delhi, 2010
2. ISRO-IRNSS-ICD-SPS-1.1, Bangalore, 2017
3. Bhatta, B., 2010. Global Navigation Satellite Systems: Insights Into GPS, Glonass, Galileo, Compass, and Others, BS Publications, New Delhi.

4. Grewal, M. S., Weill, L. R., Andrews, A. P., 2006. Global Positioning Systems, Inertial Navigation, and Integration, John Wiley & Sons, New York.
5. Hofmann-Wellenhof, B., Lichtenegger, H., Wasle, E., 2008. GNSS – Global Navigation Satellite Systems, Springer, Verlag Wien.

Course Outcomes:

1. Understand global navigational satellite systems
2. Understand Indian regional Navigational Satellite System
3. Develop GNSS Receiver

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POOL-4 (HONOR)		L	T	P	C
		3	1	0	4
SPEECH SIGNAL PROCESSING					

Unit I

Mechanics of speech: Speech production: Mechanism of speech production, Acoustic phonetics, The Acoustic Theory of Speech Production: Uniform lossless tube, Effects of losses in the vocal tract, Digital models for speech signals: Vocal tract, Radiation, Excitation, Auditory perception: psycho acoustics. Representations of speech waveform: Sampling of speech signals, Quantization.

Unit II

Time and frequency domain methods for speech processing: Time domain parameters of Speech signal: Short-Time Energy, Average Magnitude, Average Zero crossing Rate, Silence Discrimination using ZCR and energy, Short Time Auto Correlation Function, Pitch period estimation using Auto Correlation Function.

Short Time Fourier analysis: Fourier transform and linear filtering interpretations, Sampling rates in time and frequency, Pitch detection, Analysis by Synthesis, Analysis synthesis systems: Phase vocoder, Channel Vocoder, Median Smoothing, Spectrographic displays

Unit III

Linear predictive analysis of speech: Basic Principles of linear predictive analysis: Auto correlation method, Covariance method, Solution of LPC equations: Cholesky method, Durbin's Recursive algorithm, Application of LPC parameters: Pitch detection using LPC parameters, Formant analysis using LPC parameters, VELP. Relations Between the Various Speech Parameters, CELP.

Unit IV

Application of speech processing: Voice response systems: General considerations in the design of voice response systems, A multiple output digital voice response system, Speaker recognition systems: Speaker verification system, Speaker identification system.

Unit V

Speech recognition systems: Isolated digit recognition system, Continuous digit recognition system. Typical applications of computer voice response systems: Wiring communication equipment, Information retrieval systems

Textbooks:

1. L.R.Rabinerand, R.W.Schaffer, Digital Processing of Speech signals, Prentice Hall, 2004
2. Ben Gold and Nelson Morgan, Speech and Audio Signal Processing, John Wiley and Sons Inc., Singapore, 2004

References:

1. Quatieri, Discrete-time Speech Signal Processing, PrenticeHall,2001
2. L.R. Rabiner and B. H. Juang, Fundamentals of speech recognition, Prentice Hall, 1999.

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Course Outcomes:
At the end of this course the student will be able to:

1. Summarize the mechanism of human speech production and articulation
2. Identify the time domain speech signal parameters
3. Differentiate time and frequency domain methods of speech processing
4. Attribute linear predictive analysis for speech signals
5. Explain the solutions for LPC equations
6. Implementthedifferentalgorithmsandmodelsinvolvedforspeakerandspeechrecognition systems



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POOL-4 (HONOR)		L	T	P	C
		3	1	0	4
VIDEO SIGNAL PROCESSING					

Unit – I
Video formation, perception and representation – color perception and specification – video capture and display – Analog video raster – Analog color television systems, Digital video and Frequency Domain characterization of Video Signals.

Unit – II
Video sampling – Basics of the Lattice theory, Sampling of Video Signals, Conversion of Signals Sampled on Different Lattices, Sampling Rate Conversion of Video Signals

Unit -III
Video modeling-Camera model, Illumination model, Object model and Scene model, Two dimensional models, Two Dimensional motion estimation-Types, Optical Flow, Pixel Based Motion, Block matching Algorithm.

Unit -IV
Waveform Based Video Coding-Predictive coding, Video coding using Temporal prediction and transform coding, Content Dependent Video Coding – Two dimensional shape coding, Texture coding for Arbitrarily shaped Regions

Unit-V
Video Compression standards-Standardization- Video Telephony with H.261 and H.263-Multimedia content description with MPEG7

Text Books
1. Video Processing and Communication – 1st edition - Yao Wang, J.Ostermann, Ya Zhang, Prentice Hall, 2001.

Reference Books:
1. Image processing, analysis, and machine vision, 2nd Edition,-Sonka M, Hlavac V, Boyle R. Brooks Cole publishing, 1999.
2. Multidimensional, signal, image and video processing and coding, -Woods, Elsevier, Academic press, 2006.

Course Outcomes:
1. Understand the formation of video, its perception and representation and characterization of video in frequency domain
2. Understand the concept of Lattice theory and sampling of video signals
3. Modeling of the video signal in different methods and understand the different motion estimation algorithms
4. Coding of video in different approaches / algorithms
5. Knowledge in Video compression standards

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POOL-4 (HONOR)		L	T	P	C
		3	1	0	4
ADAPTIVE SIGNAL PROCESSING					

Unit -I
Introduction to Adaptive Systems: Adaptive Systems: Definitions, Characteristics, Applications, Example of an Adaptive System. The Adaptive Linear Combiner - Description, Weight Vectors, Desired Response, Performance function - Gradient & Mean Square Error.

Unit-II
Development of Adaptive Filter Theory & Searching the Performance surface: Introduction to Filtering - Smoothing and Prediction – Linear Optimum Filtering, Problem statement, Principle of Orthogonality - Minimum Mean Square Error, Wiener- Hopf equations, Error Performance surface Searching the performance surface – Methods & Ideas of Gradient Search methods, Gradient Searching Algorithm & its Solution, Stability& Rate of convergence , Learning Curve.

Unit-III
Steepest Descent Algorithms: Gradient Search by Newton's Method, Method of Steepest Descent, Comparison of Learning Curves.

Unit-IV
LMS Algorithm & Applications: Overview - LMS Adaptation algorithms, Stability & Performance analysis of LMS Algorithms - LMS Gradient & Stochastic algorithms - Convergence of LMS algorithm. Applications: Noise cancellation – Cancellation of Echoes in long distance telephone circuits, Adaptive Beam forming.

Unit-V
RLS &Kalman Filtering: Introduction to RLS Algorithm, Statement of Kalman filtering problem, The Innovation Process, Estimation of State using the Innovation Process- Expression of Kalman Gain, Filtering Examples using Kalman filtering.

Text Books
1. Adaptive Signal Processing - Bernard Widrow, Samuel D. Strearns, 2005, PE.
2. Adaptive Filter Theory - Simon Haykin-, 4th Ed., 2002, PE Asia.

Reference Books
1. Optimum signal processing: An introduction – Sophocles .J. Orfamadis, 2nd Ed., 1988, McGraw-Hill, New York
2. Adaptive signal processing-Theory and Applications - S.Thomas Alexander, 1986, Springer –Verlag.
3. Signal analysis – Candy, McGraw Hill Int. Student Edition
4. James V. Candy - Signal Processing: A Modern Approach, McGraw-Hill, International Edition, 1988



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Course outcomes

1. Review the Adaptive Systems and Understand the various measures to be opted for developing adaptive system
2. Study of different algorithms to develop the adaptive filter theory
3. Application of adaptive filter theory for different problems
4. Study of RLS &Kalman Filtering

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POOL-4 (HONOR)		L	T	P	C
		3	1	0	4
BIO- MEDICAL SIGNAL PROCESSING					

Unit I
Acquisition, Generation of Bio-signals, Origin of bio-signals, Types of bio-signals, Study of diagnostically significant bio-signal parameters

Unit II
Electrodes for bio-physiological sensing and conditioning, Electrode-electrolyte interface, polarization, electrode skin interface and motion artefact, biomaterial used for electrode, Types of electrodes (body surface, internal, array of electrodes, microelectrodes), Practical aspects of using electrodes, Acquisition of bio-signals (signal conditioning) and Signal conversion (ADC's DAC's) Processing, Digital filtering

Unit III
Biomedical signal processing by Fourier analysis, Biomedical signal processing by wavelet (time-frequency) analysis, Analysis (Computation of signal parameters that are diagnostically significant)

Unit IV
Classification of signals and noise, Spectral analysis of deterministic, stationary random signals and non-stationary signals, Coherent treatment of various biomedical signal processing methods and applications

Unit V
Principal component analysis, Correlation and regression, Analysis of chaotic signals Application areas of Bio–Signals analysis Multi resolution analysis (MRA) and wavelets, Principal component analysis(PCA), Independent component analysis(ICA). Pattern classification– supervised and unsupervised classification, Neural networks, Support vector Machines, Hidden Markov models. Examples of biomedical signal classification examples.

Text Books:
1. W. J. Tompkins, "Biomedical Digital Signal Processing", Prentice Hall,1993.
2. Eugene N Bruce, "Biomedical Signal Processing and Signal Modeling", John Wiley & Son's publication,2001.

References:
1. Myer Kutz, "Biomedical Engineering and Design Handbook, Volume I", McGraw Hill, 2009.
2. D C Reddy, "Biomedical Signal Processing", McGraw Hill,2005.
3. Katarzyn J. Blinowska, Jaroslaw Zygierewicz, "Practical Biomedical Signal Analysis Using MATLAB", 1st Edition, CRC Press,2011

Course Outcomes:
1. Understand different types of biomedical signal.
2. Identify and analyze different biomedical signals.
3. Find applications related to biomedical signal processing

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POOL-4 (HONOR)		L	T	P	C
		3	1	0	4
DSP PROCESSORS AND ARCHITECTURES					

Unit – I:
Introduction to Digital Signal Processing: Introduction, A Digital signal-processing system, The sampling process, Discrete time sequences, Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation. Computational Accuracy in DSP Implementations: Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

Unit – II:
Architectures for Programmable DSP Devices: Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed Issues, Features for External interfacing.

Unit-III:
Programmable Digital Signal Processors: Commercial digital signal processing devices, Data Addressing modes of TMS320C54XX DSPs, data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX processors, program control, TMS320C54XX instructions and programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, pipeline Operation of TMS320C54XX Processors.

Unit – IV:
Analog Devices Family of DSP Devices: Analog Devices Family of DSP Devices ALU and MAC block diagram, Shifter Instruction, Base Architecture of ADSP 2100, ADSP2181 high performance processor. Introduction to Blackfin Processor- The Blackfin Processor, Introduction to Micro signal Architecture, Overview of Hardware Processing Units and Register files, Address Arithmetic Unit, Control Unit, Bus Architecture and Memory, Basic Peripherals.

Unit – V:
Interfacing Memory and I/O Peripherals to Programmable DSP Devices: Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA).

Text Books:
1. Digital Signal Processing – Avtar Singh and S. Srinivasan, Thomson Publications, 2004.
2. A Practical Approach To Digital Signal Processing - K Padmanabhan, R. Vijayarajeswaran, Ananthi. S, New Age International, 2006/2009
3. Embedded Signal Processing with the Micro Signal Architecture Publisher: Woon-Seng Gan, Sen M. Kuo, Wiley-IEEE Press, 2007

Reference Books:

1. Digital Signal Processors, Architecture, Programming and Applications–B. Venkata ramani and M. Bhaskar, 2002, TMH.
2. DSP Processor Fundamentals, Architectures & Features – Lapsley et al., S. Chand & Co
3. Digital Signal Processing Applications Using the ADSP-2100 Family, Amy Mar, PHI
4. The Scientist and Engineer's Guide to Digital Signal Processing by Steven W. Smith, California Technical Publishing
5. Embedded Media Processing, David J. Katz and Rick Gentile of Analog Devices, Newnes

Course Outcomes:

1. Understand the basics of Digital Signal Processing and transforms.
2. Able to distinguish between the architectural features of general purpose processors and DSP processors.
3. Understand the architectures of TMS320C54xx devices and ADSP 2100 DSP devices.
4. Able to write simple assembly language programs using instruction set of TMS320C54xx.
5. Can interface various devices to DSP Processors.

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		3	1	0	4
WAVELET THEORY					

Unit – I
The Age of Wavelets –Introduction-The Origins of Wavelets-Are They Fundamentally New-Wavelets and Other Reality Transforms, Managing Heisenberg's Uncertainty Ghost. History of Wavelet from Morlet to Daubechies Via Mallat , Different Communities of Wavelets, Different Families of Wavelets within Wavelet Communities, Interesting Recent Developments, Wavelets in the Future

Unit – II
Introduction-Vector spaces – bases, orthonormality, projection, functions and function spaces, orthogonal functions, orthonormal functions, function spaces, orthogonal basis functions, orthonormality and the method of finding the coefficients, complex fourier series, orthogonality of complex exponential bases

Unit – III
Continuous Wavelet and Short time Fourier Transform-Wavelet Transform, mathematical preliminaries, continuous time frequency representation of signals, the windowed fourier transform(Short Time Fourier Transform), The uncertainty principle and time frequency tiling, properties of wavelets used in Continuous Wavelet Transform, Continuous Versus Discrete Wavelet Transform

Unit – IV
Discrete Wavelet Transform-Haar scaling functions and function spaces, Nested Spaces, Haar Wavelet Function, Normalization of Haarbases at different scales, Standardizing the Notations, Refinement Relation with Respect to Normalized Bases, Support of a wavelet system, Daubechies Wavelets

Unit – V
Biorthogonal Wavelets-Biorthogonality in vector space, Biorthogonal Wavelet Systems, Signal Representation using Biorthogonal Wavelet System, Biorthogonal Analysis, Biorthogonal Synthesis, Construction of Biorthogonal Wavelet Systems.

Text Book:
1. Insight into Wavelets: From theory to practice by K.P.Soman, Ramachandran, Resmi, PHI Learning PVT Ltd,2010
2. L.Prasad & S.S.Iyengar, Wavelet Analysis with Applications to Image Processing, CRC Press, 1997.

References:
1. Wavelet Transforms - Introduction to Theory and Applications, Raghuveer M.Rao, Ajit Bopardikar, Pearson Education, Asia
2. Fundaments of Wavelets - Theory, Algorithms and Applications, Jaideva C.Goswami, Andrew K. Chan, John Wiley & Sons.

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Course Outcomes:

1. Understand windowed Fourier transform and difference between windowed Fourier Transform and wavelet transform.
2. Understand wavelet basis and characterize continuous and discrete wavelet transforms
3. Understand multire solution analysis and identify various wavelets and evaluate their Time- frequency resolution properties
4. Implement discrete wavelet transforms with multirate digital filters and can under stand Wavelet packets
5. Design certain classes of wavelets to specification and justify the basis of the application of wavelet transforms to different fields

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POOL-4 (HONOR)		L	T	P	C
		3	1	0	4
MULTIRATE SYSTEMS AND FILTER BANKS					

Unit – I: Fundamentals of Multirate Systems: Basic Multirate Operations, Interconnection of Building Blocks, The Polyphase representation, Multistage Implementations, Some Applications of Multirate Systems, Special Filters and Filter Banks

Unit – II
Maximally Decimated Filter Banks: Errors created in the QMF Bank, A Simple Alias Free QMF System, Power Symmetric QMF Banks, M-Channel Filter Banks, Polyphase representation, Perfect Reconstruction Systems, Alias Free Filter Banks, Tree Structured Filter Banks, Trans-Multiplexers

Unit – III
Para unitary Perfect Reconstruction (PR) Filter Banks: Lossless Transfer Matrices, Filter Bank Properties Induced by Para unitariness, Two channel FIR Para unitary QMF Banks, The Two channel Para unitary QMF Lattice, Transform Coding and the LOT.

Unit – IV
Cosine Modulated Filter Banks: The Pseudo QMF Bank, Design of Pseudo QMF Bank, Efficient Polyphase Structures, Deeper Properties of Cosine Matrices, Cosine Modulated Perfect Reconstruction Systems.

Unit – V
Quantization effects, Types of Quantization effects, Review of standard techniques, Noise transmission in multirate systems, Noise in filter banks, Filter bank output noise, Limit Cycles, Coefficient Quantization

Text Book:

1. Multirate Systems and Filter Banks, P.P.Vaidyanathan, Pearson Education, Low Priced Edition, 2006.

Reference Books:

1. Multirate Signal Processing for Communication Systems by F.J.Harris, Pearson Education, Low Priced Edition.
2. Digital Signal Processing, A computer Based Approach by Sanjit K Mitra, Tata McGraw Hill Publishing.

Course Outcomes:

1. Understand the concepts multi-rate systems
2. Describe the applications of multi-rate systems
3. Study of various filter banks
4. Analyze the efforts of quantization
5. Explain the overall multi-rate systems and filter banks

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POOL-4 (HONOR)		L	T	P	C
		3	1	0	4

MATHEMATICAL METHODS FOR SIGNAL PROCESSING

Unit – I
Vectors: Representation and Dot products, Matrices: Matrix Multiplication, Transposes, Inverses, Gaussian Elimination, factorization, rank of a matrix, Vector spaces: Column and row spaces, Solving Ax=0 and Ax=b, Independence, basis, dimension, linear transformations, Orthogonality: Orthogonal vectors and subspaces, projection and least squares, Gram-Schmidt orthogonalization.

Unit – II
Determinants: Determinant formula, cofactors, inverses and volume, Eigenvalues and Eigenvectors: characteristic polynomial, Diagonalization, Hermitian and Unitary matrices, Spectral theorem, Change of basis, Positive definite matrices and singular value decomposition, Linear transformations.

Unit – III
Review of Probability: Basic set theory and set algebra, basic axioms of probability, Conditional Probability, Bayes theorem/Law of total probability.

Unit – IV
Random variables PDF/PMF/CDF Properties, random vectors marginal/joint/conditional density functions, transformation of Random Variables, characteristic/moment generating functions, Random sums of Random variables, Law of Large numbers (strong and Weak), Limit theorems convergence types, Inequalities Chebyshev/Markov/Chernoff bounds.

Unit – V
Random processes: classification of random processes, wide sense stationary processes, autocorrelation function and power spectral density and their properties. Examples of random process models - Gaussian/Markov Random process, Random processes through LTI systems.

Textbooks:
1. Introduction to linear algebra - Gilbert Strang, SIAM, 2016.
2. Introduction to probability - Bertsekas and Tsitsiklis, Athena, 2008

References Books:
1. Probability and Random processes for Electrical Engineers, Leon Garcia Addison Wesley, 2nd edition, 1994
2. Probability and Random Processes, Geoffrey Grimmett, David Stirzaker, 3rd Edition, Oxford University Press, 2001.
3. Probability and Stochastic Process, Roy D Yates, David J Goodman, 2nd edition Wiley, 2010

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Course Outcomes:

1. Understand and solve the problems associated with Vectors
2. Solve the problem associated with linear algebra
3. Understand probability theory and conditional probability
4. Summarize the concepts associated with multiple random variables and to solve the problems associated with power spectral density of the output of the system.
5. Recognize the usage of random process in signal processing and to solve the corresponding problems.

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MINOR Course		L	T	P	C
		3	0	0	4
ELECTRONICS DEVICES AND BASIC CIRCUITS					

UNIT-I :Review of Semi Conductor Physics: Hall effect, continuity equation, law of junction, Fermi Dirac function, Fermi level in intrinsic and extrinsic Semiconductors
Junction Diode Characteristics : energy band diagram of PN junction Diode, Open circuited p-n junction, Biased p-n junction, p-n junction diode, current components in PN junction Diode, diode equation, V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Diode capacitance.

UNIT-II:
Special Semiconductor Devices: Zener Diode, Breakdown mechanisms, Zener diode applications, LED, Varactor Diode, Photodiode, Tunnel Diode, UJT, PNPN Diode, SCR. Construction, operation and V-I characteristics.
Rectifiers and Filters: Basic Rectifier setup**,** half wave rectifier, full wave rectifier, bridge rectifier, derivations of characteristics of rectifiers, rectifier circuits-operation, input and output waveforms, Filters, Inductor filter(Series inductor), Capacitor filter(Stunt inductor), π-Filter, comparison of various filter circuits in terms of ripple factors.

UNIT- III: Transistor Characteristics:
BJT: Junction transistor, transistor current components, transistor equation, transistor configurations, transistor as an amplifier, characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, Ebers-Moll model of a transistor, punch through/ reach through, Photo transistor, typical transistor junction voltage values.
FET: FET types, construction, operation, characteristicsμ, g_m, r_d parameters, MOSFET-types, construction, operation, characteristics, comparison between JFET and MOSFET.

UNIT- IV: Transistor Biasing and Thermal Stabilization : Need for biasing, operating point, load line analysis, BJT biasing- methods, basic stability, fixed bias, collector to base bias, self bias, Stabilization against variations in V_{BE}, Ic, and β, Stability factors, (S,S',S''), Bias compensation, Thermal runaway, Thermal stability.
FET Biasing- methods and stabilization.

UNIT- V: Small Signal Low Frequency Transistor Amplifier Models:
BJT: Two port network, Transistor hybrid model, determination of h-parameters, conversion of h-parameters, generalized analysis of transistor amplifier model using h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis, Comparison of transistor amplifiers.
FET: Generalized analysis of small signal model, Analysis of CG, CS and CD amplifiers, comparison of FET amplifiers.

Text Books:

1. Electronic Devices and Circuits- J. Millman, C. Halkias, Tata Mc-Graw Hill, SecondEdition,2007
2. Electronic Devices and Circuits by David A. Bell, Oxford University Press
3. Electronics devices & circuit theory- Robert L.Boylestad and Loui Nashelsky, Pearson/Prentice hall, tenth edition,2009

References:

1. Integrated Electronics-J. Millman, C. Halkias,Tata Mc-Graw Hill, Second Edition, 2009
2. Electronic Devices and Circuits-K. Lal Kishore, BS Publications, Fourth Edition, 2016.
3. Electronic Devices and Circuits-Salivahanan, Kumar, Vallavaraj, Tata Mc-Graw Hill, 4th Edition, 2008.
4. Electronic Devices and Integrated Circuits – B.P. Singh, Rekha , Pearson publications, 2006.

OUTCOMES:

At the end of this course the student will be able to

1. Apply the basic concepts of semiconductor physics.
2. Understand the formation of p-n junction and how it can be used as a p-n junction as diode in different modes of operation.
3. Know the construction, working principle of rectifiers with and without filters with relevant expressions and necessary comparisons.
4. Understand the construction, principle of operation of transistors, BJT and FET with their V-I characteristics in different configurations.
5. Know the need of transistor biasing, various biasing techniques for BJT and FET and stabilization concepts with necessary expressions.
6. Perform the analysis of small signal low frequency transistor amplifier circuits using BJT and FET in different configurations.

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MINOR Course		L	T	P	C
		3	0	0	4
DIGITAL ELECTRONICS					

UNIT – I

REVIEW OF NUMBER SYSTEMS & CODES:

Representation of numbers of different radix, conversation from one radix to another radix, r-1's compliments and r's compliments of signed members. Gray code ,4 bit codes; BCD, Excess-3, 2421, 84-2-1 code etc. Error detection & correction codes: parity checking, even parity, odd parity, Hamming code.

BOOLEAN THEOREMS AND LOGIC OPERATIONS:

Boolean theorems, principle of complementation & duality, De-morgan theorems. Logic operations ; Basic logic operations -NOT, OR, AND, Universal Logic operations, EX-OR, EX-NOR operations. Standard SOP and POS Forms, NAND-NAND and NOR-NOR realizations, Realization of three level logic circuits. Study the pin diagram and obtain truth table for the following relevant ICs 7400,7402,7404,7408,7432,7486.

UNIT – II

MINIMIZATION TECHNIQUES:

Minimization and realization of switching functions using Boolean theorems, K-Map (up to 6 variables)and tabular method(Quine-mcCluskey method) with only four variables and single function.

COMBINATIONAL LOGIC CIRCUITS DESIGN:

Design of Half adder, full adder, half subtractor, full subtractor, applications of full adders; 4-bit adder-subtractor circuit, BCD adder circuit, Excess 3 adder circuit and carry look-a-head adder circuit, Design code converts using Karnaugh method and draw the complete circuit diagrams.

UNIT – III

COMBINATIONAL LOGIC CIRCUITS DESIGN USING MSI &LSI :

Design of encoder ,decoder, multiplexer and de-multiplexers, Implementation of higher order circuits using lower order circuits .Realization of Boolean functions using decoders and multiplexers. Design of Priority encoder, 4-bit digital comparator and seven segment decoder. . Study the relevant ICs pin diagrams and their functions 7442,7447,7485,74154.

INTRODUCTION OF PLD's :

PLDs: PROM, PAL, PLA -Basics structures, realization of Boolean functions, Programming table.

UNIT – IV

SEQUENTIAL CIRCUITS I:

Classification of sequential circuits (synchronous and asynchronous) , operation of NAND & NOR Latches and flip-flops; truth tables and excitation tables of RS flip-flop, JK flip-flop, T flip-flop, D flip-flop with reset and clear terminals. Conversion from one flip-flop to another

flip-flop. Design of 5ripple counters, design of synchronous counters, Johnson counter, ring counter. Design of registers - Buffer register, control buffer register, shift register, bi-directional shift register, universal shift, register.

Study the following relevant ICs and their relevant functions 7474,7475,7476,7490,7493,74121.

UNIT – V

SEQUENTIAL CIRCUITS II :

Finite state machine; state diagrams, state tables, reduction of state tables. Analysis of clocked sequential circuits Mealy to Moore conversion and vice-versa.Realization of sequence generator, Design of Clocked Sequential Circuit to detect the given sequence (with overlapping or without overlapping).

TEXT BOOKS:

1. Switching and finite automata theory Zvi.KOHAVI, Niraj.K.Jha 3rd Edition, Cambridge University Press,2009
2. Digital Design by M.Morris Mano, Michael D Ciletti,4th edition PHI publication,2008
3. Switching theory and logic design by Hill and Peterson**,** Mc-Graw Hill TMH edition, 2012.

REFERENCES:

1. Fundamentals of Logic Design by Charles H. Roth Jr, Jaico Publishers,2006
2. Digital electronics by R S Sedha.S.Chand& company limited,2010
3. Switching Theory and Logic Design by A. Anand Kumar, PHI Learning pvt ltd,2016.
4. Digital logic applications and design by John M Yarbough, Cengage learning, 2006.
5. TTL 74-Series data book.

Course Outcomes:

1. Classify different number systems and apply to generate various codes.
2. Use the concept of Boolean algebra in minimization of switching functions
3. Design different types of combinational logic circuits.
4. Apply knowledge of flip-flops in designing of Registers and counters
5. The operation and design methodology for synchronous sequential circuits and algorithmic state machines.
6. Produce innovative designs by modifying the traditional design techniques.

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		3	0	0	4

PRINCIPLES OF COMMUNICATIONS

UNIT-I

Amplitude modulation: Introduction, Amplitude Modulation: Time & Frequency – Domain description, switching modulator, Envelop detector.

Double side band-suppressed carrier modulation: Time and Frequency – Domain description,Ringmodulator,Coherentdetection,CostasReceiver,QuadratureCarrier Multiplexing.

Singleside–andvestigialsidebandmethodsofmodulation:SSBModulation,VSBModulation,FrequencyTranslation,Frequency-Division Multiplexing, Theme Example: VSB Transmission of Analog and Digital Television

UNIT-II

Angle modulation: Basic definitions, Frequency Modulation: Narrow Band FM, Wide Band FM, Transmission bandwidth of FM Signals, Generation of FM Signals, Demodulation of FM Signals, FM Stereo Multiplexing,

Phase–Locked Loop: Nonlinear model of PLL, Linear model of PLL, Nonlinear Effects in FM Systems. The Super-heterodyne Receiver

UNIT-III

Randomvariables&process:Introduction,Probability,ConditionalProbability,Randomvariables,SeveralRandomVariables.StatisticalAverages:Functionofarandomvariable,Moments,RandomProcesses,Mean,CorrelationandCovariancefunction:Propertiesofautocorrelationfunction,Cross–correlationfunctions.

Noise:ShotNoise,Thermalnoise,WhiteNoise,NoiseEquivalentBandwidth,NoiseFigure.

UNIT-IV

Noise in analog modulation: Introduction, Receiver Model, Noise in DSB-SC receivers, Noise in AM receivers, Threshold effect, Noise in FM receivers, Capture effect, FM threshold effect, FM threshold reduction, Pre-emphasis and De-emphasis in FM.

UNIT-V

Digitalrepresentationofanalogsignals: Introduction,WhyDigitizeAnalogSources?,TheSampling process, Pulse Amplitude Modulation, Time Division Multiplexing, Pulse-Position Modulation, Generation of PPM Waves, Detection of PPM Waves, The Quantization Process, Quantization Noise,

Pulse Code Modulation: Sampling, Quantization, Encoding, Regeneration, Decoding, Filtering, Multiplexing

Textbooks:

1. Principles of Communication Systems – H Taub& D. Schilling, Gautam Sahe, TMH, 2007, 3rd Edition.
2. Communication Systems–B.P.Lathi,BSPublication,2006.

References:

1. Principles of Communication Systems – Simon Haykin, John Wiley, 2nd Edition.
2. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004.
3. Communication Systems–R.P. Singh,SPSapre,SecondEditionTMH,2007.

Course Outcomes:

At the end of the course, students will be able to:

1. Analyze the performance of analog modulation schemes in time and frequency domains.
2. Analyze the performance of angle modulated signals.
3. Characterize analog signals in time domain as random processes and noise
4. Characterize the influence of channel on analog modulated signals
5. Determine the performance of analog communication systems interms of SNR
6. Analyzepulseamplitudemodulation,pulsepositionmodulation,pulseco demodulationandTDMsystems

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MINOR Course		L	T	P	C
		3	0	0	4
SIGNAL ANALYSIS					

UNIT- I: INTRODUCTION: Definition of Signals and Systems, Classification of Signals, Classification of Systems, Operations on signals: time-shifting, time-scaling, amplitude-shifting, amplitude-scaling. Problems on classification and characteristics of Signals and Systems. Complex exponential and sinusoidal signals, Singularity functions and related functions: impulse function, step function signum function and ramp function. Analogy between vectors and signals, orthogonal signal space, Signal approximation using orthogonal functions, Mean square error, closed or complete set of orthogonal functions, Orthogonality in complex functions. Related Problems.

UNIT–II: FOURIER Analysis of Periodic Signals:
Fourier series representation of continuous time periodic signals, properties of Fourier series, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Relation between Trigonometric and Exponential Fourier series, Complex Fourier spectrum.

UNIT-III: FOURIER Analysis of Aperiodic Signals:
Deriving Fourier transform from Fourier series, Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms, Fourier transforms involving impulse function and Signum function. Introduction to Hilbert Transform. Related Problems.

UNIT –IV:
CORRELATION: Auto-correlation and cross-correlation of functions, properties of correlation function, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation between Convolution and correlation
SAMPLING THEOREM : Graphical and analytical proof for Band Limited Signals, impulse sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, effect of under sampling – Aliasing, Introduction to Band Pass sampling, Related problems.

UNIT –V:
LAPLACE TRANSFORMS: Introduction**,** Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Properties of L.T's, Inverse Laplace transform, Relation between L.T's, and F.T. of a signal.

Z–TRANSFORMS: Concept of Z- Transform of a discrete sequence. Region of convergence in Z-Transform, constraints on ROC for various classes of signals, Inverse Z-transform, properties of Z-transforms. Distinction between Laplace, Fourier and Z transforms.

TEXT BOOKS:

1. Signals, Systems & Communications - B.P. Lathi, BS Publications, 2003.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2ndEdn,1997



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REFERENCE BOOKS:

1. Signals & Systems - Simon Haykin and Van Veen, Wiley, 2ndEdition,2007

Course Outcomes: At the end of this course the student will able to:

1. Differentiate the various classifications of signals and systems
2. Analyze the frequency domain representation of signals using Fourier concepts
3. Know the sampling process and various types of sampling techniques.
4. Apply Laplace and z-transforms to analyze signals and Systems (continuous & discrete).

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COURSE STRUCTURE AND SYLLABUS

For

B.TECH – ELECTRICAL AND ELECTRONICS ENGINEERING

(Applicableforbatchesadmittedfrom2020-2021)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA-533003, Andhra Pradesh, India

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA–533003, Andhra Pradesh, India
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

I B.Tech – I SEMESTER

Sl. No	Course Components	Subjects	L	T	P	Credits
1	HSMC	Communicative English	3	0	0	3
2	BSC	Mathematics-I (Calculus and Differential Equations)	3	0	0	3
3	BSC	Mathematics-II **(**Linear Algebra and Numerical Methods**)**	3	0	0	3
4	ESC	Programming for Problem Solving Using C	3	0	0	3
5	ESC	Engineering Drawing & Design	1	0	4	3
6	HSMC	EnglishCommunicationSkillsLaboratory	0	0	3	1.5
7	BSC	Electrical Engineering Workshop	0	1	3	1.5
8	ESC	Programming for Problem Solving Using C Lab	0	0	3	1.5
		Total Credits				**19.5**

I B.Tech – II SEMESTER

Sl. No	Course Components	Subjects	L	T	P	Credits
1	BSC	Mathematics-III (Vector Calculus, Transforms and PDE)	3	0	0	3
2	BSC	Applied Physics	3	0	0	3
3	ESC	Data Structures Through C	3	0	0	3
4	ESC	Electrical Circuit Analysis-I	3	0	0	3
5	ESC	Basic Civil and Mechanical Engineering	3	0	0	3
6	BSC	Applied Physics Lab	0	0	3	1.5
7	ESC	Basic Civil and Mechanical Engineering Lab	0	0	3	1.5
8	ESC	Data Structures through C Lab	0	0	3	1.5
9	Mandatory Course	Constitution of India	2	0	0	0
		Total Credits				**19.5**

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II B.Tech – I Semester

Sl. No	Course Components	Subjects	L	T	P	Credits
1	BSC	Mathematics– IV	3	0	0	3
2	PCC	Electronic Devices and Circuits	3	0	0	3
3	PCC	Electrical Circuit Analysis –II	3	0	0	3
4	PCC	DC Machines and Transformers	3	0	0	3
5	PCC	Electro Magnetic Fields	3	0	0	3
6	PCC	Electrical Circuits Lab	0	0	3	1.5
7	PCC	DC Machines and Transformers Lab	0	0	3	1.5
8	PCC	Electronic Devices and Circuits lab	0	0	3	1.5
9	SC	Skill oriented course - Design of Electrical Circuits using Engineering Software Tools	0	0	4	2
10	MC	Professional Ethics & Human Values	2	0	0	0
		Total Credits	**21.5**			

II B.Tech – II Semester

Sl. No	Course Components	Subjects	L	T	P	Credits
1	ESC	Python Programming	3	0	0	3
2	PCC	Digital Electronics	3	0	0	3
3	PCC	Power System-I	3	0	0	3
4	PCC	Induction and Synchronous Machines	3	0	0	3
5	HSMC	Managerial Economics & Financial Analysis	3	0	0	3
6	ESC	Python Programming Lab	0	0	3	1.5
7	PCC	Induction and Synchronous Machines Lab	0	0	3	1.5
8	PCC	Digital Electronics Lab	0	0	3	1.5
9	SC	Skill oriented course- IoT Applications of Electrical Engineering Lab	0	0	4	2
		Total Credits	**21.5**			
		Minors Course*	4	0	0	4
		Honors Course*	4	0	0	4

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III B.Tech – I Semester

Sl. No	Course Components	Subjects	L	T	P	Credits
1	PCC	Power Systems-II	3	0	0	3
2	PCC	Power Electronics	3	0	0	3
3	PCC	Control Systems	3	0	0	3
4	OEC	Open Elective- I/ Job Oriented Elective-I	3	0	0	3
5	PEC	Professional Elective - I	3	0	0	3
6	PCC	Control Systems Lab	0	0	3	1.5
7	PCC	Power Electronics Lab	0	0	3	1.5
8	SC	Soft Skill Course:Employability Skills	2	0	0	2
9	MC	Environmental Science	2	0	0	0
10	PROJ	Summer Internship 2 Months (Mandatory) after second year (to be evaluated during V semester)	0	0	0	1.5
		TotalCredits	**21.5**			
		Minors Course*	4	0	0	4
		Honors Course*	4	0	0	4

III B.Tech – II Semester

Sl. No	Course Components	Subjects	L	T	P	Credits
1	PCC	Microprocessors and Microcontrollers	3	0	0	3
2	PCC	Electrical Measurements and Instrumentation	3	0	0	3
3	PCC	Power System Analysis	3	0	0	3
4	PEC	Professional Elective - II	3	0	0	3
5	OEC	Open Elective –II/ Job Oriented Elective-II	3	0	0	3
6	PCC	Electrical Measurements and Instrumentation Lab	0	0	3	1.5
7	PCC	Microprocessors and Microcontrollers Lab	0	0	3	1.5
8	PCC	Power Systems and Simulation Lab	0	0	3	1.5
9	SC	**Skill Advanced Course:** Machine Learning with Python	2	0	0	2
10	MC	Research Methodology	2	0	0	0
		Total Credits	**21.5**			
		Minors Course*	4	0	0	4
		Honors Course*	4	0	0	4

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IV B.Tech – I Semester

Sl. No	Course Components	Subjects	L	T	P	Credits
1	PEC	Professional Elective – III	3	0	0	3
2	PEC	Professional Elective – IV	3	0	0	3
3	PEC	Professional Elective – V	3	0	0	3
4	OEC	Open Elective- III/Job Oriented Elective-III	3	0	0	3
5	OEC	Open Elective-IV /Job Oriented Elective-IV	3	0	0	3
6	HSMC	Universal Human Values-2: Understanding Harmony	3	0	0	3
7	SC	**Skill Advanced Course** Machine Learning with PythonLab	0	0	4	2
8	PROJ	Industrial / Research Internship 2 Months (Mandatory) after third year (to be evaluated during VII Semester)	0	0	3	3
		Total Credits	**23**			
		Minors Course*	4	0	0	4
		Honors Course*	4	0	0	4

IVB.TechIISemester

Sl. No	Course Components	Subjects	L	T	P	Credits
1	Major Project	Project work, seminar and internship in industry (6 Months)	--	--	--	12
		Total Credits	**12**			

HSMC:Humanities and Social Science Including Management Courses
BSC :Basic Science Courses
ESC:Engineering Science Courses
PCC:Professional Core Courses

PEC : Professional Elective Courses
OEC : Open Elective Courses
PROJ : Internship, Seminar, Project Wok
MC : Mandatory Courses
SC : Skill Oriented Courses

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Professional Elective Subjects offered to EEE Branch Students:

Professional Elective – I:

1. Linear IC Applications
2. Utilization of Electrical Energy
3. Computer Architecture and Organization
4. Optimization Techniques
5. Object Oriented Programming through Java

Professional Elective – II:

1. Signal and Systems
2. Electric Drives
3. Advanced Control Systems
4. Switchgear and Protection
5. Big Data Analytics

Professional Elective –III:

1. Digital Signal Processing
2. Renewable and Distributed Energy Technologies
3. Flexible Alternating Current Transmission Systems
4. Power Systems Deregulation
5. Data Base Management Systems

Professional Elective – IV:

1. Hybrid Electric Vehicles
2. High Voltage Engineering
3. Programmable Logic Controllers and Applications
4. Cloud Computing with AWS
5. Deep Learning Techniques

Professional Elective – V:

1. Power System Operation and Control
2. Switched Mode Power Conversion
3. AI Applications toElectrical Engineering
4. Data Science
5. MEAN Stack Technologies

Open Electives offered by EEE Department for Other Branches (Except EEE Branch)

Open Elective-I:

1. Renewable Energy Sources
2. Concepts of Optimization Techniques
3. Concepts of Control Systems

Open Elective-II:

1. Battery Management Systems and Charging Stations
2. Fundamentals of utilization of Electrical Energy
3. Indian Electricity Act

Open Elective-III:

1. Concepts of Microprocessors and Microcontrollers
2. Fundamentals of Electric Vehicles
3. Concepts of Internet of Things

Open Elective-IV:

1. Concepts of Power System Engineering
2. Concepts of Smart Grid Technologies

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*For Honor's/ Minor Course Fullfillments:

- The 20 additional Credits need to be acquired, 16/15 credits can be earned by undergoing specified courses listed as pools, with 4/5 courses, each carrying 4/3 credits. The remaining 4/5 credits must be acquired through two online MOOCs (Swayam /NPTEL), which shall be domain specific, with 2/3 credits and with a minimum duration of 8/12weeks as recommended by the Board of Studies.
- Minor Engineering subjects are offered to other branches by EEE Department (except for EEE Students).
- Honors Engineering subjects are offered to EEE Students.
- The head of the department will float the list of allowed MOOC electives in each academic year, based on the list floated by MOOCs (Swayam/NPTEL).

*Honors Engineering Courses offered EEE Branch students

II B.Tech II Semester:

1. Communication Systems
2. Electrical Wiring, Estimation and Costing
3. Electrical Distribution Systems

III B.Tech I Semester:

1. Advanced Computer Networks
2. Power Quality
3. Special Electrical Machines

III B.Tech II Semester:

1. Digital Control Systems
2. Analysis of Power Electronic Converters
3. HVDC Transmission

IV B.Tech I Semester:

1. EHV AC Transmission
2. Smart Grid Technologies
3. Power Electronic Control of Electrical Drives

*Minor Engineering Courses offered by EEE Department for Other Branches (Except EEE Branch)

II B.Tech II Semester:

1. Fundamentals of Electrical Circuits
2. Concepts of Electrical Measurements

III B.Tech I Semester:

1. Analysis of Linear Systems
2. Energy Auditing, Conservation and Management

III B.Tech II Semester:

1. Evolutionary Algorithms
2. Fundamentals of Power Electronics

IV B.Tech I Semester:

1. Neural Networks and Fuzzy Logic
2. Concepts of Electric Drives and Its Applications

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I Year I Semester		L	T	P	C
		3	0	0	3
COMMUNICATIVE ENGLISH					

Introduction

The course is designed to train students in receptive (listening and reading) as well as productive and interactive (speaking and writing) skills by incorporating a comprehensive, coherent and integrated approach that improves the learners' ability to effectively use English language in academic/ workplace contexts. The shift is from *learning about the language* to *using the language*. On successful completion of the compulsory English language course/s in B.Tech., learners would be confident of appearing for international language qualification/proficiency tests such as IELTS, TOEFL, or BEC, besides being able to express themselves clearly in speech and competently handle the writing tasks and verbal ability component of campus placement tests. Activity based teaching-learning methods would be adopted to ensure that learners would engage in actual use of language both in the classroom and laboratory sessions.

Course Objectives

- Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Learning Outcomes

At the end of the module, the learners will be able to

- understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information
- ask and answer general questions on familiar topics and introduce oneself/others
- employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information
- recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs
- form sentences using proper grammatical structures and correct word forms

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Unit 1:

Lesson-1: A Drawer full of happiness from "**Infotech English**", Maruthi Publications

Lesson-2: Deliverance by Premchand from "**The Individual Society",** Pearson Publications. (Non-detailed)

Listening: Listening to short audio texts and identifying the topic. Listening to prose, prose and conversation.

Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests. Self introductions and introducing others.

Reading: Skimming text to get the main idea. Scanning to look for specific pieces of information.

Reading for Writing: Paragraph writing (specific topics) using suitable cohesive devices; linkers, sign posts and transition signals; mechanics of writing - punctuation, capital letters.

Vocabulary: Technical vocabulary from across technical branches (20) GRE Vocabulary (20) (Antonyms and Synonyms, Word applications) Verbal reasoning and sequencing of words.

Grammar: Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countables and uncountables; singular and plural basic sentence structures; simple question form - wh-questions; word order in sentences.

Pronunciation: Vowels, Consonants, Plural markers and their realizations

Unit 2:

Lesson-1: Nehru's letter to his daughter Indira on her birthday from "**Infotech English**", Maruthi Publications

Lesson-2: Bosom Friend by Hira Bansode from "**The Individual Society",** Pearson Publications.(Non-detailed)

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts, both in speaking and writing.

Speaking: Discussion in pairs/ small groups on specific topics followed by short structured talks. Functional English: Greetings and leave takings. **Reading**: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions.

Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary Analogies (20 words) (Antonyms and Synonyms, Word applications)

Grammar: Use of articles and zero article; prepositions.

Pronunciation: Past tense markers, word stress-di-syllabic words

Unit 3:

Lesson-1: Stephen Hawking-Positivity 'Benchmark' from "**Infotech English**", Maruthi Publications

Lesson-2: Shakespeare's Sister by Virginia Woolf from "**The Individual Society",** Pearson Publications. (Non-detailed**)**

Listening: Listening for global comprehension and summarizing what is listened to, both in speaking and writing.

Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed. Functional English: Complaining and Apologizing.

Reading: Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension. Critical reading.

Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. Letter writing-types, format and principles of letter writing. E-mail etiquette, Writing CV's.

Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Association, sequencing of words

Grammar: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.

Pronunciation: word stress-poly-syllabic words.

Unit 4:

Lesson-1: Liking a Tree, Unbowed: Wangari Maathai-biography from "**Infotech English**", Maruthi Publications

Lesson-2: Telephone Conversation-Wole Soyinka from "**The Individual Society",** Pearson Publications**.**(Non-detailed)

Listening: Making predictions while listening to conversations/ transactional dialogues without video (only audio); listening to audio-visual texts.

Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions. Functional English: Permissions, Requesting, Inviting.

Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicative process or display complicated data.

Reading for Writing: Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables. Writing SOP, writing for media.

Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Cloze Encounters.

Grammar: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms

Pronunciation: Contrastive Stress

Unit 5:

Lesson-1: Stay Hungry-Stay foolish from "**Infotech English**", Maruthi Publications

Lesson-2: Still I Rise by Maya Angelou from "**The Individual Society",** Pearson Publications. (Non-detailed)

Listening: Identifying key terms, understanding concepts and interpreting the concepts both in speaking and writing.

Speaking: Formal oral presentations on topics from academic contexts - without the use of PPT slides. Functional English: Suggesting/Opinion giving.

Reading: Reading for comprehension. RAP Strategy Intensive reading and Extensive reading techniques.

Reading for Writing: Writing academic proposals- writing research articles: format and style.

Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Coherence, matching emotions.

Grammar: Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)

Pronunciation: Stress in compound words

Prescribed text books for theory for Semester-I:

1. "**Infotech English**", Maruthi Publications. (Detailed)

2."**The Individual Society",** Pearson Publications. (Non-detailed)

Prescribed text book for Laboratory for Semesters-I & II:

1. "**Infotech English**", Maruthi Publications. (With Compact Disc)

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Reference Books:

- Bailey, Stephen. *Academic writing: A handbook for international students*. Routledge, 2014.
- Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking.* Heinley ELT; 2nd Edition, 2018.
- Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
- Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012.

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I Year - I Semester		L	T	P	C
		3	0	0	3
MATHEMATICS-I (Calculus and Differential Equations)					

(Common to ALL branches of First Year B. Tech)

Course Objectives:

- To familiarize a variety of well-known sequences and series, with a developing intuition about the behavior of new ones.
- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real-world problems and their applications.

Course Outcomes: At the end of the course, the student will be able to

- utilize mean value theorems to real life problems (L3)
- solve the differential equations related to various engineering fields (L3)
- familiarize with functions of several variables which is useful in optimization (L3)
- apply double integration techniques in evaluating areas bounded by region (L3)
- students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional and 3-dimensional coordinate systems (L5)

UNIT – I: Sequences, Series and Mean value theorems: (10hrs)

Sequences and Series: Convergences and divergence – Ratio test – Comparison tests – Integral test – Cauchy's root test – Alternate series– Leibnitz's rule.

Mean Value Theorems (without proofs): Rolle's Theorem – Lagrange's mean value theorem – Cauchy's mean value theorem – Taylor's and Maclaurin's theorems with remainders, Problems and applications on the above theorem.

UNIT – II: Differential equations of first order and first degree: (10hrs)

Linear differential equations– Bernoulli's equations –Exact equations and equations reducible to exact form.

Applications: Newton's Law of cooling– Law of natural growth and decay– Orthogonal trajectories– Electrical circuits.

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UNIT – III: Linear differential equations of higher order: (10hrs)

Homogeneous and Non-homogeneous differential equations of higher order with constant coefficients – with non-homogeneous term of the type e^{ax}, sin ax, cos ax, polynomials in x^n, $e^{ax}V(x)$ and $x^nV(x)$ – Method of Variation of parameters, Cauchy and Legendre's linear equations.

Applications: LCR circuit, Simple Harmonic motion.

UNIT – IV: Partial differentiation: (10hrs)

Introduction – Homogeneous function – Euler's theorem– Total derivative– Chain rule– Jacobian – Functional dependence –Taylor's and MacLaurin's series expansion of functions of two variables.
Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method.

UNIT – V: Multiple integrals: (8 hrs)

Double and Triple integrals – Change of order of integration in double integrals – Change of variables to polar, cylindrical and spherical coordinates.
Applications: Finding Areas and Volumes.

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers, 2018
2. B. V. Ramana, Higher Engineering Mathematics, 6th Edition, Tata Mc. Graw Hill Education, 2007.

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India, 2011.
2. Joel Hass, Christopher Heil and Maurice D. Weir, Thomas calculus, 14thEdition, Pearson, 2017.
3. Lawrence Turyn, Advanced Engineering Mathematics, CRC Press, 2013.
4. Srimantha Pal, S. C. Bhunia, Engineering Mathematics, Oxford University Press, 2015.

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I Year I Semester		L	T	P	C
		3	0	0	3
MATHEMATICS-II (Linear Algebra and Numerical Methods) (Common to ALL branches of First Year B.Tech.)					

Course Objectives:

- To instruct the concept of Matrices in solving linear algebraic equations
- To elucidate the different numerical methods to solve nonlinear algebraic equations
- To disseminate the use of different numerical techniques for carrying out numerical integration.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real-world problems and their applications.

Course Outcomes: At the end of the course, the student will be able to

- develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6)
- solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel (L3)
- evaluate the approximate roots of polynomial and transcendental equations by different algorithms (L5)
- apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals (L3)
- apply numerical integral techniques to different Engineering problems (L3)
- apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations (L3)

UNIT – I: Solving systems of linear equations, Eigen values and Eigen vectors: (10hrs)

Rank of a matrix by echelon form and normal form – Solving system of homogeneous and non-homogeneous linear equations – Gauss Elimination method – Eigen values and Eigen vectors and properties (article-2.14 in text book-1).

Unit – II: Cayley–Hamilton theorem and Quadratic forms: (10hrs)

Cayley-Hamilton theorem (without proof) – Applications – Finding the inverse and power of a matrix by Cayley-Hamilton theorem – Reduction to Diagonal form – Quadratic forms and nature of the quadratic forms – Reduction of quadratic form to canonical forms by orthogonal transformation. Singular values of a matrix, singular value decomposition (text book-3).

UNIT – III: Iterative methods: (8 hrs)

Introduction– Bisection method–Secant method – Method of false position– Iteration method – Newton-Raphson method (One variable and simultaneous equations) – Jacobi and Gauss-Seidel methods for solving system of equations numerically.

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UNIT – IV: Interpolation: (10 hrs)
Introduction– Errors in polynomial interpolation – Finite differences– Forward differences– Backward differences –Central differences – Relations between operators – Newton's forward and backward formulae for interpolation – Interpolation with unequal intervals – Lagrange's interpolation formula– Newton's divide difference formula.

UNIT – V: Numerical differentiation and integration, Solution of ordinary differential equations with initial conditions: (10 hrs)
Numerical differentiation using interpolating polynomial – Trapezoidal rule– Simpson's $1/3^{rd}$ and $3/8^{th}$ rule– Solution of initial value problems by Taylor's series– Picard's method of successive approximations– Euler's method – Runge-Kutta method (second and fourth order).

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 44^{th} Edition, Khanna Publishers, 2018
2. B. V. Ramana, Higher Engineering Mathematics, 6^{th} Edition, Tata McGraw Hill Education, 2007
3. David Poole, Linear Algebra- A modern introduction, 4^{th} Edition, Cengage, 2015

Reference Books:

1. Steven C. Chapra, Applied Numerical Methods with MATLAB for Engineering and Science, Tata McGraw Hill Education, 4^{th} Edition, 2018
2. M. K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publications, 3^{rd} Edition, 2020.
3. Lawrence Turyn, Advanced Engineering Mathematics, CRC Press, 1^{st} Edition 2014.

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I Year I Semester		L	T	P	C
		3	0	0	3
PROGRAMMING FOR PROBLEM SOLVING USING C					

Course Objectives:

- To learn about the computer systems, computing environments, developing of a computer program and Structure of a C Program
- To gain knowledge of the operators, selection, control statements and repetition in C
- To learn about the design concepts of arrays, strings, enumerated structure and union types. To learn about their usage.
- To assimilate about pointers, dynamic memory allocation and know the significance of Preprocessor.
- To assimilate about File, I/O and significance of functions

UNIT I

Introduction to Computers: Creating and running Programs, Computer Numbering System, Storing Integers, Storing Real Numbers

Introduction to the C Language: Background, C Programs, Identifiers, Types, Variable, Constants, Input/output, Programming Examples, Scope, Storage Classes and Type Qualifiers.

Structure of a C Program: Expressions Precedence and Associativity, Side Effects, Evaluating Expressions, Type Conversion Statements, Simple Programs, Command Line Arguments.

UNIT II

Bitwise Operators: Exact Size Integer Types, Logical Bitwise Operators, Shift Operators.

Selection & Making Decisions: Logical Data and Operators, Two Way Selection, Multi-way Selection, More Standard Functions

Repetition: Concept of Loop, Pretest and Post-test Loops, Initialization and Updating, Event and Counter Controlled Loops, Loops in C, Other Statements Related to Looping, Looping Applications, Programming Examples

UNIT III

Arrays: Concepts, Using Array in C, Array Application, Two Dimensional Arrays, Multidimensional Arrays, Programming Example – Calculate Averages

Strings: String Concepts, C String, String Input / Output Functions, Arrays of Strings, String Manipulation Functions String/ Data Conversion, A Programming Example – Morse Code

Enumerated, Structure, and Union: The Type Definition (Type def), Enumerated Types, Structure, Unions, and Programming Application

UNIT IV

Pointers: Introduction, Pointers to pointers, Compatibility, L value and R value

Pointer Applications: Arrays, and Pointers, Pointer Arithmetic and Arrays, Memory Allocation Function, Array of Pointers, Programming Application

Processor Commands: Processor Commands

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UNIT V

Functions: Designing, Structured Programs, Function in C, User Defined Functions, Inter-Function Communication, Standard Functions, Passing Array to Functions, Passing Pointers to Functions, Recursion

Text Input / Output: Files, Streams, Standard Library Input / Output Functions, Formatting Input / Output Functions, Character Input / Output Functions

Binary Input / Output: Text versus Binary Streams, Standard Library, Functions for Files, Converting File Type.

Course Outcomes:

After the completion of the course the student should be able:

- To write algorithms and to draw flowcharts for solving problems
- To convert flowcharts/algorithms to C Programs, compile and debug programs
- To use different operators, data types and write programs that use two-way/ multi-way selection
- To select the best loop construct for a given problem
- To design and implement programs to analyze the different pointer applications
- To decompose a problem into functions and to develop modular reusable code
- To apply file I/O operations

Text Books:

1. Programming for Problem Solving, Behrouz A. Forouzan, Richard F.Gilberg, 1st edition, Cengage, 2019.
2. The C Programming Language, Brian W.Kernighan, Dennis M. Ritchie, 2 edition, Pearson, 2015.

References:

1. Computer Fundamentals and Programming, Sumithabha Das, 1st edition, McGraw Hill, 2018.
2. Programming in C, Ashok N. Kamthane, Amit Kamthane,3rd edition, Pearson, 2015.
3. Computer Fundamentals and Programming in C, PradipDey, ManasGhosh, 2nd edition, Oxford, 2013.

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I Year I Semester		L	T	P	C
		1	0	4	3
ENGINEERING DRAWING & DESIGN					

Course Objective: Engineering drawing being the principal method of communication for engineers,the objective is to introduce the students, the techniques of constructing the various types of polygons, curves and scales. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.

Unit I
Objective: To introduce the students to use drawing instruments and to draw polygons, Engg. Curves.
Polygons: Constructing regular polygons by general methods, inscribing and describing polygons on circles.
Curves: Parabola, Ellipse and Hyperbola by general and special methods, cycloids, involutes, tangents and normal for the curves.
Scales: Plain scales, diagonal scales and vernier scales

Unit II
Objective: To introduce the students to use orthographic projections, projections of points & simple lines. To make the students draw the projections of the lines inclined to both the planes.
Orthographic Projections: Reference plane, importance of reference lines, projections of points in various quadrants, projections of lines, line parallel to both the planes, line parallel to one plane and inclined to other plane.
Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclination and traces.

Unit III
Objective: The objective is to make the students draw the projections of the plane inclined to both the planes.
Projections of planes: regular planes perpendicular/parallel to one reference plane and inclined to the other reference plane; inclined to both the reference planes.

Unit IV
Objective: The objective is to make the students draw the projections of the various types of solids in different positions inclined to one of the planes.
Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to both the planes.

Unit V
Objective: The objective is to represent the object in 3D view through isometric views. The student will be able to represent and convert the isometric view to orthographic view and vice versa.
Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.
Computer Aided Design, drawing practice using Auto CAD, creating 2D&3D drawings of objects using Auto CAD

Note: In the End Examination there will be no question from CAD.

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TEXT BOOKS:

1. Engineering Drawing by N.D. Butt, 53rd edition, Charotar Publications, 2014.
2. Engineering Drawing by Agarwal & Agarwal,3rd edition, Tata McGraw Hill Publishers, 2019.

REFERENCE BOOKS:

1. Engineering Drawing by K. L. Narayana & P. Kannaiah, Scitech Publishers, 2011.
2. Engineering Graphics for Degree by K.C. John, 1st edition, PHI Publishers, 2009.
3. Engineering Graphics by PI Varghese, Mc Graw Hill Publishers, 2012.
4. Engineering Drawing + AutoCAD – K Venugopal, V. Prabhu Raja, 5th edition, New Age, 2011.

Course Outcome: The student will learn how to visualize 2D & 3D objects.

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I Year I Semester		L	T	P	C
		0	0	3	1.5
ENGLISH COMMUNICATION SKILLS LABORATORY					

TOPICS

UNIT I:

Vowels, Consonants, Pronunciation, Phonetic Transcription, Common Errors in Pronunciation,

UNIT II:

Word stress-di-syllabic words, poly-syllabic words, weak and strong forms, contrastive stress (Homographs)

UNIT III:

Stress in compound words, rhythm, intonation, accent neutralisation.

UNIT IV:

Listening to short audio texts and identifying the context and specific pieces of information to answer a series of questions in speaking.

UNIT V:

Newspapers reading; Understanding and identifying key terms and structures useful for writing reports.

Prescribed text book: "**Infotech English**", Maruthi Publications.

References:

1. Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL.
2. English Pronunciation in use- Mark Hancock, Cambridge University Press.
3. English Phonetics and Phonology-Peter Roach, Cambridge University Press.
4. English Pronunciation in use- Mark Hewings, Cambridge University Press.
5. English Pronunciation Dictionary- Daniel Jones, Cambridge University Press.
6. English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications.

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I Year I Semester		L	T	P	C
		0	1	3	1.5
ELECTRICAL ENGINEERING WORKSHOP					

Course Objectives:

- To demonstrate the usage of measuring equipment
- To train the students in setting up simple wiring circuits
- To impart methods in electrical machine wiring

Any 10 of the following experiments are to be conducted

List of Experiments:

1. Study of various electrical tools and symbols.
2. Study various types of electrical cables/wires, switches, fuses, fuse carriers, MCB, ELCB, RCCB and MCCB with their specifications and usage.
3. Soldering and de-soldering practice.
4. Identification of various types of resistors and capacitors and understand the usage digital multi-meter.
5. Identification of various semiconductor devices.
6. Study of Moving Iron, Moving Coil, Electrodynamic and Induction type meters.
7. Fluorescent lamp wiring.
8. Wiring of lighting circuit using two-way control (stair case wiring)
9. Go down wiring/ Tunnel wiring
10. Hospital wiring.
11. Measurement of voltage, current, power in DC circuit.
12. Wiring of power distribution arrangement using single phase MCB distribution board with ELCB, main switch and energy meter for calculating Power and Power Factor.
13. Measurement of earth resistance.
14. Wiring of backup power supply for domestic Installations including inverter, battery and load.
15. Troubleshooting of domestic electrical equipment’s (tube light and fan).
16. Understand the usage of CRO, function generator. & Regulated power supply and Measurement of ac signal parameters using CRO.
17. Assembling electronic components on bread board.
18. Obtain V-I characteristics of Light Emitting Diode.

Course Outcomes:

After the completion of the course the student should be able to:

- Explain the limitations, tolerances, safety aspects of electrical systems and wiring.
- Select wires/cables and other accessories used in different types of wiring.
- Make simple lighting and power circuits.
- Measure current, voltage and power in a circuit.

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I Year I Semester		L	T	P	C
		0	0	3	1.5
PROGRAMMING FOR PROBLEM SOLVING USING C LAB (ES1202)					

Course Objectives:

- Apply the principles of C language in problem solving.
- To design flowcharts, algorithms and knowing how to debug programs.
- To design & develop of C programs using arrays, strings pointers & functions.
- To review the file operations, preprocessor commands.

Exercise 1:

- Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five and four characters.
- Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5 inches.
- Write a C program to display multiple variables.

Exercise 2:

- Write a C program to calculate the distance between the two points.
- Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".

Exercise 3:

- Write a C program to convert a string to a long integer.
- Write a program in C which is a Menu-Driven Program to compute the area of the various geometrical shape.
- Write a C program to calculate the factorial of a given number.

Exercise 4:

- Write a program in C to display the n terms of even natural number and their sum.
- Write a program in C to display the n terms of harmonic series and their sum. 1 + 1/2 + 1/3 + 1/4 + 1/5 ... 1/n terms.
- Write a C program to check whether a given number is an Armstrong number or not.

Exercise 5:

- Write a program in C to print all unique elements in an array.
- Write a program in C to separate odd and even integers in separate arrays.
- Write a program in C to sort elements of array in ascending order.

Exercise 6:

- Write a program in C for multiplication of two square Matrices.
- Write a program in C to find transpose of a given matrix.

Exercise 7:

- Write a program in C to search an element in a row wise and column wise sorted matrix.
- Write a program in C to print individual characters of string in reverse order.

Exercise 8:

- Write a program in C to compare two strings without using string library functions.
- Write a program in C to copy one string to another string.

Exercise 9:

- Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
- Write a program in C to demonstrate how to handle the pointers in the program.

Exercise 10:

- Write a program in C to demonstrate the use of & (address of) and *(value at address) operator.
- Write a program in C to add two numbers using pointers.

Exercise 11:

- Write a program in C to add numbers using call by reference.
- Write a program in C to find the largest element using Dynamic Memory Allocation.

Exercise 12:

- Write a program in C to swap elements using call by reference.
- Write a program in C to count the number of vowels and consonants in a string using a pointer.

Exercise 13:

- Write a program in C to show how a function returning pointer.
- Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc( ) function.

Exercise 14:

- Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc( ) function. Understand the difference between the above two programs
- Write a program in C to convert decimal number to binary number using the function.

Exercise 15:

- Write a program in C to check whether a number is a prime number or not using the function.
- Write a program in C to get the largest element of an array using the function.

Exercise 16:

- Write a program in C to append multiple lines at the end of a text file.
- Write a program in C to copy a file in another name.
- Write a program in C to remove a file from the disk.

Course Outcomes:

After the completion of the course the student should be able to:

- Gains Knowledge on various concepts of a C language.
- Draw flowcharts and write algorithms.
- Design and development of C problem solving skills.
- Design and develop modular programming skills.
- Trace and debug a program

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I Year II Semester		L	T	P	C
		3	0	0	3
MATHEMATICS-III (Vector Calculus, Transforms and PDE)					

Course Objectives:

- To familiarize the techniques in partial differential equations
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real-world applications.

Course Outcomes: At the end of the course, the student will be able to

- interpret the physical meaning of different operators such as gradient, curl and divergence (L5)
- estimate the work done against a field, circulation and flux using vector calculus (L5)
- apply the Laplace transform for solving differential equations (L3)
- find or compute the Fourier series of periodic signals (L3)
- know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms (L3)
- identify solution methods for partial differential equations that model physical processes(L3)

UNIT –I: Vector calculus: (10 hrs)
Vector Differentiation: Gradient– Directional derivative – Divergence– Curl– Scalar Potential

Vector Integration: Line integral – Work done – Area– Surface and volume integrals – Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof) and problems on above theorems.

UNIT –II: Laplace Transforms: (10 hrs)
Laplace transforms – Definition and Laplace transforms of some certain functions– Shifting theorems – Transforms of derivatives and integrals – Unit step function –Dirac's delta function Periodic function – Inverse Laplace transforms– Convolution theorem (without proof).
Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.

UNIT –III: Fourier series and Fourier Transforms: (10 hrs)
Fourier Series: Introduction– Periodic functions – Fourier series of periodic function – Dirichlet's conditions – Even and odd functions –Change of interval– Half-range sine and cosine series.
Fourier Transforms: Fourier integral theorem (without proof) – Fourier sine and cosine integrals – Sine and cosine transforms – Properties (article-22.5 in text book-1)– inverse transforms – Convolution theorem (without proof) – Finite Fourier transforms.

UNIT –IV: PDE of first order: **(8 hrs)**
Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.

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UNIT – V: Second order PDE and Applications: (10 hrs)

Second order PDE: Solutions of linear partial differential equations with constant coefficients –non-homogeneous term of the type e^{ax+by}, $\sin(ax+by)$, $\cos(ax+by)$, $x^m y^n$.

Applications of PDE: Method of separation of Variables– Solution of One-dimensional Wave, Heat and two-dimensional Laplace equation.

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers, 2018.
2. B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata McGraw Hill Education.

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India. 2015.
2. Dean. G. Duffy, Advanced Engineering Mathematics with MATLAB, 3rd Edition, CRC Press, 2010.
3. Peter O' Neil, Advanced Engineering Mathematics, 7th edition, Cengage, 2011..
4. Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford University Press, 2015.

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I Year II Semester		L	T	P	C
		3	0	0	3
APPLIED PHYSICS					

(For All Circuital Branches like ECE, EEE, CSE etc)

Unit-I: Wave Optics **12hrs**

Interference: Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Colors in thin films- Newton's Rings- Determination of wavelength and refractive index.

Diffraction: Introduction - Fresnel and Fraunhofer diffraction - Fraunhofer diffraction due to single slit, double slit - N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating(Qualitative).

Polarization: Introduction-Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol's Prism -Half wave and Quarter wave plates.

Unit Outcomes: The students will be able to

- **Explain** the need of coherent sources and the conditions for sustained interference (L2)
- **Identify** engineering applications of interference (L3)
- **Analyze** the differences between interference and diffraction with applications (L4)
- **Illustrate** the concept of polarization of light and its applications (L2)
- **Classify** ordinary polarized light and extraordinary polarized light (L2)

Unit-II: Lasers and Fiber optics **8hrs**

Lasers: Introduction – Characteristics of laser – Spontaneous and Stimulated emissions of radiation – Einstein's coefficients – Population inversion – Lasing action - Pumping mechanisms – Ruby laser – He-Ne laser - Applications of lasers.

Fiber optics: Introduction –Principle of optical fiber- Acceptance Angle - Numerical Aperture - Classification of optical fibers based on refractive index profile and modes – Propagation of electromagnetic wave through optical fibers - Applications.

Unit Outcomes: The students will be able to

- **Understand** the basic concepts of LASER light Sources (L2)
- **Apply** the concepts to learn the types of lasers (L3)
- **Identifies** the Engineering applications of lasers (L2)
- **Explain** the working principle of optical fibers (L2)
- **Classify** optical fibers based on refractive index profile and mode of propagation (L2)
- **Identify** the applications of optical fibers in various fields (L2)

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Unit III: Quantum Mechanics, Free Electron Theory and Band theory 10hrs

Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory– Equation for electrical conductivity based on quantum free electron theory- Fermi-Dirac distribution- Density of states (3D) - Fermi energy.

Band theory of Solids: Bloch's Theorem (Qualitative) - Kronig - Penney model (Qualitative)- E vs K diagram - V vs K diagram - effective mass of electron – Classification of crystalline solids–concept of hole.

Unit Outcomes:

The students will be able to

- **Explain** the concept of dual nature of matter (L2)
- **Understand** the significance of wave function (L2)
- **Interpret** the concepts of classical and quantum free electron theories (L2)
- **Explain** the importance of K-P model
- **Classify** the materials based on band theory (L2)
- **Apply** the concept of effective mass of electron (L3)

Unit-IV: Dielectric and Magnetic Materials 8hrs

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility and Dielectric constant - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field- Clausius- Mossotti equation- Piezoelectricity.

Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability - Origin of permanent magnetic moment - Classification of magnetic materials: Dia, para, Ferro, antiferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials- Eddy currents- Engineering applications.

Unit Outcomes: The students will be able to

- **Explain** the concept of dielectric constant and polarization in dielectric materials (L2)
- **Summarize** various types of polarization of dielectrics (L2)
- **Interpret** Lorentz field and Claussius-Mosotti relation in dielectrics(L2)
- **Classify** the magnetic materials based on susceptibility and their temperature dependence (L2)
- **Explain** the applications of dielectric and magnetic materials (L2)
- **Apply** the concept of magnetism to magnetic data storage devices (L3)

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Unit – V: Semiconductors and Superconductors 10hrs

Semiconductors: Introduction- Intrinsic semiconductors – Density of charge carriers – Electrical conductivity – Fermi level – extrinsic semiconductors – density of charge carriers – dependence of Fermi energy on carrier concentration and temperature - Drift and diffusion currents – Einstein's equation- Hall effect – Hall coefficient –Applications of Hall effect.

Superconductors: Introduction – Properties of superconductors – Meissner effect – Type I and Type II superconductors – BCS theory (Qualitative) – Josephson effects (AC and DC) – SQUIDs High T_c superconductors – Applications of superconductors.

Unit Outcomes: The students will be able to

- **Classify** the energy bands of semiconductors (L2)
- **Interpret** the direct and indirect band gap semiconductors (L2)
- **Identify** the type of semiconductor using Hall effect (L2)
- **Identify** applications of semiconductors in electronic devices (L2)
- **Classify** superconductors based on Meissner's effect (L2)
- **Explain** Meissner's effect, BCS theory & Josephson effect in superconductors (L2)

Text books:

1. M. N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy" A Text book of Engineering Physics"- S.Chand Publications, 11th Edition 2019.
2. Engineering Physics" by D.K.Bhattacharya and Poonam Tandon, 1st edition, Oxford press, 2015.
3. Applied Physics by P.K.Palanisamy 3rd edition, SciTech publications, 2013.

Reference Books:

1. Fundamentals of Physics – Halliday, Resnick and Walker,10th edition, John Wiley &Sons, 2013.
2. Engineering Physics by M.R.Srinivasan, New Age international publishers, 2009.
3. Shatendra Sharma, Jyotsna Sharma, " Engineering Physics", 1st edition, Pearson Education, 2018.
4. Engineering Physics - Sanjay D. Jain, D. Sahasrabudhe and Girish, 1st edition, University Press, 2010.
5. Semiconductor physics and devices- Basic principle – Donald A, Neamen, 3rd edition, Mc Graw Hill, 2003.
6. B.K. Pandey and S. Chaturvedi, Engineering Physics, 1st edition, Cengage Learning, 2013.

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I Year II Semester		L	T	P	C
		3	0	0	3
DATA STRUCTURES THROUGH C					

Preamble:
This course is core subject developed to help the student understand the data structure principles used in power systems, machines and control systems. This subject covers linear data structures, linked lists, trees, graphs, searching and sorting.

Course Objectives:

- Operations on linear data structures and their applications.
- The various operations on linked lists.
- The basic concepts of Trees, Traversal methods and operations.
- Concepts of implementing graphs and its relevant algorithms.
- Sorting and searching algorithms.

Unit-1: Linear Data Structures: Arrays, Stacks and Queues
Data Structures -Operations-Abstract Data Types-Complexity of Algorithms-Time and Space-Arrays-Representation of Arrays-Linear Arrays-Insertion–Deletion and Traversal of a Linear Array-Array as an Abstract Data Type-Multi-Dimensional Arrays-Strings-String Operations-Storing Strings-String as an Abstract Data Type

Stack -Array Representation of Stack-Stack Abstract Data Type-Applications of Stacks: Prefix-Infix and Postfix Arithmetic Expressions-Conversion-Evaluation of Postfix Expressions-Recursion-Towers of Hanoi-Queues-Definition-Array Representation of Queue-The Queue Abstract Data Type-Circular Queues-Dequeues-Priority Queues.

Unit-II: Linked Lists
Pointers-Pointer Arrays-Linked Lists-Node Representation-Single Linked List-Traversing and Searching a Single Linked List-Insertion into and Deletion from a Single Linked List-Header Linked Lists-Circularly Linked Lists-Doubly Linked Lists-Linked Stacks and Queues-Polynomials-Polynomial Representation-Sparse Matrices.

Unit-III: Trees
Terminology-Representation of Trees-Binary Trees-Properties of Binary Trees-Binary Tree Representations-Binary Tree Traversal-Preorder-In-order and Post-order Traversal-Threads-Thread Binary Trees-Balanced Binary Trees-Heaps-Max Heap-Insertion into and Deletion from a Max Heap-Binary Search Trees-Searching-Insertion and Deletion from a Binary Search Tree-Height of Binary Search Tree, m-way Search Trees, B-Trees.

Unit-IV: Graphs

Graph Theory Terminology-Graph Representation-Graph Operations-Depth First Search-Breadth First Search-Connected Components-Spanning Trees-Biconnected Components-Minimum Cost Spanning Trees-Kruskal's Algorithm-Prism's Algorithm-Shortest Paths-Transitive Closure-All-Pairs Shortest Path-Warshall's Algorithm.

Unit-V: Searching and Sorting

Searching -Linear Search-Binary Search-Fibonacci Search-Hashing-Sorting-Definition-Bubble Sort-Insertion sort-Selection Sort-Quick Sort-Merging-Merge Sort-Iterative and Recursive Merge Sort-Shell Sort-Radix Sort-Heap Sort.

Course Outcomes:

After the completion of the course the student should be able to:

- data structures concepts with arrays, stacks, queues.
- linked lists for stacks, queues and for other applications.
- traversal methods in the Trees.
- various algorithms available for the graphs.
- sorting and searching in the data ret retrieval applications.

Text Books:

1. Fundamentals of Data Structures in C, 2nd Edition, E.Horowitz, S.Sahni and Susan Anderson Freed, Universities Press Pvt. Ltd.
2. Data Structures with C, Seymour Lipschutz, Schaum's Outlines, Tata McGraw Hill.

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I Year II Semester		L	T	P	C
		3	0	0	3
ELECTRICAL CIRCUIT ANALYSIS -I					

Preamble:
This course introduces the basic concepts of circuit analysis which is the foundation for all subjects of the Electrical Engineering discipline. The emphasis of this course is laid on the basic analysis of circuits which includes single phase circuits, magnetic circuits, network theorems, transient analysis and network topology.

Course Objectives:
- To study the concepts of passive elements, types of sources and various network reduction techniques.
- To understand the applications of network topology to electrical circuits.
- To study the concept of magnetic coupled circuit.
- To understand the behavior of RLC networks for sinusoidal excitations.
- To study the performance of R-L, R-C and R-L-C circuits with variation of one of the parameters and to understand the concept of resonance.
- To understand the applications of network theorems for analysis of electrical networks.

UNIT-I
Introduction to Electrical Circuits
Basic Concepts of passive elements of R, L, C and their V-I relations, Sources (dependent and independent), Kirchhoff's laws, Network reduction techniques (series, parallel, series - parallel, star-to-delta and delta-to-star transformation), source transformation technique, nodal analysis and mesh analysis to DC networks with dependent and independent voltage and current sources., node and mesh analysis.

UNIT-II
Magnetic Circuits
Basic definition of MMF, flux and reluctance, analogy between electrical and magnetic circuits, Faraday's laws of electromagnetic induction – concept of self and mutual inductance, Dot convention – coefficient of coupling and composite magnetic circuit, analysis of series and parallel magnetic circuits.

UNIT-III
Single Phase A.C Systems
Periodic waveforms (determination of rms, average value and form factor), concept of phasor, phase angle and phase difference – waveforms and phasor diagrams for lagging, leading networks, complex and polar forms of representations. node and mesh analysis.
Steady state analysis of R, L and C circuits, power factor and its significance, real, reactive and apparent power, waveform of instantaneous power and complex power.

UNIT-IV
Resonance - Locus Diagrams
series and parallel resonance, selectively band width and Quality factor, locus diagram- RL, RC, RLC with R, L and C variables.

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UNIT-V

Network theorems (DC & AC Excitations)

Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem, Reciprocity theorem, Millman's theorem and compensation theorem.

Course Outcomes:

After the completion of the course the student should be able to:

- Various electrical networks in presence of active and passive elements.
- Electrical networks with network topology concepts.
- Any magnetic circuit with various dot conventions.
- Any R, L, C network with sinusoidal excitation.
- Any R, L, network with variation of any one of the parameters i.e., R, L, C and f.
- Electrical networks by using principles of network theorems.

Text Books:

1. Engineering Circuit Analysis by William Hayt and Jack E. Kemmerley, 6th edition McGraw Hill Company, 2012.
2. Network Analysis: Van Valkenburg; Prentice-3rd edition, Hall of India Private Ltd, 2015.

Reference Books:

1. Fundamentals of Electrical Circuits by Charles K. Alexander and Mathew N.O.Sadiku, 5th edition, McGraw Hill Education (India), 2013.
2. Linear Circuit Analysis by De Carlo, Lin, 2nd edition, Oxford publications, 2001.
3. Electric Circuits – (Schaum's outlines) by Mahmood Nahvi & Joseph Edminister, Adapted by KumaRao, 5th Edition – McGraw Hill, 2017.
4. Electric Circuits by David A. Bell, 7th edition, Oxford publications, 2009.
5. Introductory Circuit Analysis by Robert L Boylestad, 13th edition, Pearson, 2015
6. Circuit Theory (Analysis and Synthesis) by A. Chakrabarthi, 7th edition, DhanpatRai&Co., 2018.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

I Year II Semester		L	T	P	C
		3	0	0	3
BASIC CIVIL AND MECHANICAL ENGINEERING					

Course Objectives:

COB 1: To impart basic principles of stress, strain, shear force and bending moment.
COB 2: To teach principles of strain measurement using electrical strain gauges.
COB 3: To impart basic characteristics of building materials.
COB 4: To familiarize the sources of energy, power plant economics and environmental aspects.
COB 5: To make the students to understand the basics concept of Boilers & I.C. engines.

Course Outcomes:

At the end of this course, the student will be able to

CO 1 : Apply Shear force diagram & Bending moment diagram principles for Cantilever and Simply supported beams.
CO 2 : Apply concepts of Rosette analysis for strain measurements.
CO 3 : Analyse the characteristics of common building materials.
CO 4 : Compare the working characteristics of Internal Combustion engines.
CO 5 : Compare the differences between boiler mountings and accessories.

Mapping of Course Outcomes with Program Outcomes

CO/PO	PO 1 (K3)	PO 2 (K4)	PO 3 (K5)	PO 4 (K3)	PO 5 (K3)	PO 6 (K3)	PO 7 (K2)	PO 8 (K3)	PO 9 (K2)	PO 10 (K2)	PO 11 (K3)	PO12 (K)
CO1 (K3)	3	2	-	-	-	-	2	-	-	-	-	-
CO2 (K3)	3	2	-	-	-	-	3	-	-	-	-	-
CO3 (K4)	3	3	-	-	-	-	3	-	-	-	-	-
CO4 (K4)	2	3	-	-	-	-	3	-	-	-	-	-
CO5 (K4)	3	3	-	-	-	-	3	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes

CO / PSO	PSO 1(K5)	PSO 2(K5)	PSO 3(K3)
CO1 (K3)	-	-	-
CO2 (K3)	-	1	-
CO3 (K4)	-	2	-
CO4 (K4)	-	-	-
CO5 (K4)	-	2	-

UNIT – I:

Basic Definitions of Force –Stress –Strain –Elasticity. Shear force – Bending Moment Torsion . Simple problems on Shear force Diagram and Bending moment Diagram for cantilever and simply supported beams.

UNIT – II:

Measurement of Strain - Electrical Capacitance and Resistance Strain gauges multi channel strain indicators. Rosette analysis Rectangular and Triangular strain rosettes.

UNIT – III:

Characteristics of common building materials – Brick – Types Testing; Timber Classification Seasoning Defects in Timber; Glass Classification uses; steel and its applications in construction industry.

UNIT IV

Hydraulic Turbines and Pumps:

Introduction to Power transmission tools, Hydraulic Turbines: Classification-Difference between Impulse and Reaction Turbine.
Pumps: Classification of Pumps, Centrifugal Pump-Applications-Priming-Reciprocating Pumps, Single Acting & Double acting-Comparison with Centrifugal Pump

UNIT V –

I.C Engine: Heat Engine – Types of Heat Engine–Classification of I.C. Engine-Valve Timing Diagram, Port Timing Diagram- Comparison of 2S & 4S Engines- Comparisonof Petrol Engine and Diesel Engine-Fuel System of a Petrol Engine-Ignition Systems.
Boilers: Classification of Boilers – – Simple Vertical Boiler – Cochran Boiler – Babcock and Wilcox Boiler Benson Boiler Difference between Fire Tube and Water Tube Boilers Boiler Mountings and Accessories.

Text Books:

1. Basic Civil and Mechanical Engineering, by Prof. V. Vijayan, Prof. M. Prabhakaran and Er. R. Viashnavi, 2nd edition, S. Chand Publication, 2010
2. Elements of Mechanical Engineering, Fourth Edition, S. Trymbaka Murthy, University Press, 2014
4. Shanmugam G and Palanichamy M S, Basic Civil and Mechanical Engineering, Tata McGraw Hill Publishing Co., New Delhi, (1996).
5. Ramamrutham S., Basic Civil Engineering, Dhanpat Rai Publishing Co. (P) Ltd. (1999).

Reference Books:

1. Seetharaman S., “Basic Civil Engineering”, Anuradha Agencies, (2005).
2. Venugopal K. and Prahu Raja V., “Basic Mechanical Engineering”, Anuradha Publishers, Kumbakonam, (2000).
3. Er. R. Vaishnavi, Basic Civil and Mechanical Engineering, 2/e, S.Chand Publications (2003)

Web Links:

1. http://www.umich.edu/~nppcpub/resources/compendia/ARCHpdfs/ARCHsbmIntro.pdf
2. http://www.hillagric.ac.in/edu/coa/agengg/lecture/243/Lecture%203%20Engine.pdf

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

I Year II Semester		L	T	P	C
		0	0	3	1.5
APPLIED PHYSICS LAB					

(For All Circuital Branches like CSE, ECE, EEE etc.)

(Any 10 of the following listed experiments)

List of Applied Physics Experiments

1. Determination of thickness of thin object by wedge method.
2. Determination of radius of curvature of a given plano convex lens by Newton's rings.
3. Determination of wavelengths of different spectral lines in mercury spectrumusing diffraction grating in normal incidence configuration.
4. Determination of dispersive power of the prism.
5. Determination of dielectric constant using charging and discharging method.
6. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
7. Determination of numerical aperture and acceptance angle of an optical fiber.
8. Determination of wavelength of Laser light using diffraction grating.
9. Estimation of Planck's constant using photoelectric effect.
10. Determination of the resistivity of semiconductor by four probe method.
11. To determine the energy gap of a semiconductor using p-n junction diode.
12. Magnetic field along the axis of a current carrying circular coil by Stewart & Gee's Method
13. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall Effect .
14. Measurement of resistance of a semiconductor with varying temperature.
15. Resistivity of a Superconductor using four probe method & Meissner effect.

References:

1. S. Balasubramanian, M.N. Srinivasan "A Text Book of PracticalPhysics"- S Chand Publishers, 2017.

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I Year II Semester		L	T	P	C
		0	0	3	1.5
BASIC CIVIL AND MECHANICAL ENGINEERING LAB					

Preamble:

Course Objectives:

COB 1: To make the student learn about the constructional features and operational details of various types of internal combustion engines.
COB 2: To make the student learn about the constructional features, operational details of various types of hydraulic turbines
COB 3: To practice the student about the fundamental of fluid dynamic equations and its applications fluid jets.
COB 4: To train the student in the areas of types of hydro electric power plants, estimation and calculation of different loads by considering various factors.

Course Outcomes:

At the end of the Course, Student will be able to:

CO 1: Solve to arrive at finding constant speed and variable speed on IC engines and interpret their performance.
CO 2: Estimate energy distribution by conducting heat balance test on IC engines
CO 3: Explain procedure for standardization of experiments.
CO 4: Determine flow discharge measuring device used in pipes channels and tanks.
CO 5: Determine fluid and flow properties.
CO 6: Solve for drag coefficients.
CO 7: Test for the performance of pumps and turbines

Mapping of Course Outcomes with Program Outcomes

CO/PO	PO 1 (K3)	PO 2 (K4)	PO 3 (K5)	PO 4 (K5)	PO 5 (K3)	PO 6 (K3)	PO 7 (K2)	PO 8 (K3)	PO 9 (K2)	PO 10 (K2)	PO 11 (K3)	PO 12 (K3)
CO1(K3)	3	2	1	1	3	3	-	-	-	2	3	-
CO2(K5)	3	3	-	-	3	3	-	-	-	3	3	-
CO3(K2)	2	1	-	-	2	2	-	-	-	3	2	-
CO4(K5)	3	3	3	3	3	3	-	-	-	-	3	-
CO5(K5)	3	3	3	3	3	3	-	-	-	-	3	-
CO6(K3)	3	2	1	1	3	3	-	-	-	3	3	-
CO7(K4)	3	3	2	2	3	3	-	-	-	3	3	-

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Mapping of Course Outcomes with Program Specific Outcomes

CO/PSO	PSO 1 (K5)	PSO 2 (K5)	PSO 3 (K3)
CO1 (K3)	-	-	-
CO2 (K5)	-	-	-
CO3 (K2)	-	-	-
CO4 (K5)	-	-	-
CO5 (K5)	-	-	-
CO6 (K3)	-	-	-
CO7 (K4)	-	3	-

Part-A

List of Experiments:

Thermal Engineering Lab:

1. Valve time timing diagram on 4-S Diesel engine.
2. Valve time timing diagram on 4-S Petrol engine.
3. Port timing diagram on 2-S Petrol engine.
4. Study on Boiler models.
5. COP determination of Refrigeration tutor.
6. COP determination of Air conditioner tutor.

Part-B

Hydraulic machinery Lab:

1. Determination of coefficient of discharge on Impact of Jets on Vanes apparatus.
2. Performance test on Pelton wheel.
3. Performance test on Francis turbine.
4. Performance test on Kaplan turbine.
5. Performance test on Single stage Centrifugal pump.
6. Performance test on Reciprocating pump.

List of Augmented Experiments:

(Student can perform any one of the following experiments)

1. Heat balance sheet on VCR engine
2. Determination of Loss of head due to sudden contraction and suddenenlargement.
3. Heat balance sheet on Multi cylinder Petrol engine.
4. Heat balance sheet on 4-S diesel engine.
5. Determination of coefficient of discharge on Venturimeter.
6. Determination of coefficient of discharge on Orificemeter.

Web Links:

1. https://www.iare.ac.in/sites/default/files/lab2/TE%2Blab.pdf
2. https://www.dbit.ac.in/ce/syllabus/hydraulics-and-hydraulic-machines-lab.pdf

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I Year II Semester		L	T	P	C
		0	0	3	1.5
DATA STRUCTURES THROUGH C LAB					

Any 10 of the following experiments are to be conducted

Course Objectives:

- To develop skills to design and analyze simple linear and non linear data structures.
- To strengthen the ability to the students to identify and apply the suitable data structure for the given real world problem.
- To gain knowledge in practical applications of data structures.

List of Experiments:

1. Implement operations on Strings.
2. Implement basic operations on Stacks.
3. Implement basic operations on Queue.
4. Implement basic operations on Circular Queue.
5. Implement multi stack in a single array.
6. Implement List data structure using i) array ii) singly linked list.
7. Implement basic operations on doubly linked list.
8. Implement basic operations (insertion, deletion, search, find min and find max) on Binary Search trees.
9. Implementation of Heaps.
10. Implementation of Breadth First Search Techniques.
11. Implementation of Depth First Search Techniques.
12. Implementation of Prim's algorithm.
13. Implementation of Kruskal's Algorithm.
14. Implementation of Linear search.
15. Implementation of Fibanocci search.
16. Implementation of Merge sort.
17. Implementation of Quick sort**.**

Course Outcomes:

After the completion of the course the student should be able to:

- Be able to design and analyze the time and space efficiency of the data structure.
- Be capable to identity the appropriate data structure for given problem.
- Have practical knowledge on the applications of data structures.

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I Year II Semester		L	T	P	C
		2	0	0	0
CONSTITUTION OF INDIA					

Preamble:

Course Objectives:

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
- To understand the central and state relation financial and administrative.

UNIT-I

Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

Learning outcomes:

After completion of this unit student will

- Understand the concept of Indian constitution
- Apply the knowledge on directive principle of state policy
- Analyze the History, features of Indian constitution
- Evaluate Preamble Fundamental Rights and Duties

UNIT-II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre-State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions;

Learning outcomes: -After completion of this unit student will

- Understand the structure of Indian government
- Differentiate between the state and central government
- Explain the role of President and Prime Minister
- Know the Structure of supreme court and High court

UNIT-III

State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organization, Structure and Functions

Learning outcomes: -After completion of this unit student will

- Understand the structure of state government
- Analyze the role Governor and Chief Minister
- Explain the role of state Secretariat
- Differentiate between structure and functions of state secretariat

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UNIT-IV

A. Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation Pachayati Raj: Functions PRI: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy

Learning outcomes: -After completion of this unit student will

- Understand the local Administration
- Compare and contrast district administration role and importance
- Analyze the role of Myer and elected representatives of Municipalities
- Evaluate Zilla panchayat block level organization

UNIT-V

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission, Functions of Commissions for the welfare of SC/ST/OBC and women

Learning outcomes: -After completion of this unit student will

- Know the role of Election Commission apply knowledge
- Contrast and compare the role of Chief Election commissioner and Commissionerate
- Analyze role of state election commission
- Evaluate various commissions of viz SC/ST/OBC and women

References:

1. Durga Das Basu, Introduction to the Constitution of India, 12th edition Prentice – Hall of India Pvt. Ltd. New Delhi 2011.
2. Subash Kashyap, Indian Constitution, 2nd edition, National Book Trust, 2011.
3. J.A. Siwach, Dynamics of Indian Government & Politics, 2nd edition, Sterling Pub Private Ltd.,1990.
4. D.C. Gupta, Indian Government and Politics, 8th edition, Vikas Publishing House Pvt Ltd., 2015.
5. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication), 2015.
6. J.C. Johari, Indian Government and Politics Hans, 13th edition, Shoban Lal & Co.2012.
7. J. Raj Indian Government and Politics, 1st edition, SAGE Texts Publication, 2008.
8. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, 3rd edition, Lexis Nexis Publications, 2008.
9. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

E-resources:

1. nptel.ac.in/courses/109104074/8
2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture-details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Course Outcomes:
At the end of the semester/course, the student will be able to have a clear knowledge on the following:

- Understand historical background of the constitution making and its importance for building a democratic India.
- Understand the functioning of three wings of the government i.e., executive, legislative and judiciary.
- Understand the value of the fundamental rights and duties for becoming good citizen of India.
- Analyze the decentralization of power between central, state and local self-government.
- Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.
  1. Know the sources, features and principles of Indian Constitution.
  2. Learn about Union Government, State government and its administration.
  3. Get acquainted with Local administration and Pachayati Raj.
  4. Be aware of basic concepts and developments of Human Rights.
  5. Gain knowledge on roles and functioning of Election Commission

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

II Year I Semester		L	T	P	C
		3	0	0	3
MATHEMATICS-IV (Complex Variables and Statistical Methods)					

Course Objectives:

- To familiarize the complex variables.
- To familiarize the students with the foundations of probability and statistical methods.
- To equip the students to solve application problems in their disciplines.

UNIT – I: Functions of a complex variable and Complex integration: (10 hrs)

Introduction – Continuity – Differentiability – Analyticity –Cauchy-Riemann equations in Cartesian and polar coordinates – Harmonic and conjugate harmonic functions – Milne – Thompson method.
Complex integration: Line integral – Cauchy's integral theorem – Cauchy's integral formula – Generalized integral formula (all without proofs) and problems on above theorems.

UNIT – II: Series expansions and Residue Theorem: (10 hrs)

Radius of convergence – Expansion in Taylor's series, Maclaurin's series and Laurent series. Types of Singularities: Isolated – Essential –Pole of order m– Residues – Residue theorem (without proof) – Evaluation of real integral of the types $\int_{-\infty}^{\infty} f(x)dx$ and

UNIT – III: Probability and Distributions: (10 hrs)

Review of probability and Baye's theorem – Random variables – Discrete and Continuous random variables – Distribution functions – Probability mass function, Probability density function and Cumulative distribution functions – Mathematical Expectation and Variance – Binomial, Poisson, Uniform and Normal distributions.

UNIT – IV: Sampling Theory: (8 hrs)

Introduction – Population and Samples – Sampling distribution of Means and Variance (definition only) – Central limit theorem (without proof) – Representation of the normal theory distributions – Introduction to t, χ^2 and F-distributions – Point and Interval estimations – Maximum error of estimate.

UNIT – V: Tests of Hypothesis: (10 hrs)

Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors – Level of significance – One tail and two-tail tests – Tests concerning one mean and two means (Large and Small samples) – Tests on proportions.

Course Outcomes: At the end of the course students will be able to

- apply Cauchy-Riemann equations to complex functions in order to determine whether a given continuous function is analytic (L3)
- find the differentiation and integration of complex functions used in engineering problems (L5)
- make use of the Cauchy residue theorem to evaluate certain integrals (L3)
- apply discrete and continuous probability distributions (L3)
- design the components of a classical hypothesis test (L6)
- infer the statistical inferential methods based on small and large sampling tests (L4)

Text Books:

1. **B. S. Grewal,** Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017.
2. **Miller and Freund's,** Probability and Statistics for Engineers,Pearson,7th edition, 2008.

Reference Books:

1. **J. W. Brown and R. V. Churchill**, Complex Variables and Applications, 9th edition, Mc-Graw Hill, 2013.
2. **S.C. Gupta and V.K. Kapoor**, Fundamentals of Mathematical Statistics, 11th edition, Sultan Chand & Sons Publications, 2012.
3. **Jay l. Devore,** Probability and Statistics for Engineering and the Sciences, 8th Edition, Cengage.
4. **Shron L.Myers, Keying Ye, Ronald E Walpole,** Probability and Statistics Engineers and the Scientists,8th Edition, Pearson 2007.
5. **Sheldon, M. Ross**, Introduction to probability and statistics Engineers and the Scientists, 4thEdition, Academic Foundation,2011

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

II Year I Semester		L	T	P	C
		3	0	0	3
ELECTRONIC DEVICES AND CIRCUITS					

Preamble:
This course introduces the concepts of semi-conductor physics and operation of various semi-conductor devices. Realization of rectifiers, amplifiers and oscillators using semi-conductor devices, transistors and their analysis is introduced in this course.

Course Objectives:
The main objectives of this course are:

- The basic concepts of semiconductor physics are to be reviewed.
- Study the physical phenomena such as conduction, transport mechanism and electrical characteristics of different diodes.
- The application of diodes as rectifiers with their operation and characteristics with and without filters are discussed.
- The principal of working and operation of Bipolar Junction Transistor and Field Effect Transistor and their characteristics are explained.
- The need of transistor biasing and its significance is explained. The quiescent point or operating point is explained.
- Small signal equivalent circuit analysis of BJT and FET transistor amplifiers in different configuration is explained.

UNIT - I
Semi-Conductor Physics: Insulators, Semiconductors, and Metals, classification using energy band diagrams, mobility and conductivity, electrons and holes in intrinsic semiconductors, extrinsic semiconductors, drift and diffusion, charge densities in semiconductors, Hall effect, continuity equation, law of junction, Fermi Dirac function, Fermi level in intrinsic and extrinsic Semiconductors
Junction Diode Characteristics: Open circuited p-n junction, Biased p-n junction, p-n junction diode, current components in PN junction Diode, diode equation, V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Diode capacitance, energy band diagram of PN junction Diode.

UNIT - II
Special Semiconductor Devices: Zener Diode, Breakdown mechanisms, Zener diode applications, LED, Photodiode, Tunnel Diode, SCR, UJT. Construction, operation and characteristics of all the diodes are required to be considered.
Rectifiers and Filters: Basic Rectifier setup**,** half wave rectifier, full wave rectifier, bridge rectifier, derivations of characteristics of rectifiers, rectifier circuits-operation, input and output waveforms, Filters, Inductor filter, Capacitor filter, comparison of various filter circuits in terms of ripple factors.

UNIT - III
BJT: Junction transistor, transistor current components, transistor equation, transistor configurations, transistor as an amplifier, characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, Ebers-Moll model of a transistor, punch through/ reach through, Photo transistor, typical transistor junction voltage values.
FET: FET types, construction, operation, characteristics, parameters, MOSFET-types, construction, operation, characteristics, comparison between JFET and MOSFET.

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UNIT - IV

Transistor Biasing and Thermal Stabilization: Need for biasing, operating point, load line analysis, BJT biasing- methods, basic stability, fixed bias, collector to base bias, self-bias, Stabilization against variations in V_{BE}, I_c, and β, Stability factors, (S, S', S''), Bias compensation, Thermal runaway, Thermal stability. FET Biasing- methods and stabilization.

UNIT –V

Small Signal Low Frequency Transistor Amplifier Models:

BJT: Two port network, Transistor hybrid model, determination of h-parameters, conversion of h-parameters, generalized analysis of transistor amplifier model using h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis, Comparison of transistor amplifiers.

FET: Generalized analysis of small signal model, Analysis of CG, CS and CD amplifiers, comparison of FET amplifiers.

Course Outcomes:

At the end of this course the student can able to:

- Understand the basic concepts of semiconductor physics.
- Understand the formation of p-n junction and how it can be used as a p-n junction as diode in different modes of operation.
- Know the construction, working principle of rectifiers with and without filters with relevant expressions and necessary comparisons.
- Understand the construction, principle of operation of transistors, BJT and FET with their V-I characteristics in different configurations.
- Know the need of transistor biasing, various biasing techniques for BJT and FET and stabilization concepts with necessary expressions.
- Perform the analysis of small signal low frequency transistor amplifier circuits using BJT and FET in different configurations.

Text Books:

1. Electronic Devices and Circuits- J. Millman, C.Halkias, Tata Mc-Graw Hill, 2nd Edition,2010.
2. Electronics devices & circuit theory- Robert L.Boylestad and LouiNashelsky, Pearson/Prentice hall, 10th edition, 1999.

References:

1. Electronic Devices and Circuits-K. Satya Prasad, VGS Book Links, 2nd Edition, 2006.
2. Electronic Devices and Circuits-Salivahanan, Kumar, Vallavaraj, Tata Mc-Graw Hill, 2nd Edition, 2018.
3. Electronic Devices and Circuits – David Bell, Oxford, 5th Edition, 2008.

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II Year I Semester		L	T	P	C
		3	0	0	3
ELECTRICAL CIRCUIT ANALYSIS - II					

Preamble:
This course introduces the basic concepts of circuit analysis which is the foundation for all subjects of the Electrical Engineering discipline. The emphasis of this course is laid on the basic analysis of circuits which includes single phase circuits, magnetic circuits, network theorems, transient analysis and network topology.

Course Objectives:

- To study the concepts of passive elements, types of sources and various network reduction techniques.
- To understand the applications of network topology to electrical circuits.
- To study the concept of magnetic coupled circuit.
- To understand the behavior of RLC networks for sinusoidal excitations.
- To study the performance of R-L, R-C and R-L-C circuits with variation of one of the parameters and to understand the concept of resonance.
- To understand the applications of network theorems for analysis of electrical networks.

UNIT - I
Balanced and Unbalanced Three phase circuits
Analysis of three phase balanced circuits:
Phase sequence, star and delta connection of sources and loads, relation between line and phase voltages and currents, analysis of balanced three phase circuits, measurement of active and reactive power.
Analysis of three phase unbalanced circuits:
Loop method, Star-Delta transformation technique, two-wattmeter method for measurement of three phase power.

UNIT - II
Transient Analysis in DC Circuits
Transient response of First order (R-L, R-C) and second order (R-L-C) circuits using differential equations.
Transient response of First order (R-L, R-C) and second order (R-L-C) circuits using Laplace transforms.

UNIT - III
Transient Analysis in AC circuits
Transient response of First order (R-L, R-C) and second order (R-L-C) circuits using differential equations.

Transient response of First order (R-L, R-C) and second order (R-L-C) circuits using Laplace transforms.

UNIT - IV
Two Port Networks
Two port network parameters – Z, Y, ABCD and Hybrid parameters and their relations, cascaded networks.

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UNIT - V

Filters

Need of Filters – Classification -Characteristic impedance- Low Pass Filter, High Pass Filter, Band Pass Filter, Band Stop or Band Elimination Filter, m-Derived Filter, Composite filters– Design of Filters.

Course Outcomes:

At the end of the course, student will be able to

- Understand the concepts of balanced and unbalanced three-phase circuits.
- Know the transient behavior of electrical networks with DC excitations.
- Learn the transient behavior of electrical networks with AC excitations.
- Estimate various parameters of a two port network.
- Understand the significance of filters in electrical networks.

Text Books:

1. Engineering Circuit Analysis by William Hayt and Jack E.Kemmerley, McGraw Hill Company,9thedition, 2018.
2. Network analysis: Van Valkenburg: Prentice-Hall of India Private Ltd, 3rd edition, 2019.

Reference Books:

1. Fundamentals of Electrical Circuits by Charles K.Alexander and Mathew N.O.Sadiku, McGraw Hill Education (India), 6th edition, 2019.
2. Introduction to circuit analysis and design by Tildon H Glisson. Jr, Springer Publications, 1st edition, 2011.
3. Circuits by A.Bruce Carlson, Cengage Learning Publications, 1st edition, 2008.
4. Network Theory Analysis and Synthesis by SmarajitGhosh, PHI publications, ninth print, 2015.
5. Networks and Systems by D. Roy Choudhury, New Age International publishers, 2nd edition, 2013.
6. Electric circuit by Joseph Edminister, Schaum's outlines series, seventh edition, 2017.
7. Electric Circuits by David A. Bell, Oxford publications, 7th edition, 2009.
8. Circuit Theory (Analysis and Synthesis) by A.Chakrabarthi, DhanpatRai&Co, 7th-Revised edition, 2018)

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II Year I Semester		L		T	P	C
		3		0	0	3
DC MACHINES AND TRANSFORMERS						

Preamble:
This is a basic course on rotating electrical machines. This course covers the topics related to principles, performance, applications and design considerations of dc machines and transformers.

Course Objectives:

- To Understand the construction, principle of operation and performance of DC machines.
- To Learn the characteristics, performance, methods of speed control and testing methods of DC motors.
- To predetermine the performance of single phase transformers with equivalent circuit models.
- To Understand the methods of testing of single-phase transformer.
- To Analyze the three phase transformers and achieve three phase to two phase conversion.

UNIT - I
Electromechanical Energy Conversion and introduction to DC machines
Principles of electromechanical energy conversion - singly excited and multi excited systems-calculation of force and torque using the concept of co-energy**.**
Construction and principle of operation of DC machines – EMF equation for generator – Excitation techniques– characteristics of DC shunt generator –applications of DC Generators

UNIT - II
Operation of DC motors
Back-emf and torque equations of dc motors – Armature reaction and commutation – characteristics of separately-excited, shunt, series and compound motors – losses and efficiency – applications of dc motors.
Necessity of a starter – starting by 3 point and 4-point starters.

UNIT - III
Speed Control of motors and Testing of DC Machines
Speed control by armature voltage and field control – testing of DC machines – brake test, Swinburne's method – principle of regenerative or Hopkinson's method – retardation test – field's test- separation of losses.

Single-phase Transformers
Types and constructional details – principle of operation –emf equation – operation on no load and on load – lagging, leading and unity power factors loads –phasor diagrams of transformers – equivalent circuit.

UNIT - IV
Performance and testing of transformers and auto transformers:
Regulation – losses and efficiency – effect of variation of frequency and supply voltage on losses – all day efficiency.
Tests on single phase transformers – open circuit and short circuit tests – Sumpner's test – separation of losses – parallel operation with equal voltage ratios – auto transformer – equivalent circuit – comparison with two winding transformers.

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UNIT - V

3-Phase Transformer:

Polyphase connections- Y/Y, Y/ Δ, Δ/Y, Δ/ Δ and open Δ- third harmonics in phase voltages – three winding transformers- transients in switching –off load and on load tap changers- Scott connection.

Course Outcomes:

At the end of the course, student will be able to:

- Assimilate the concepts of electromechanical energy conversion.
- Mitigate the ill-effects of armature reaction and improve commutation in dc machines.
- Understand the torque production mechanism and control the speed of dc motors.
- Analyze the performance of single phase transformers.
- Predetermine regulation, losses and efficiency of single phase transformers.
- Parallel transformers, control voltages with tap changing methods and achieve three-phase to two-phase transformation.

Text Books:

1. Electrical Machines by P.S. Bhimbra, Khanna Publishers,7th edition, 2011.
2. Electric Machinery by A.E.Fitzgerald, Charleskingsley, Stephen D.Umans, TMH, 6th edition, 2003.

Reference Books:

1. Electrical Machines by D. P.Kothari, I. J. Nagarth, McGraw Hill Publications, 4th edition, 2010.
2. Electrical Machines by R.K.Rajput, Lakshmi publications, 5th edition.
3. Electrical Machinery by Abijith Chakrabarthi and Sudhipta Debnath, McGraw Hill, 1st edition.
4. Electrical Machinery Fundamentals by Stephen J Chapman McGraw Hill education, 4th edition, 2010.
5. Electric Machines by MulukutlaS.Sarma & Mukeshk Pathak, CENGAGE Learning, 1st edition, 2008.
6. Theory & Performance of Electrical Machines by J.B.Guptha. S.K.Kataria& Sons, 1st edition, 2009.

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II Year I Semester		L	T	P	C
		3	0	0	3
ELECTRO MAGNETIC FIELDS					

Preamble:
Electromagnetic field theory is the pre-requisite for most of the subjects in the gamut of electrical engineering. The study of this subject enables students to understand and interpret the phenomenon pertinent to electrical engineering using microscopic quantities such as electric and magnetic field intensities, scalar and vector potentials.

Course Objectives:

- To study the production of electric field and potentials due to different configurations of static charges.
- To study the properties of conductors and dielectrics, calculate the capacitance of different configurations. Understand the concept of conduction and convection current densities.
- To study the magnetic fields produced by currents in different configurations, application of Ampere's law and the Maxwell's second and third equations.
- To study the magnetic force and torque through Lorentz force equation in magnetic field environment like conductors and other current loops.
- To develop the concept of self and mutual inductances and the energy stored.
- To study time varying and Maxwell's equations in different forms and Maxwell's fourth equation for the induced EMF

UNIT - I

Electrostatics:

Coulomb's Law – Electric Field Intensity (EFI) – EFI due to a line and a surface charge, work done in moving a point charge in an electrostatic field, electric potential – potential gradient, Gauss's law – Maxwell's first law (div(D)=ρ_v), Laplace's and Poison's equations and solution of Laplace's equation in one variable.

UNIT - II

Conductors – Dielectrics and Capacitance:

Electric dipole – dipole moment – potential and EFI due to an electric dipole, Torque on an Electric dipole in an electric field, conductors and Insulators – their behavior in electric field. Polarization, boundary conditions between conductor to dielectric, dielectric to dielectric and conductor to free space. Capacitance of parallel plates, spherical dielectrics, energy stored and energy density in a static electric field, current density, conduction and convection current densities, Ohm's law in point form – equation of continuity.

UNIT - III

Magneto statics, Ampere's Law and Force in magnetic fields:

Biot-Savart's law and its applications viz. Straight current carrying filament, circular, square, rectangle and solenoid current carrying wire – Maxwell's second Equation (div(B)=0), Ampere's circuital law and its applications viz. MFI due to an infinite sheet, long filament, solenoid, toroidal current carrying conductor, point form of Ampere's circuital law, Maxwell's third equation (Curl (H)=J)

Magnetic force, moving charges in a magnetic field – Lorentz force equation, force on a current element in a magnetic field, force on a straight and a long current carrying conductor in a magnetic field, force between two straight long and parallel current carrying conductors.

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UNIT - IV

Self and mutual inductance:

Self and mutual inductance – determination of self-inductance of a solenoid and toroid and mutual inductance between a straight long wire and a square loop wire in the same plane – energy stored and density in a magnetic field.

UNIT - V

Time Varying Fields:

Faraday's laws of electromagnetic induction – integral and point forms, Maxwell's fourth equation (Curl(E)=-∂B/∂t), statically and dynamically induced EMF – modification of Maxwell's equations for time varying fields, displacement current, Poynting theorem and Poynting vector.

Course Outcomes:

At the end of the course, student will be able to,

- Compute electric fields and potentials using Gauss law or solve Laplace's or Poisson's equations for various electric charge distributions.
- Calculate the capacitance and energy stored in dielectrics.
- Calculate the magnetic field intensity due to current carrying conductor and understanding the application of Ampere's law, Maxwell's second and third law.
- Estimate self and mutual inductances and the energy stored in the magnetic field.
- Understand the concepts of displacement current and Poynting theorem and Poynting vector

Text Books:

1. "Engineering Electromagnetics" by William H. Hayt & John. A. Buck Mc. Graw-Hill, 7th Editon.2006.
2. "Principles of Electro Magnetics" by Sadiku, Oxford Publications, 6th edition, 2015.

Reference Books:

1. Introduction to Electro Dynamics by D J Griffiths, Prentice-Hall of India Pvt. Ltd, 2nd edition
2. Electromagnetic Field Theory by Yaduvir Singh, Pearson India, 1st edition, 2011.
3. Fundamentals of Engineering Electro magnetics by Sunil Bhooshan, Oxford UniversityPress, 2012.
4. Electro magnetics by Joseph A. Edminister, Schaum's Outline,4th Edition,2014.

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II Year I Semester		L	T	P	C
		0	0	3	1.5
ELECTRICAL CIRCUITS LAB					

Preamble:
To verify and demonstrate various theorems, locus diagrams, resonance and two port networks. To determine self and mutual inductance of a magnetic circuit, parameters of a given coil and measurement of 3- phase power.

Course Objectives:

- To verify and demonstrate various theorems and resonance.
- To draw the locus diagram of series circuits
- To determine the various parameters of a two port networks
- To determine self and mutual inductance of a magnetic circuit, parameters of a given coil.
- To measure the power of three phase unbalanced circuit.

(Any 10 of the following experiments are to be conducted)

1. Verification of Kirchhoff's circuit laws.
2. Verification of Superposition theorem
3. Verification of Thevenin's and Norton's Theorems
4. Verification of Maximum power transfer theorem
5. Verification of Compensation theorem
6. Verification of Reciprocity and Millman's Theorems
7. Locus diagrams of R-L(L Variable) and R-C (C Variable) series circuits
8. Series and parallel resonance
9. Determination of self, mutual inductances and coefficient of coupling
10. Determination of Impedance (Z) and Admittance (Y) Parameters for a two port network
11. Determination of Transmission and Hybrid parameters
12. Determination of Parameters of a choke coil.
13. Determination of cold and hot resistance of an electric lamp.
14. Measurement of 3-phase power by two wattmeter method for unbalanced loads

Course Outcomes:
At the end of the course, student will be able to

- Apply various theorems
- Determination of self and mutual inductances
- Two port parameters of a given electric circuits
- Draw locus diagrams
- Draw Waveforms and phasor diagrams for lagging and leading networks

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II Year I Semester		L	T	P	C
		0	0	3	1.5
DC MACHINES AND TRANSFORMERS LAB					

Preamble:
The aim of the lab is to demonstrate the operation of various types of DC machines and transformers under no load and loaded conditions by conducting various tests and performance will be analyzed.

Course Objectives:
- To plot the magnetizing characteristics of DC shunt generator and understand the mechanism of self-excitation.
- To control the speed of DC motors.
- To determine and predetermine the performance of DC machines.
- To predetermine the efficiency and regulation of transformers and assess their performance.

(Any 10 of the following experiments are to be conducted)

1. Determination of critical field resistance and critical speed of DC shunt generator by using Magnetization characteristics
2. Predetermination of efficiency of DC Machine by conducting Swinburne's test
3. Performance characteristics of a DC shunt motor by conducting Brake test.
4. Predetermination of efficiency of two DC shunt machines by conducting Hopkinson's test
5. Speed control of DC shunt motor by Field and armature Control methods
6. Determination of constant losses of DC shunt motor by conducting Retardation test
7. Separation of losses (Eddy current and Hysteresis) in a DC shunt motor.
8. Predetermination of efficiency, regulation and to obtain the parameters of the equivalent circuit of a single phase transformer by conducting OC & SC tests.
9. Predetermination of efficiency, regulation and to obtain the parameters of the equivalent circuit of a single phase transformer by conducting Sumpner's test.
10. Conversion of three phase to two phase supply by using Scott connection of transformers
11. Parallel operation of two Single phase Transformers under no-load and load conditions
12. Separation of core losses of a single phase transformer
13. Heat run test on a bank of three single phase Delta connected transformers

Course Outcomes:
At the end of the course, student will be able to
- Determine and predetermine the performance of DC machines and Transformers.
- Control the speed of DC motor.
- Obtain three phase to two phase transformation.

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II Year I Semester		L	T	P	C
		0	0	3	1.5
ELECTRONIC DEVICES AND CIRCUITS LAB					

Preamble:
The aim of the lab imparts the knowledge to understand the concepts, working and characteristics of Different Diodes, BJT and FET Transistors, amplifiers and compensation techniques of transistors

Course Objectives: The student is able
- To study the characteristics of electronic components and measuring instruments.
- To understand the characteristics of PN, Zener diode, design rectifiers with and without filters
- To understand the characteristics of BJT, FET, MOSFET, SCR, UJT
- To understand the biasing of transistors
- To understand the frequency response of amplifiers, measure frequency, phase of signals.

Electronic Workshop Practice:

1. Identification, Specifications, Color Codes for resistor, R, L, C Components, Potentiometers, Coils, Gang condensers, Relays, Bread Boards.
2. Identification, Specifications and Testing of active devices, Diodes, BJTs, JFETs, LEDs, LCDs, SCR, UJT.
3. Soldering Practice- Simple circuits using active and passive components.
4. Study and operation of Ammeters, Voltmeters, Transformers, Analog and Digital
5. Multimeter, Function Generator, Regulated Power Supply and CRO.

List of Experiments
(Any 10 of the following experiments are to be conducted)

1. P.N Junction Diode Characteristics
   Part A: Germanium Diode (Forward bias& Reverse bias)
   Part B: Silicon Diode (Forward Bias only)
2. Zener Diode Characteristics
   Part A: V-I Characteristic
   Part B: Zener Diode as Voltage Regulator
3. Rectifiers (without and with c-filter)
   Part A: Half-wave Rectifier
   Part B: Full-wave Rectifier
4. BJT Characteristics (CE Configuration)
   Part A: Input Characteristics
   Part B: output Characteristics
5. FET Characteristics
   Part A: Drain Characteristics
   Part B: Transfer Characteristics
6. SCR Characteristics

7. UJT Characteristics
8. MOSFET Characteristics
9. Transistor Biasing
10. Measurement of electrical quantities using CRO
11. BJT-CE Amplifier
12. Emitter Follower –CC Amplifier
13. FET-CS Amplifier

Note: The students are required to perform the experiment to obtain the V-I characteristics and to determine the relevant parameters from the obtained graphs.

Equipment required:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Digital Multi-meters
5. Decade Résistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)
9. Active & Passive Electronic Components

Course Outcomes: At the end of the course, student will be able to

- Analyze the characteristics of diodes, transistors and other devices
- Design and implement the rectifier circuits, SCR and UJT in the hardware circuits.
- Design the biasing and amplifiers of BJT and FET amplifiers
- Measure electrical quantities using CRO in the experimentation.

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II Year I Semester		**L**	**T**	**P**	**C**
		0	**0**	4	**2**
SKILL ORIENTED COURSE **DESIGN OF ELECTRICAL CIRCUITS USING ENGINEERING SOFTWARE TOOLS**					

Preamble:
The aim of the course is to simulate various theorems and resonance. Also to determine self and mutual inductance of a magnetic circuit, parameters of a given coil through simulation.

Course Objectives:

- To Learn the fundamentals of MATLAB Tools
- To generate various waveform signals and sequences
- To verify and simulate various electrical circuits using Mesh and NodalAnalysis
- To verify and simulate various theorems
- To verify and simulate RLC series and parallel resonance.
- To determine self and mutual inductance of a magnetic circuit, parameters of agiven coil.

List of Experiments
(Any 10 of the following experiments are to be conducted)

Note: MATLAB/SMULINK fundamentals shall be explained during the first week before starting of the Lab course

1. Generation of various signals and sequences (Periodic and Aperiodic), such as unit Impulse, Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp.
2. Operations on signals and sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy, and Average Power
3. Verification of Kirchhoff's current law and voltage law using simulation tools.
4. Verification of mesh analysis using simulation tools.
5. Verification of nodal analysis using simulation tools.
6. Determination of average value, rms value, form factor, peak factor of sinusoidal wave, square wave using simulation tools.
7. Verification of super position theorem using simulation tools.
8. Verification of reciprocity theorem using simulation tools.
9. Verification of maximum power transfer theorem using simulation tools.
10. Verification of Thevenin's theorem using simulation tools.
11. Verification of Norton's theorem using simulation tools.
12. Verification of compensation theorem using simulation tools.
13. Verification of Milliman's theorem using simulation tools.
14. Verification of series resonance using simulation tools.
15. Verification of parallel resonance using simulation tools.
16. Verification of self inductance and mutual inductance by using simulation tools.

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Course Outcomes:

At the end of the course, student will be able to

- write the MATLAB programs to simulate the electrical circuit problems
- simulate various circuits for electrical parameters
- simulate various wave form for determination of wave form parameters
- simulate RLC series and parallel resonance circuits for resonant parameters
- simulate magnetic circuits for determination of self and mutual inductances

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II Year I Semester		L	T	P	C
		2	0	0	0
PROFESSIONAL ETHICS & HUMAN VALUES					

Preamble:
This course is a mandatory course introduced to impart the Ethics and Human Values to the students in engineering education.

Course Objectives:

- To create an awareness on Engineering Ethics and Human Values.
- To instill Moral and Social Values and Loyalty
- To appreciate the rights of others
- To create awareness on assessment of safety and risk

UNIT -I

Human Values:

Morals, Values and Ethics-Integrity-Work Ethic-Service learning – Civic Virtue – Respect for others –Living Peacefully –Caring –Sharing –Honesty -Courage-Cooperation– Commitment – Empathy –Self Confidence Character –Spirituality.

Learning outcomes:

1. Learn about morals, values & work ethics.
2. Learn to respect others and develop civic virtue.
3. Develop commitment
4. Learn how to live peacefully

UNIT -II

Engineering Ethics:

Senses of 'Engineering Ethics-Variety of moral issued –Types of inquiry –Moral dilemmas – Moral autonomy –Kohlberg's theory-Gilligan's Theory-Consensus and controversy –Models of professional roles-Theories about right action-Self-interest -Customs and religion –Uses of Ethical theories –Valuing time –Cooperation –Commitment.

Learning outcomes:

1. Learn about the ethical responsibilities of the engineers.
2. Create awareness about the customs and religions.
3. Learn time management
4. Learn about the different professional roles.

UNIT -III

Engineering as Social Experimentation:

Engineering As Social Experimentation –Framing the problem –Determining the facts – Codes of Ethics –Clarifying Concepts –Application issues –Common Ground -General Principles –Utilitarian thinking respect for persons.

Learning outcomes:

1. Demonstrate knowledge to become a social experimenter.
2. Provide depth knowledge on framing of the problem and determining the facts.
3. Provide depth knowledge on codes of ethics.
4. Develop utilitarian thinking

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UNIT -IV

Engineers Responsibility for Safety and Risk:

Safety and risk –Assessment of safety and risk –Risk benefit analysis and reducing risk-Safety and the Engineer-Designing for the safety-Intellectual Property rights (IPR).

Learning outcomes:

1. Create awareness about safety, risk & risk benefit analysis.
2. Engineer's design practices for providing safety.
3. Provide knowledge on intellectual property rights.

UINIT- V

Global Issues:

Globalization –Cross-culture issues-Environmental Ethics –Computer Ethics –Computers as the instrument of Unethical behavior –Computers as the object of Unethical acts –Autonomous Computers-Computer codes of Ethics –Weapons Development -Ethics and Research –Analyzing Ethical Problems in research.

Learning outcomes:

1. Develop knowledge about global issues.
2. Create awareness on computer and environmental ethics
3. Analyze ethical problems in research.
4. Give a picture on weapons development.

Course outcomes:

Students will be able to:

- Identify and analyze an ethical issue in the subject matter under investigation or in a relevant field
- Identify the multiple ethical interests at stake in a real-world situation or practice
- Articulate what makes a particular course of action ethically defensible
- Assess their own ethical values and the social context of problems
- Identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources, the objective presentation of data, and the treatment of human subjects
- Demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work
- Integrate, synthesize, and apply knowledge of ethical dilemmas and resolutions in academic settings, including focused and interdisciplinary research.

Text Books:

1) "Engineering Ethics includes Human Values" by M.Govindarajan, S.Natarajan and, V.S.Senthil Kumar-PHI Learning Pvt. Ltd-2009
2) "Engineering Ethics" by Harris, Pritchard and Rabins, CENGAGE Learning, India Edition, 2009.
3) "Ethics in Engineering" by Mike W. Martin and Roland Schinzinger –Tata McGraw-Hill–2003.
4) "Professional Ethics and Morals" by Prof.A.R.Aryasri, DharanikotaSuyodhana-Maruthi Publications.
5) "Professional Ethics and Human Values" by A.Alavudeen, R.KalilRahman and M. Jayakumaran, Laxmi Publications.
6) "Professional Ethics and Human Values" by Prof.D.R.Kiran-"Indian Culture, Values and Professional Ethics" by PSR Murthy-BS Publication

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II Year II Semester		L	T	P	C
		3	0	0	3
PYTHON PROGRAMMING					

Preamble:
This course is developed to impart the programming skills to the students and prepare them to suitable for industry ready

Course Objectives:
The Objectives of Python Programming are

- To learn about Python programming language syntax, semantics, and the runtime environment
- To be familiarized with universal computer programming concepts like data types, containers
- To be familiarized with general computer programming concepts like conditional execution, loops & functions
- To be familiarized with general coding techniques and object-oriented programming

UNIT-I

Introduction:
Introduction to Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, Operators. Type conversions, Expressions, More about Data Output.
Data Types, and Expression: Strings Assignment, and Comment, Numeric Data Types and Character Sets, Using functions and Modules.
Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables. Repetition Structures: Introduction, while loop, for loop, Calculating a Running Total, Input Validation Loops, Nested Loops.

UNIT- II
Control Statement:
Definite iteration for Loop Formatting Text for output, Selection if and if else Statement Conditional Iteration The While Loop
Strings and Text Files: Accessing Character and Substring in Strings, Data Encryption, Strings and Number Systems, String Methods Text Files.

UNIT -III
List and Dictionaries:
Lists, Defining Simple Functions, Dictionaries
Design with Function**:** Functions as Abstraction Mechanisms, Problem Solving with Top Down Design, Design with Recursive Functions, Case Study Gathering Information from a File System, Managing a Program's Namespace, Higher Order Function.
Modules: Modules, Standard Modules, Packages.

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UNIT- IV

File Operations:

Reading config files in python, Writing log files in python, Understanding read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines(), Manipulating file pointer using seek, Programming using file operations

Object Oriented Programming**:** Concept of class, object and instances, Constructor, class attributes and destructors, Real time use of class in live projects, Inheritance , overlapping and overloading operators, Adding and retrieving dynamic attributes of classes, Programming using OOPs support

Design with Classes: Objects and Classes, Data modeling Examples, Case Study An ATM, Structuring Classes with Inheritance and Polymorphism

UNIT -V

Errors and Exceptions:

Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defined Exceptions, Defining Clean-up Actions, Redefined Clean-up Actions.

Graphical User Interfaces: The Behavior of Terminal Based Programs and GUI -Based, Programs, Coding Simple GUI-Based Programs, Other Useful GUI Resources.

Programming**:** Introduction to Programming Concepts with Scratch.

Course Outcomes:

- Develop essential programming skills in computer programming concepts like data types, containers
- Apply the basics of programming in the Python language Solve coding tasks related
- conditional execution, loops
- Solve coding tasks related to the fundamental notions and techniques used in object- oriented programming

Text Books

1) Fundamentals of Python First Programs, Kenneth. A. Lambert, Cengage, 2/e, 2011.

Reference Books:

1) Introduction to Python Programming, Gowrishankar S., VeenaA, CRC Press, 2nd Edition, 2019.
2) Introduction to Programming Using Python, Y. Daniel Liang, Pearson, 1st Edition, 2012.

e-Resources:

1) https://www.tutorialspoint.com/python3/python_tutorial.pdf

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II Year II Semester		L	T	P	C
		3	0	0	3
DIGITAL ELECTRONICS					

Preamble:
This course covers the topics related to representation numbers in different radix formats, complements and codes. It also introduces the basic gates and their realization in SOP and POS form. Boolean algebra and various logic gates minimization process is introduced. Design principles of combinational and sequential circuits are explained to make the students thorough in design of these circuits.

Course Objectives:

- To solve a typical number base conversion and analyze new error coding techniques.
- Theorems and functions of Boolean algebra and behavior of logic gates.
- To optimize logic gates for digital circuits using various techniques.
- To understand concepts of combinational circuits.
- To develop advanced sequential circuits.

UNIT - I
Review of Number Systems & Codes:
Representation of numbers of different radix, conversion from one radix to another radix, r-1's complements and r's complements of signed members. Gray code,4 bit codes; BCD, Excess-3, 2421, 84-2-1 code etc., Error detection & correction codes: parity checking, even parity, odd parity, Hamming code.
Boolean theorems and logic operations
Boolean theorems, principle of complementation & duality, De-Morgan theorems. Logic operations; Basic logic operations -NOT, OR, AND, Universal Logic operations, EX-OR, EX-NOR operations. Standard SOP and POS Forms, NAND-NAND and NOR-NOR realizations.

UNIT - II
Minimization Techniques:
Minimization and realization of switching functions using Boolean theorems, K-Map (up to 6 variables) and tabular method.
Combinational Logic Circuits Design:
Design of Half adder, full adder, half subtractor, full subtractor, applications of full adders; 4-bit adder-subtractor circuit, BCD adder circuit, Excess 3 adder circuit and carry look-a-head adder circuit

UNIT - III
Combinational Logic Circuits Design Using MSI &LSI:
Design of encoder, decoder, multiplexer and demultiplexers, Implementation of higher order circuits using lower order circuits. Realization of Boolean functions using decoders and multiplexers. Design of Priority encoder, 4-bit digital comparator and seven segment decoder
Introduction of PLD's:
PLDs: PROM, PAL, PLA -Basics structures, realization of Boolean functions.

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UNIT - IV

Sequential Circuits-I:

Classification of sequential circuits (synchronous and asynchronous) , operation of NAND & NOR Latches and flip-flops; truth tables and excitation tables of RS flip-flop, JK flip-flop, T flip-flop, D flip-flop with reset and clear terminals. Conversion from one flip-flop to another flip-flop. Design of ripple counters, design of synchronous counters, Johnson counter, ring counter. Design of registers - Buffer register, control buffer register, shift register, bi-directional shift register, universal shift register.

UNIT - V

Sequential Circuits -II:

Finite state machine; state diagrams, state tables, reduction of state tables. Analysis of clocked sequential circuits Mealy to Moore conversion and vice-versa. Realization of sequence generator and sequence detector circuits, Races and Hazards.

Course Outcomes: At the end of the course, student will be able to

- Classify different number systems and apply to generate various codes.
- Use the concept of Boolean algebra in minimization of switching functions
- Design different types of combinational logic circuits.
- Apply knowledge of flip-flops in designing of Registers and counters
- The operation and design methodology for synchronous sequential circuits and algorithmic state machines.

Text Books:

1. Switching and finite automata theory:ZviKohavi, Niraj K. Jha,Cambridge University Press, 3rd Edition, 2009.
2. Digital Design by Morris Mano, Prentice Hall India, 5th Edition.

Reference Books:

1. Digital Principles and Applications by Leach , Malvino , Saha, Mc-Graw Hill, 8th Edition, 2014.
2. Switching Theory and Logic Design by A. Anand Kumar, PHI learning, 3rd edition.
3. Introduction to Switching Theory and Logic Design – Fredriac J Hill, Gerald R Peterson, 3rdEdition, John Willey and Sons Inc,
4. Fundamentals of Logic Design by Charles H. RothJr., Cengage Learning, 7th edition,2013.

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II Year II Semester		L	T	P	C
		3	0	0	3
POWER SYSTEMS - I					

Preamble:
Electrical Power plays significant role in day-to-day life of entire mankind. The aim of this course is to allow the students to understand the concepts of the generation and distribution of power along with economic aspects.

Course Objectives:

- To study the principle of operation of different components of a thermal power stations.
- To study the principle of operation of different components of a Nuclear power stations.
- To study the constructional and operation of different components of an Air and Gas Insulated substations.
- To study the constructional details of different types of cables.
- To study different types of load curves and tariffs applicable to consumers.

UNIT - I
Hydroelectric Power Stations:
Selection of site, general layout of a hydroelectric power plant with brief description of major components and principle of operation
Thermal Power Stations
Selection of site, general layout of a thermal power plant. Brief description of components: boilers, super heaters, economizers and electrostatic precipitators, steam turbines: impulse and reaction turbines, condensers, feed water circuit, cooling towers and chimney.

UNIT - II
Nuclear Power Stations
Location of nuclear power plant, working principle, nuclear fission, nuclear fuels, nuclear chain reaction, nuclear reactor components: moderators, control rods, reflectors and coolants, types of nuclear reactors and brief description of PWR, BWR and FBR. Radiation: radiation hazards and shielding, nuclear waste disposal.

UNIT - III
Classification of Air and Gas Insulated substations
Air Insulated Substations – indoor & outdoor substations, substations layouts of 33/11 kV showing the location of all the substation equipment.

Bus bar arrangements in the sub-stations: simple arrangements like single bus bar, sectionalized single bus bar, double bus bar with one and two circuit breakers, main and transfer bus bar system with relevant diagrams.
Gas Insulated Substations (GIS) – advantages of gas insulated substations, constructional aspects of GIS, installation and maintenance of GIS, comparison of air insulated substations and gas insulated substations.

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UNIT- IV

Underground Cables

Types of cables, construction, types of insulating materials, calculation of insulation resistance, stress in insulation and power factor of cable.

Capacitance of single and 3-Core belted Cables. Grading of cables: capacitance grading and intersheath grading.

UNIT - V

Economic Aspects of Power Generation & Tariff

Economic Aspects – load curve, load duration and integrated load duration curves, discussion on economic aspects: connected load, maximum demand, demand factor, load factor, diversity factor, plant capacity factor and plant use factor, base and peak load plants.

Tariff Methods– costs of generation and their division into fixed, semi-fixed and running costs, desirable characteristics of a tariff method, tariff methods: simple rate, flat rate, block-rate, two-part, three–part, and power factor tariff methods.

Course Outcomes:

At the end of the course, student will be able to

- Identify the different components of thermal power plants.
- Identify the different components of nuclear Power plants.
- Identify the different components of air and gas insulated substations.
- Identify single core and three core cables with different insulating materials.
- Analyse the different economic factors of power generation and tariffs.

Text Books:

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagarand A. Chakrabarti, DhanpatRai& Co. Pvt. Ltd, 2016.
2. Generation, Distribution and Utilization of Electric Energy by C.L.Wadhawa, New age International (P) Limited, Publishers, 3rd edition.

Reference Book:

1. Elements of Electrical Power Station Design by M V Deshpande, PHI, New Delhi, 2009.

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II Year II Semester		L	T	P	C
		3	0	0	3
INDUCTION AND SYNCHRONOUS MACHINES					

Preamble:
This course covers the topics on 3-phase induction motor, 1-phase induction motor and synchronous machines which have wide application in power systems. The main aim of the course is to provide a detailed analysis of operation and performance of 3-phase induction motor, 1-phase induction motor and synchronous machines. In addition, it also covers voltage regulation and parallel operation of synchronous generators.

Course Objectives:

- Understand the principle of operation and performance of 3-phase induction motor.
- Quantify the performance of induction motor and induction generator in terms of torque and slip.
- To understand the torque producing mechanism of a single phase induction motor.
- To understand the principle of emf generation, the effect of armature reaction and predetermination of voltage regulation in synchronous generators.
- To study parallel operation and control of real and reactive powers for synchronous generators.
- To understand the operation, performance and starting methods of synchronous motors.

UNIT - I
3-phase induction motors
Construction details of squirrel cage and slip ring induction motors – production of rotating magnetic field – principle of operation – Equivalent circuit –phasor diagram- slip speed-rotor emf and rotor frequency – rotor current and pf at standstill and during running conditions – rotor power input, rotor copper loss and mechanical power developed and their interrelationship.

UNIT - II
Characteristics and testing methods of induction motors
Torque equation – expressions for maximum torque and starting torque – torque slip characteristic – double cage and deep bar rotors – crawling and cogging – speed control of induction motor with V/f control method – no load and blocked rotor tests – circle diagram for predetermination of performance – induction generator operation (Qualitative treatment only)

UNIT - III
Starting methods of 3-phase induction motors
Methods of starting of three phase Induction motors: DOL, Auto transformer, Star-Delta and rotor resistance methods.

Single phase induction motors:
Constructional features- equivalent circuit- problem of starting-double revolving field theory-Methods of starting. AC series motors.

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UNIT - IV

Construction, operation, voltage regulation and parallel operation of synchronous generator:

Constructional features of non-salient and salient pole machines –types of armature windings – distribution, pitch and winding factors – E.M.F equation –improvements of waveform and armature reaction –phasor diagrams- voltage regulation by synchronous impedance method – MMF method and Potier triangle method– two reaction analysis of salient pole machines and phasor diagram.

Parallel operation with infinite bus and other alternators – synchronizing power – load sharing – control of real and reactive power – numerical problems.

UNIT - V

Synchronous motor – operation, starting and performance

Synchronous motor principle and theory of operation – phasor diagram – starting torque – variation of current and power factor with excitation – capability curves - synchronous condenser – mathematical analysis for power developed – hunting and its suppression – methods of starting – applications.

Course Outcomes: At the end of the course, student will be able to

- Explain the operation and performance of three phase induction motor.
- Analyze the torque-speed relation, performance of induction motor and induction generator.
- Implement the starting of single phase induction motors.
- Develop winding design and predetermine the regulation of synchronous generators.
- Explain hunting phenomenon, implement methods of staring and correction of power factor with synchronous motor.

Text Books:

1. Electrical Machines by P.S. Bhimbra, Khanna Publishers
2. Electric Machinery by A.E.Fitzgerald, Charles Kingsley, Stephen D.Umans, TMH

Reference Books:

1. 1.Performance and design of AC machines – M.G. Say
2. Alternating Current Machines by A.F.Puchstein, T.C. Lloyd, A.G. Conrad, ASIA Publishing House
3. Electrical Machinery Fundamentals by Stephen J Chapman McGraw Hill education, 2010.
4. Electrical Machines by R.K.Rajput, Lakshmi publications, 5th edition

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II Year II Semester		L	T	P	C
		3	0	0	3
MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS					

Course Objectives:

- The Learning objectives of this paper are to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting.
- To familiarize about the Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis.
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles.
- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation.
- Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals.

Unit-I

Introduction to Managerial Economics and demand Analysis:

Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand-Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.

Unit – II:

Theories of Production and Cost Analyses:

Theories of Production function- Law of Variable Proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs-Fixed costs, Variable Costs and Total costs –Cost –Volume-Profit Analysis-Determination of Breakeven point(problems)-Managerial significance and limitations of Breakeven point.

Unit – III:

Introduction to Markets, Theories of the Firm & Pricing Policies:

Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson's models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing, Business Cycles: Meaning and Features – Phases of a Business Cycle. Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and their forms.

Unit – IV:

Introduction to Accounting & Financing Analysis:

Introduction to Double Entry System, Journal, Ledger, Trail Balance and Preparation of Final Accounts with adjustments – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow and cash flow analysis (Problems)

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Unit – V:

Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods (payback period, accounting rate of return) and modern methods (Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)

Course Outcomes:

- The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product.
- The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs.
- The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units.
- The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis.
- The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making.

Text Books:

1. Managerial Economics and Financial Analysis by A R Aryasri, McGraw – Hill, 3rd edition.

References Books:

1. Managerial Economics by Varshney R.L, K.L Maheswari, S. Chand & Company Ltd,
2. Managerial Economics, JL Pappas and EF Brigham, Holt, R & W; New edition.
3. Accounting for Management, N.P Srinivasn and M. Sakthivel Murugan, S. Chand & Company Ltd, 1st edition, 2011.
4. An Introduction to Accountancy by Maheswari S.N, Vikas Publishing House Pvt Ltd, 12th edition, 2018.
5. Financial Management by I.M Pandey, Vikas Publishing House Pvt Ltd, 9th edition, 2009.
6. Managerial Economics by V. Maheswari, S. Chand & Company Ltd, 2002.

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II Year II Semester		L	T	P	C
		0	0	3	1.5
PYTHON PROGRAMMING LAB					

Preamble:

This lab is designed to impart the advanced programming skills to the students and prepare them to suitable for industry ready

Course Objectives:
The aim of Python Programming Lab is

- To acquire programming skills in core Python.
- To acquire Object Oriented Skills in Python
- To develop the skill of designing Graphical user Interfaces in Python
- To develop the ability to write database applications in Python

1) Write a program that asks the user for a weight in kilograms and converts it to pounds. There are 2.2 pounds in a kilogram.
2) Write a program that asks the user to enter three numbers (use three separate input statements). Create variables called total and average that hold the sum and average of the three numbers and print out the values of total and average.
3) Write a program that uses a *for* loop to print the numbers 8, 11, 14, 17, 20, . . . , 83, 86,89.
4) Writeaprogramthatasks theuserfortheirnameandhowmanytimestoprintit.The program should print out the user's name the specified number of times.
5) Use a *for* loop to print a triangle like the one below. Allow the user to specify how high the triangle should be.

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*
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6) Generate a random number between 1 and 10. Ask the user to guess the number and print a message based on whether they get it right or not.
7) Write a program that asks the user for two numbers and prints *Close* if the numbers are within .001 of each other and Not close otherwise.
8) Write a program that asks the user to enter a word and prints out whether that word contains any vowels.
9) Write a program that asks the user to enter two strings of the same length. The program should then check to see if the strings are of the same length. If they are not, the program should print an appropriate message and exit. If they are of the same length, the program should alternate the characters of the two strings. For example, if the user enters *abcde* and *ABCDE* the program should print out*AaBbCcDdEe*.
10) Write a program that asks the user for a large integer and inserts commas into it according to the standard American convention for commas in large numbers. For instance, if the user enters 1000000, the output should be1,000,000.

11) In algebraic expressions, the symbol for multiplication is often left out, as in 3x+4y or 3(x+5). Computers prefer those expressions to include the multiplication symbol, like 3*x+4*y or 3*(x+5). Write a program that asks the user for an algebraic expression and then inserts multiplication symbols where appropriate.
12) Write a program that generates a list of 20 random numbers between 1 and100.
    (a) Print the list.
    (b) Print the average of the elements in the list.
    (c) Print the largest and smallest values in the list.
    (d) Print the second largest and second smallest entries in the list
    (e) Print how many even numbers are in the list.
13) Write a program that asks the user for an integer and creates a list that consists of the factors of that integer.
14) Write a program that generates 100 random integers that are either 0 or 1. Then find the longest run of zeros, the largest number of zeros in a row. For instance, the longest run of zeros in [1,0,1,1,0,0,0,0,1,0,0] is4.
15) Write a program that removes any repeated items from a list so that each item appears at most once. For instance, the list [1,1,2,3,4,3,0,0] would become[1,2,3,4,0].
16) Write a program that asks the user to enter a length in feet. The program should then give the user the option to convert from feet into inches, yards, miles, millimeters, centimeters, meters, or kilometers. Say if the user enters a 1, then the program converts to inches, if they enter a 2, then the program converts to yards, etc. While this can be done with if statements, itis much shorter with lists and it is also easier to add new conversions if you use lists.
17) Write a function called *sum_digits* that is given an integer num and returns the sum of the digits of num.
18) Write a function called *first_diff* that is given two strings and returns the first location in which the strings differ. If the strings are identical, it should return-1.
19) Write a function called *number_of_factors* that takes an integer and returns how many factors the number has.
20) Write a function called *is_sorted* that is given a list and returns True if the list is sorted and False otherwise.
21) Write a function called root that is given a number x and an integer n and returns $x^{1/n}$. In the function definition, set the default value of n to2.
22) Write a function called primes that is given a number n and returns a list of the first n primes. Let the default value of n be100.
23) Write a function called merge that takes two already sorted lists of possibly different lengths, and merges them into a single sorted list.
    (a) Do this using the sort method. (b) Do this without using the sort method.
24) Write a program that asks the user for a word and finds all the smaller words that can be made from the letters of that word. The number of occurrences of a letter in a smaller word can't exceed the number of occurrences of the letter in the user's word.
25) Write a program that reads a file consisting of email addresses, each on its own line. Your program should print out a string consisting of those email addresses separated by semicolons.

26) Write a program that reads a list of temperatures from a file called *temps.txt*, converts those temperatures to Fahrenheit, and writes the results to a file called ftemps.txt.
27) Write a class called Product. The class should have fields called name, amount, and holding the product's name, the number of items of that product in stock, and the regular price of the product. There should be a method *get_price* that receives the number of items to be bought and returns a the cost of buying that many items, where the regular price is charged for orders of less than 10 items, a 10% discount is applied for orders of between 10 and 99 items, and a 20% discount is applied for orders of 100 or more items. There should also be a method called *make_purchase* that receives the number of items to be bought and decreases amount by that much.
28) Write a class called Time whose only field is a time in seconds. It should have a method called *convert_to_minutes* that returns a string of minutes and seconds formatted as in the following example: if seconds is 230, the method should return '5:50'. It should also have a method called *convert_to_hours* that returns a string of hours, minutes, and seconds formatted analogously to the previous method.
29) Write a class called Converter. The user will pass a length and a unit when declaring an object from the class for example, c = Converter(9,'inches'). The possible units are inches, feet, yards, miles, kilometers, meters, centimeters, and millimeters. For each of these units there should be a method that returns the length converted into those units. For example, using the Converter object created above, the user could call c. feet() and should get 0.75 as the result.
30) Write a Python class to implement pow(x,n).
31) Write a Python class to reverse a string word byword.
32) Write a program that opens a file dialog that allows you to select a text file. The program then displays the contents of the file in a textbox.
33) Write a program to demonstrate Try/except/else.
34) Write a program to demonstrate try/finally and with/as.

Course Outcomes:

By the end of this lab, the student is able to

- Write, Test and Debug Python Programs
- Use Conditionals and Loops for Python Programs
- Use functions and represent Compound data using Lists, Tuples and
- Dictionaries Use various applications using python

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II Year II Semester		L	T	P	C
		0	0	3	1.5
INDUCTION AND SYNCHRONOUS MACHINES LAB					

Preamble:
The aim of the lab is to provide a detailed analysis of operation and performance of 3-phase induction motor, 1-phase induction motor and synchronous machines. In addition, it also covers voltage regulation and parallel operation of synchronous generators.

Course Objectives:
The students are able to understand the,

- Speed control methods of three-phase induction motors.
- Performance characteristics of three-phase and single-phase induction motors.
- Principles of power factor improvement of single-phase induction motor.
- Voltage regulation calculations of three–phase alternator by various methods,
- Performance curves of three-phase synchronous motor.

(Any 10 of the following experiments are to be conducted)

1. Performance characteristics of a three- phase Induction Motor by conducting Brake test
2. Determination of equivalent circuit parameters, efficiency and regulation of a three phase Induction motor by conducting No–load & Blocked rotor tests
3. Determination of Regulation of a three–phase alternator by using synchronousimpedance & m.m.f. methods
4. Determination of Regulation of a three–phase alternator by using Potier triangle method
5. Determination of V and Inverted V curves of a three phase synchronous motor.
6. Determination of X_d and X_q of a salient pole synchronous machine
7. Speed control of three phase induction motor by V/f method.
8. Determination of equivalent circuit parameters of single phase induction motor
9. Determination of efficiency of three-phase alternator by loading with three phaseinduction motor.
10. Power factor improvement of single-phase induction motor by using capacitors.
11. Parallel operation of three-phase alternator under no-load and load conditions
12. Determination of efficiency of a single-phase AC series Motor by conducting Brake test.
13. Starting of single-phase Induction motor by using capacitor start and capacitor startrun methods.
14. Determination of efficiency of a single-phase Induction Motor by conducting Brake test.

Course Outcomes:
At the end of the course, student will be able to

- Assess the performance of single phase and three phase induction motors.
- Control the speed of three phase induction motor.
- Predetermine the regulation of three–phase alternator by various methods.
- Find the X_d/X_q ratio of alternator and asses the performance of three–phase synchronous motor.
- Determine the performance of single phase AC series motor.

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II Year II Semester		L	T	P	C
		0	0	3	1.5
DIGITAL ELECTRONICS LAB					

Preamble:
The aim of this lab is to understand the Basics of digital electronics and able to design basic logic circuits, combinational and sequential circuits.

Course Objectives:

- To know the concept of Boolean laws for simplifying the digital circuits.
- To understand the concepts of flipflops.
- To understand the concepts of counters.
- To analyze and design various circuits.

List of Experiments:

Any TEN of the following Experiments are to be conducted

1. Verification of truth tables of Logic gates: Two input (i) OR (ii) AND (iii) NOR (iv) NAND (v) Exclusive OR (vi) Exclusive NOR
2. Design a simple combinational circuit and obtain minimal SOP expression and verify the truth table using Digital Trainer Kit
3. Verification of functional table of 3 to 8 line Decoder / De-multiplexer
4. 4 variable logic function verification using 8 to 1 multiplexer.
5. Design full adder circuit and verify its functional table.
6. Design full Subtractor circuit and verify its functional table.
7. Verification of functional tables of Flip-Flops
8. Design a four bit ring counter using D Flip – Flops / JK Flip Flop and verify output
9. Design a four bit Johnson's counter using D Flip-Flops / JK Flip Flops and verify output
10. Draw the circuit diagram of MOD-8 ripple counter and construct a circuit using T-Flip-Flops and Test it with a low frequency clock and Sketch the output waveforms.
11. Design MOD – 10 ripple counter using T- Flip-Flop and verify the result and Sketch the output waveforms
12. Design MOD – 8 synchronous counter using D Flip-Flop and verify the result and Sketch the output waveforms.

Course Outcomes: At the end of the course, student will be able to

- Learn the basics of gates, filp-flops and counters.
- Construct basic combinational circuits and verify their functionalities
- Apply the design procedures to design basic sequential circuits
- To understand the basic digital circuits and to verify their operation
- Apply Boolean laws to simplify the digital circuits.

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II Year II Semester		L	T	P	C
		0	**0**	4	2
SKILL ORIENTED COURSE **IOT APPLICATIONS OF ELECTRICAL ENGINEERING**					

Preamble:
The aim of this course is to introduce Internet of Things to simulate real time applicationsusing Arduino/Raspberry Pi.

Course Objectives:
- To understand fundamentals of various technologies of Internet of Things.
- To know various communication technologies used in the Internet of Things.
- To know the connectivity of devices using web and internet in the IoT environment.
- To understand the implementation of IoT by studying case studies like Smart Home, Smart city, etc.

List of Experiments:

Any TEN of the following Experiments are to be conducted

1. Familiarization with Arduino/Raspberry Pi and perform necessary software installation.
2. To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds.
3. To interface Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.
4. To interface temperature sensor with Arduino/Raspberry Pi and write a program to print temperature and humidity readings.
5. To interface Organic Light Emitting Diode (OLED) with Arduino/Raspberry Pi
6. To interface Bluetooth with Arduino/Raspberry Pi and write a program to send sensor data to smartphone using Bluetooth.
7. To interface Bluetooth with Arduino/Raspberry Pi and write a program to turn LED ON/OFF when ‘1’/’0’ is received from smartphone using Bluetooth.
8. Write a program on Arduino/Raspberry Pi to upload and retrieve temperature and humidity data to thingspeak cloud.
9. 7 Segment Display
10. Analog Input & Digital Output
11. Night Light Controlled & Monitoring System
12. Fire Alarm Using Arduino
13. IR Remote Control for Home Appliances
14. A Heart Rate Monitoring System
15. Alexa based Home Automation System

Course Outcomes:
After the completion of the course the student should be able to:
- apply various technologies of Internet of Things to real time applications.
- apply various communication technologies used in the Internet of Things.
- connect the devices using web and internet in the IoT environment.
- implement IoT to study Smart Home, Smart city, etc.

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III Year – I SEMESTER		L	T	P	C
		3	0	0	3
POWER SYSTEMS–II					

Preamble:
This course is an extension of power systems–I course. It deals with basic theory of transmission lines modeling and their performance analysis. Transients in power system and effects of corona are discussed in detail. It is important for the student to understand the mechanical design aspects of transmission lines, insulators. These aspects are also covered in detail in this course.

Course Objectives:
- To understand the concepts of GMD/GMR and to compute inductance/capacitance of transmission lines.
- To distinguish the short and medium length transmission lines, their models and performance.
- To understand the performance and modeling of long transmission lines.
- To learn the effect of travelling waves on transmission lines.
- To learn the concepts of corona and the factors effecting corona..
- To understand sag and tension computation of transmission lines as well as to learn the performance of overhead insulators.

UNIT–I
Transmission Line Parameters
Conductor materials – Types of conductors – Calculation of resistance for solid conductors – Skin and Proximity effects – Calculation of inductance for Single-phase and Three-phase– Single and double circuit lines– Concept of GMR and GMD–Symmetrical and asymmetrical conductor configuration with and without transposition–Bundled conductors – Calculation of capacitance for 2 wire and 3 wire systems – Effect of ground on capacitance – Capacitance calculations for symmetrical and asymmetrical single and Three-phase–Single and double circuit lines without and with Bundled conductors.

UNIT–II
Performance Analysis of Transmission Lines
Classification of Transmission Lines – Short, medium, long lines and their model representation – Nominal-T, Nominal-Pie and A, B, C, D Constants for symmetrical and Asymmetrical Networks.
Rigorous Solution for long line equations –Representation of Long lines – Equivalent T and Equivalent Pie network models - Surge Impedance and Surge Impedance Loading (SIL) of Long Lines - Regulation and efficiency for all types of lines – Ferranti effect.

UNIT – III
Power System Transients
Types of System Transients – Propagation of Surges – Attenuation–Distortion– Reflection and Refraction Coefficients.

Termination of lines with different types of conditions – Open Circuited Line–Short Circuited Line – T-Junction – Lumped Reactive Junctions.

UNIT–IV
Corona
Description of the phenomenon – Types of Corona - critical voltages and power loss – Advantages and Disadvantages of Corona - Factors affecting corona - Radio Interference.

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UNIT–V

Sag and Tension Calculations and Overhead Line Insulators:

Sag and Tension calculations with equal and unequal heights of towers–Effect of Wind and Ice on weight of Conductor – Stringing chart and sag template and its applications

Types of Insulators – String efficiency and Methods for improvement - Voltage distribution–Calculation of string efficiency – Capacitance grading and Static Shielding.

Course Outcomes:

After the completion of the course the student should be able to:

- Calculate parameters of transmission lines for different circuit configurations.
- Determine the performance of short, medium and long transmission lines.
- Analyse the effect of travelling waves on transmission lines.
- Analyse the various voltage control methods and effect of corona.
- Calculate sag/tension of transmission lines and performance of line insulators.

Text Books:

1. Electrical Power Systems – by C.L.Wadhwa, New Age International (P) Limited, 1998.
2. Power System Engineering by I.J.Nagarath and D.P.Kothari, Tata McGraw Hill, 3rd Edition.

Reference Books:

1. Power system Analysis–by John J Grainger William D Stevenson, TMC Companies, 4th edition
2. Power System Analysis and Design by B.R.Gupta, Wheeler Publishing.
3. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar A.Chakrabarthy, DhanpatRai Co Pvt. Ltd.2016
4. Electrical Power Systems by P.S.R. Murthy, B.S. Publications, 2017.

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III Year – I SEMESTER		L	T	P	C
		3	0	0	3
POWER ELECTRONICS					

Preamble:
The usage of power electronics in day to day life has increased in recent years. It is important for student to understand the fundamental principles behind all power electronic converters. This course covers characteristics of semiconductor devices and operation of ac/dc, dc/dc, ac/ac and dc/ac converters. The importance of using pulse width modulated techniques to obtain high quality power supply (dc/ac converter) is also discussed in detail in this course.

Course Objectives:
- To know the characteristics of various power semiconductor devices.
- To learn the operation of single phase full–wave converters and perform harmonic analysis of input current.
- To learn the operation of three phase full–wave converters and AC/AC converters.
- To learn the operation of different types of DC-DC converters.
- To learn the operation of PWM inverters for voltage control and harmonic mitigation.

UNIT – I
Power Semi-Conductor Devices
Silicon controlled rectifier (SCR) – Two transistor analogy - Static and Dynamic characteristics – Turn on and Turn off Methods - Triggering Methods (R, RC and UJT) – Snubber circuit design.
Static and Dynamic Characteristics of Power MOSFET and Power IGBT– Gate Driver Circuits for Power MOSFET and IGBT - Numerical problems.

UNIT – II
Single-phase AC-DC Converters
Single-phase half-wave controlled rectifiers - R and RL loads with and without freewheeling diode - Single-phase fully controlled mid-point and bridge converter with R load, RL load and RLE load - Continuous and Discontinuous conduction - Effect of source inductance in Single-phase fully controlled bridge rectifier – Expression for output voltages – Single-phase Semi-Converter with R load-RL load and RLE load – Continuous and Discontinuous conduction - Harmonic Analysis – Dual converter and its mode of operation - Numerical Problems.

UNIT – III
Three-phase AC-DC Converters & AC – AC Converters
Three-phase half-wave Rectifier with R and RL load - Three-phase fully controlled rectifier with R and RL load - Three-phase semi converter with R and RL load - Expression for Output Voltage - Harmonic Analysis - Three-phase Dual Converters - Numerical Problems.
Single-phase AC-AC power control by phase control with R and RL loads - Expression for rms output voltage – Single-phase step down and step up Cycloconverter - Numerical Problems.

UNIT – IV
DC–DC Converters
Operation of Basic Chopper – Analysis of Buck, Boost and Buck-Boost converters in Continuous Conduction Mode (CCM) and Discontinuous Conduction Modes (DCM) - Output voltage equations using volt-sec balance in CCM & DCM – Expressions for output voltage ripple and inductor current ripple – control techniques – Introduction to PWM control -Numerical Problems.

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UNIT – V

DC–AC Converters

Introduction - Single-phase half-bridge and full-bridge inverters with R and RL loads – Phase Displacement Control – PWM with bipolar voltage switching, PWM with unipolar voltage switching - Three-phase square wave inverters - 120^0 conduction and 180^0 conduction modes of operation - Sinusoidal Pulse Width Modulation - Current Source Inverter (CSI) - Numerical Problems.

Course Outcomes:

After the completion of the course the student should be able to:

- Illustrate the static and dynamic characteristics of SCR, Power-MOSFET and Power-IGBT.
- Analyse the operation of phase-controlled rectifiers.
- Analyse the operation of three-phase full–wave converters, AC Voltage Controllers and Cycloconverters.
- Examine the operation and design of different types of DC-DC converters.
- Analyse the operation of PWM inverters for voltage control and harmonic mitigation.

Text Books:

1. Power Electronics: Converters, Applications and Design by Ned Mohan, Tore M Undeland, William P Robbins, John Wiley & Sons.
2. Power Electronics: Circuits, Devices and Applications – by M. H. Rashid, Prentice Hall of India, 2nd edition, 1998
3. Power Electronics: Essentials & Applications by L.Umanand, Wiley, Pvt. Limited, India, 2009.

Reference Books:

1. Elements of Power Electronics–Philip T.Krein. Oxford University Press; Second edition
2. Power Electronics – by P.S.Bhimbra, Khanna Publishers.
3. Thyristorised Power Controllers – by G. K. Dubey, S. R. Doradla, A. Joshi and R. M. K.Sinha, New Age International (P) Limited Publishers, 1996.
4. Power Electronics: by Daniel W.Hart, Mc Graw Hill.

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III Year – I SEMESTER		L	T	P	C
		3	0	0	3
CONTROL SYSTEMS					

Preamble:
This course covers mathematical modeling, time response, frequency response, stability analysis of Linear Time Invariant (LTI) control systems and their analysis. State space analysis of LTI systems and design of compensator using Bode diagrams is also discussed in this course.

Course Objectives:
- To learn the mathematical modeling of physical systems and to use block diagram algebra and signal flow graph to determine overall transfer function
- To analyze the time response of first and second order systems and improvement of performance using PI, PD, PID controllers. To investigate the stability of closed loop systems using Routh's stability criterion and root locus method.
- To understand basic aspects of design and compensation of LTI systems using Bode diagrams.
- To learn Frequency Response approaches for the analysis of LTI systems using Bode plots, polar plots and Nyquist stability criterion.
- To learn state space approach for analysis of LTI systems and understand the concepts of controllability and observability.

UNIT – I
Mathematical Modelling of Control Systems
Classification of control systems - open loop and closed loop control systems and their differences - Feedback characteristics - transfer function of linear system, differential equations of electrical networks- translational and rotational mechanical systems - transfer function of Armature voltage controlled DC servo motor - block diagram algebra - signal flow graph – reduction using Mason's gain formula.

UNIT-II
Time Response Analysis and Controllers
Standard test signals – time response of first and second order systems – time domain specifications - steady state errors and error constants - effects of proportional (P) - proportional integral (PI) - proportional derivative (PD) - proportional integral derivative (PID) systems.
Stability Assessment Techniques
The concept of stability – Routh's stability criterion – limitations of Routh's stability, root locus concept – construction of root loci (simple problems) - Effect of addition of Poles and Zeros to the transfer function.

UNIT–III
Frequency Response Analysis
Introduction to frequency domain specifications – Bode diagrams – transfer function from the Bode diagram –Polar plots, Nyquist stability criterion- stability analysis using Bode plots (phase margin and gain margin).

UNIT–IV
Classical Control Design Techniques
Lag, lead, lag-lead compensators - physical realisation - design of compensators using Bode plots.

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UNIT–V

State Space Analysis of Linear Time Invariant (LTI) Systems

Concepts of state - state variables and state model - state space representation of transfer function - diagonalization using linear transformation - solving the time invariant state equations - State Transition Matrix and its properties- concepts of controllability and observability.

Course Outcome:

After the completion of the course the student should be able to:

- Derive the transfer function of physical systems and determination of overall transfer function using block diagram algebra and signal flow graphs.
- Determine time response specifications of second order systems and absolute and relative stability of LTI systems using Routh's stability criterion and root locus method.
- Analyze the stability of LTI systems using frequency response methods.
- Design Lag, Lead, Lag-Lead compensators to improve system performance using Bode diagrams.
- Represent physical systems as state models and determine the response. Understand the concepts of controllability and observability.

Text Books:

1. Modern Control Engineering by Kotsuhiko Ogata, Prentice Hall of India
2. Automatic control systems by Benjamin C.Kuo, Prentice Hall of India, 2nd Edition.

Reference Books:

1. Control Systems principles and design by M.Gopal, Tata Mc Graw Hill education Pvt Ltd., 4th Edition.
2. Control Systems Engineering by Norman S. Nise, Wiley Publications, 7th edition
3. Control Systems by Manik Dhanesh N, Cengage publications.
4. Control Systems Engineering by I.J.Nagarath and M.Gopal, Newage International Publications, 5th Edition.

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III Year –I SEMESTER		L	T	P	C
		3	0	0	3

RENEWABLE ENERGY SOURCES
(OPEN ELECTIVE-I)

Preamble:
This course presents the various sources of renewable energy such as solar, wind, geothermal energy, biomass & other potential energy and contribution towards energy profile of the nation.

Course Objectives:
- To study the solar radiation data, equivalent circuit of PV cell and its I-V & P-V characteristics.
- To understand the concept of Wind Energy Conversion & its applications.
- To study the principles of biomass and geothermal energy.
- To understand the principles of Ocean Thermal Energy Conversion (OTEC), motion of waves and power associated with it.
- To study the various chemical energy sources such as fuell cell and hydrogen energy along with their operation and equivalent circuit.

UNIT–I
Solar Energy: Introduction - Renewable Sources - prospects, Solar radiation at the Earth Surface - Equivalent circuit of a Photovoltaic (PV) Cell - I-V & P-V Characteristics - Solar Energy Collectors: Flat plate Collectors, concentrating collectors - Solar Energy storage systems and Applications: Solar Pond - Solar water heating - Solar Green house.

UNIT–II
Wind Energy: Introduction - basic Principles of Wind Energy Conversion, the nature of Wind - the power in the wind - Wind Energy Conversion - Site selection considerations - basic components of Wind Energy Conversion Systems (WECS) - Classification - Applications.

UNIT–III
Biomass and Geothermal Energy:
Biomass: Introduction - Biomass conversion technologies - Photosynthesis, factors affecting Bio digestion - classification of biogas plants - Types of biogas plants - selection of site for a biogas plant
Geothermal Energy: Introduction, Geothermal Sources – Applications - operational and Environmental problems.

UNIT–IV
Energy From oceans, Waves & Tides:
Oceans: Introduction - Ocean Thermal Electric Conversion (OTEC) – methods - prospects of OTEC in India.
Waves: Introduction - Energy and Power from the waves - Wave Energy conversion devices.
Tides: Basic principle of Tide Energy -Components of Tidal Energy.

UNIT–V
Chemical Energy Sources:
Fuel Cells: Introduction - Fuel Cell Equivalent Circuit - operation of Fuel cell - types of Fuel Cells - Applications.
Hydrogen Energy: Introduction - Methods of Hydrogen production - Storage and Applications
Magneto Hydro Dynamic (MHD) Power generation: Principle of Operation - Types.

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Course Outcomes:

After the completion of the course the student should be able to:

- Analyze solar radiation data, extra-terrestrial radiation, radiation on earth's surface and solar Energy Storage.
- Illustrate the components of wind energy systems.
- Illustrate the working of biomass, digesters and Geothermal plants.
- Demonstrate the principle of Energy production from OTEC, Tidal and Waves.
- Evaluate the concept and working of Fuel cells & MHD power generation.

Text Books:

1. G.D.Rai, Non-Conventional Energy Sources, Khanna Publications, 2011.
2. John Twidell & Tony Weir, Renewable Energy Sources, Taylor & Francis, 2013.

Reference Books:

1. S.P.Sukhatme & J.K.Nayak, Solar Energy-Principles of Thermal Collection and Storage, TMH, 2011.
2. John Andrews & Nick Jelly, Energy Science- principles, Technologies and Impacts, Oxford, 2nd edition, 2013.
3. Shoba Nath Singh, Non- Conventional Energy Resources, Pearson Publications, 2015.

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III Year – I SEMESTER		L	T	P	C
		3	0	0	3

CONCEPTS OF OPTIMIZATION TECHNIQUES
(OPEN ELECTIVE-I)

Preamble:

The applications of optimization techniques have expanded in all fields including design aspects of electrical machines. It is pertinent to link these concepts with that of programming skills. This course covers basic features of linear & nonlinear programming problems. Concept of dynamic programming and transportation problem are also taught.

Course Objectives:

- To know the importance of adopting optimization techniques in day to day life.
- To analyse the importance of various types of constraints at various stages.
- To learn more on linear & nonlinear programming concepts.
- To analyse the significance of transportation problem.
- To learn the concepts of dynamic programming.

UNIT – I
Introduction to Optimization Techniques
Statement of an Optimization problem – design vector – design constraints – objective function – classification of Optimization problems.
Classical Optimization Techniques
Single variable Optimization – multi variable Optimization without constraints – necessary and sufficient conditions for minimum/maximum – multivariable Optimization with equality constraints. Solution by method of Lagrange multipliers.

UNIT – II
Linear Programming
Standard form of a linear programming problem – geometry of linear programming problems – definitions and theorems – solution of a system of linear simultaneous equations – pivotal reduction of a general system of equations – motivation to the simplex method – simplex algorithm.

UNIT – III
Nonlinear Programming
Unconstrained cases - One – dimensional minimization methods: Classification - Fibonacci method and Quadratic interpolation method - Univariate method - Powell's method.
Constrained cases - Characteristics of a constrained problem - Classification - Basic approach of Penalty Function method.

UNIT – IV
Transportation Problem
Finding initial basic feasible solution by north – west corner rule - least cost method and Vogel's approximation method – testing for optimality of balanced transportation problems – Special cases in transportation problem.

UNIT – V
Dynamic Programming
Dynamic programming - Multistage decision processes – types – concept of sub optimization and the principle of optimality – computational procedure in dynamic programming – examples illustrating the calculus method of solution.

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Course Outcomes:

After the completion of the course the student should be able to:

- State and formulate the optimization problem without and with constraints, also apply classical optimization techniques to minimize or maximize a multi-variable objective function, without or with constraints and arrive at an optimal solution.
- Formulate a mathematical model and apply linear programming technique by using Simplex method. Also extend the concept of dual Simplex method for optimal solutions.
- Formulate a mathematical model and apply non-linear programming techniques for unconstrained and constrained case studies.
- Solve transportation and assignment problem by using Linear programming Simplex method.
- Formulate and apply Dynamic programming technique to inventory control, production planning, engineering design problems etc. to reach a final optimal solution from the current optimal solution.

Text Books:

1. "Engineering optimization: Theory and practice"-by S. S.Rao- New Age International (P) Limited - 3rd edition - 1998.
2. "Introductory Operations Research" by H.S. Kasene& K.D. Kumar - Springer (India) 2013.

Reference Books:

1. "Optimization Methods in Operations Research and systems Analysis" – by K.V. Mital and C. Mohan - New Age International (P) Limited - Publishers - 3rd edition - 1996.
2. Operations Research – by Dr. S.D.Sharma- Kedarnath - Ramnath& Co - 2012.
3. "Operations Research: An Introduction" – by H.A.Taha - PHI pvt. Ltd. - 6th edition
4. Linear Programming–by G.Hadley.

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III Year – I SEMESTER		L	T	P	C
		3	0	0	3
CONCEPTS OF CONTROL SYSTEMS (OPEN ELECTIVE-I)					

Preamble:
This course covers mathematical modeling, time response, frequency response, stability analysis of Linear Time Invariant (LTI) control systems and their analysis. State space analysis of LTI systems and design of compensator using Bode diagrams is also discussed in this course.

Course Objectives:
- To learn the mathematical modeling of physical systems and to use block diagram algebra and signal flow graph to determine overall transfer function
- To analyze the time response of first and second order systems and improvement of performance using PI, PD, PID controllers.
- To investigate the stability of closed loop systems using Routh's stability criterion and root locus method.
- To learn Frequency Response approaches for the analysis of LTI systems using Bode plots, polar plots and Nyquist stability criterion.
- To learn state space approach for analysis of LTI systems and understand the concepts of controllability and observability.

UNIT – I
Mathematical Modelling of Control Systems
Classification of control systems - open loop and closed loop control systems and their differences - transfer function of linear system - differential equations of electrical networks - translational and rotational mechanical systems – block diagram algebra – Feedback characteristics.

UNIT-II
Time Response Analysis
Standard test signals – time response of first and second order systems – time domain specifications - steady state errors and error constants - P - PI & PID Controllers.

UNIT–III
Stability and Root Locus Technique
The concept of stability – Routh-Hurwitz Criteria – limitations of Routh-Hurwitz criterion-.Root locus concept – construction of root loci (simple problems).

UNIT–IV
Frequency Response Analysis
Introduction to frequency domain specifications – Bode diagrams – Transfer function from the Bode diagram – phase margin and gain margin.

UNIT–V
State Space Analysis of Linear Time Invariant (LTI) Systems
Concepts of state - state variables and state model - state space representation of transfer function - State Transition Matrix and it's properties - concepts of controllability and observability.

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Course Outcomes:

After the completion of the course the student should be able to:

- Derive the transfer function of physical systems and determination of overall transfer function using block diagram algebra and signal flow graphs.
- Determine time response specifications of second order systems and to determine error constants.
- Analyze absolute and relative stability of LTI systems using Routh's stability criterion and the root locus method.
- Analyze the stability of LTI systems using frequency response methods.
- Represent physical systems as state models and determine the response. Understanding the concepts of controllability and observability.

Text Books:

1. Modern Control Engineering by Kotsuhiko Ogata - Prentice Hall of India.
2. Automatic control systems by Benjamin C.Kuo - Prentice Hall of India - 2nd Edition.

Reference Books:

1. Control Systems principles and design by M.Gopal - Tata Mc Graw Hill education Pvt Ltd. - 4th Edition.
2. Control Systems by Manik Dhanesh N - Cengage publications.
3. Control Systems Engineering by I.J.Nagarath and M.Gopal - Newage International Publications - 5th Edition.
4. Control Systems Engineering by S.Palani - Tata Mc Graw Hill Publications.

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III Year – I SEMESTER		L	T	P	C
		3	0	0	3
LINEAR IC APPLICATIONS (PROFESSIONAL ELECTIVE – I)					

Unit – I

OP-Amp Block Diagram (Symbolic Representation), Characteristics of Op-Amp, Ideal and Practical Op-Amp specifications, DC and AC Characteristics, Definitions of Input and Output Off-set voltage and currents slow rate, CMRR, PSRR. Measurements of Op-Amp Parameters, Three-Terminal Voltage Regulators 78xx& 79xx Series, current Booster, adjustable voltage, DualPowerSupplywith78xx&79xx

Unit – II

OP-AMPS Applications: Introduction, Basic Op-Amp Applications, Instrumentation Amplifier, AC Amplifier, V to I and I to V Converter, Sample and Hold Circuit, Log and Antilog Amplifier, Multiplier and Divider, Differentiator, integrator.

Comparators and Waveform Generators: Introduction, Comparator, Square Wave Generator, Monostable Multivibrator, Triangular Wave Generator, Sine Wave Generators.

Unit – III

Active Filters:

Design & Analysis of Butterworth active filters – 1st order, 2nd order LPF, HPF filters. Band pass, Band reject and all pass filters.

Unit – IV

Timers: Introduction to 555 timer, functional diagram, Monostable and Astable operations and applications, Schmitt Trigger.

Phase Locked Loops: Introduction, block schematic, principles and description of individual blocks, 565 PLL, Applications of PLL – frequency multiplication, frequency translation, AM, FM & FSK demodulators. Applications of VCO (566)

Unit – V

Digital To Analog And Analog To Digital Converters: Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, A-D Converters – parallel Comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC.DAC and ADC Specifications.

Course Outcomes:

At the end of the course, student will be able to:

- Describe the Op-Amp and internal Circuitry: 555 Timer, PLL
- Discuss the Applications of Operational amplifier: 555 Timer, PLL
- Design the Active filters using Operational Amplifier
- Use the Op-Amp in A to D & D to A Converters

Text Books:

1. Linear Integrated Circuits – D. Roy Choudhury, New Age International (p) Ltd, 2nd Edition 2003.
2. Operational Amplifiers & Linear Integrated Circuits –Sanjay Sharma; SK Kataria & Sons; 2nd Edition, 2010

References:

1. Op-Amps & Linear ICs - Ramakanth A. Gayakwad, PHI, 1993.
2. Operational Amplifiers & Linear ICs – David A Bell, Oxford Uni. Press, 3rd Edition.

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III Year –I SEMESTER		L	T	P	C
		3	0	0	3

UTILIZATION OF ELECTRICAL ENERGY
(PROFESSIONAL ELECTIVE – I)

Preamble:
This course primarily deals with utilization of electrical energy generated from various sources. It is important to understand the technical reasons behind selection of motors for electric drives based on the characteristics of loads. Electric heating, welding and illumination are some important loads in the industry in addition to motor/drives. Another major share of loads is taken by Electric Traction. Utilization of electrical energy in all the above loads is discussed in detail in this course. Energy Storage Systems concepts are also introduced as a part of this course.

Course Objectives:
- To study the basic principles of illumination and its measurements and to design the different types lighting systems.
- To acquaint with the different types of heating and welding techniques.
- To understand the operating principles and characteristics of various motors with respect to speed, temperature and loading conditions.
- To understand the basic principles of electric traction including speed–time curves of different traction services and calculation of braking, acceleration and other related parameters.
- To Introduce the concepts of various types of energy storage systems.

UNIT – I
Illumination fundamentals
Introduction - terms used in illumination–Laws of illumination–Polar curves–Integrating sphere–Lux meter–Sources of light.
Various Illumination Methods
Discharge lamps - MV and SV lamps – Comparison between tungsten filament lamps and fluorescent tubes–Basic principles of light control– Types and design of lighting and flood lighting–LED lighting - Energy conservation.

UNIT – II
Selection of Motors
Choice of Motor - Type of Electric Drives - Starting And Running Characteristics – Speed Control–Temperature Rise – Applications of Electric Drives–Types of Industrial Loads–Continuous–Intermittent And Variable Loads–Load Equalization - Introduction To Energy Efficient Motors.

UNIT – III
Electric Heating
Advantages and methods of electric heating–Resistance heating induction heating and dielectric heating.

Electric Welding
Electric welding–Resistance and arc welding–Electric welding equipment–Comparison between AC and DC Welding.

UNIT – IV
Electric Traction
System of electric traction and track electrification– Review of existing electric traction systems in India–Special features of traction motor– Mechanics of train movement–Speed–time curves for different services – Trapezoidal and quadrilateral speed time curves. Calculations of tractive effort– power – Specific energy consumption for given run–Effect of varying acceleration and braking retardation–

Adhesive weight and braking retardation adhesive weight and coefficient of adhesion-Numerical problems.

UNIT – V

Introduction to Energy Storage Systems

Need For Energy Storage - Types of Energy Storage-Thermal - Electrical - Magnetic And Chemical Storage Systems - Comparison of Energy Storage Technologies-Applications.

Course Outcomes:

After the completion of the course the student should be able to:

- Identify various illumination methods produced by different illuminating sources.
- Identify a suitable motor for electric drives and industrial applications
- Identify most appropriate heating and welding techniques for suitable applications.
- Distinguish various traction system and determine the tractive effort and specific energy consumption.
- Validate the necessity and usage of different energy storage schemes for different applications and comparisons.

Text Books:

1. Utilization of Electric Energy – by E. Openshaw Taylor - Orient Longman.
2. Art & Science of Utilization of electrical Energy – by Partab - Dhanpat Rai& Sons.
3. “Thermal energy storage systems and applications”-by Ibrahim Dincer and Mark A.Rosen. John Wiley and Sons 2002.

Reference Books:

1. Utilization of Electrical Power including Electric drives and Electric traction – by N.V.Suryanarayana - New Age International (P) Limited - Publishers - 1996.
2. Generation - Distribution and Utilization of electrical Energy – by C.L. Wadhwa - New Age International (P) Limited - Publishers - 1997.

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III Year – I SEMESTER		L	T	P	C
		3	0	0	3

COMPUTER ARCHITECTURE AND ORGANIZATION
(PROFESSIONAL ELECTIVE – I)

Preamble:
This course aims to give an overall idea about the architecture and working of a computer. This course covers various operations of a computers and discusses the memory organization of a digital computer. This course will be very useful to the students to improve their computer programming skills and to find job opportunities in hardware/software industry.

Course Objectives:
- To explain the basic working of a digital computer.
- To understand the register transfer language and micro operators.
- To learn various addressing modes supported by the processors.
- To be familiar with peripheral interfacing with processors.
- To understand memory hierarchy in computers.

UNIT-I
Basic Computer Organization and Design: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input- Output and Interrupt, Complete Computer Description, Design of Basic Computer, Design of Accumulator Logic.

UNIT-II
Register Transfer and Micro operations: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations, Arithmetic Logic Shift Unit. Micro programmed Control: Control Memory, Address Sequencing, Micro program Example, Design of Control Unit.

UNIT-III
Central Processing Unit: Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer(RISC) Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISK Pipeline, Vector Processing, Array Processors.

UNIT-IV
Input/output Organization: Peripheral Devices, I/O interface, Asynchronous data transfer, Modes of transfer, priority Interrupt, Direct memory access, Input-Output Processor (IOP), Serial Communication.

UNIT-V
Memory Organization: Memory Hierarchy, Main memory, Auxiliary memory, Associate Memory, Cache Memory, and Virtual memory, Memory Management Hardware.

Course Outcomes:
At the end of this course, student will be able to:
- Explain the instruction cycle of a computer.
- Understand various micro operations and register transfer language.
- Describe parallel processing and pipelining.
- Interface different peripherals with processors.
- Know the advantages of cache and virtual memory.

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Text Books:

1. Computer System Architecture, M. Morris Mano, Prentice Hall of India Pvt. Ltd., 3rd Edition, Sept. 2008.

References Books:

1. Computer Architecture and Organization, William Stallings, PHI Pvt. Ltd., Eastern Economy Edition, Sixth Edition, 2003.
2. Computer Organization and Architecture, Linda Null, Julia Lobur, Narosa Publications ISBN 81-7319-609-5
3. Computer System Organization by John. P. Hayes.

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III Year – I SEMESTER		L	T	P	C
		3	0	0	3

OPTIMIZATION TECHNIQUES
(PROFESSIONAL ELECTIVE – I)

Preamble:

The applications of optimization techniques have expanded in all fields including design aspects of electrical machines. It is pertinent to link these concepts with that of programming skills. This course covers basic features of linear & nonlinear programming problems. Concept of dynamic programming and transportation problem are also taught.

Course Objectives:

- To know the importance of adopting optimization techniques in day to day life.
- To analyse the importance of various types of constraints at various stages.
- To learn more on linear & nonlinear programming concepts.
- To analyse the significance of transportation problem.
- To learn the concepts of dynamic programming.

UNIT – I

Introduction to Optimization Techniques

Statement of an Optimization problem – design vector – design constraints – constraint surface – objective function – objective function surfaces – classification of Optimization problems.

Classical Optimization Techniques

Single variable Optimization – multi variable Optimization without constraints – necessary and sufficient conditions for minimum/maximum – multivariable Optimization with equality constraints.Solution by method of Lagrange multipliers – multivariable Optimization with inequality constraints – Kuhn – Tucker conditions.

UNIT – II

Linear Programming

Standard form of a linear programming problem – geometry of linear programming problems – definitions and theorems – solution of a system of linear simultaneous equations – pivotal reduction of a general system of equations – motivation to the simplex method – simplex algorithm - Duality in Linear Programming – Dual Simplex method.

UNIT – III

Nonlinear Programming

Unconstrained cases - One – dimensional minimization methods: Classification - Fibonacci method and Quadratic interpolation method - Univariate method - Powell's method and steepest descent method.

Constrained cases - Characteristics of a constrained problem - Classification - Basic approach of Penalty Function method; Basic approaches of Interior and Exterior penalty function methods.

UNIT – IV

Transportation Problem

Finding initial basic feasible solution by north – west corner rule - least cost method and Vogel's approximation method – testing for optimality of balanced transportation problems – Special cases in transportation problem.



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UNIT - V

Dynamic Programming

Dynamic programming multistage decision processes – types – concept of sub optimization and the principle of optimality – computational procedure in dynamic programming – examples illustrating the calculus method of solution - examples illustrating the tabular method of solution.

Course Outcomes:

After the completion of the course the student should be able to:

- State and formulate the optimization problem without and with constraints, also apply classical optimization techniques to minimize or maximize a multi-variable objective function, without or with constraints and arrive at an optimal solution.
- Formulate a mathematical model and apply linear programming technique by using Simplex method. Also extend the concept of dual Simplex method for optimal solutions.
- Formulate a mathematical model and apply non-linear programming techniques for unconstrained and constrained case studies.
- Solve transportation and assignment problem by using Linear programming Simplex method.
- Formulate and apply Dynamic programming technique to inventory control, production planning, engineering design problems etc. to reach a final optimal solution from the current optimal solution.

Text Books:

2. "Engineering optimization: Theory and practice"-by S. S.Rao- New Age International (P) Limited - 3rd edition - 1998.
1. "Introductory Operations Research" by H.S. Kasene& K.D. Kumar - Springer (India) 2013.

Reference Books:

1. "Optimization Methods in Operations Research and systems Analysis" – by K.V. Mital and C. Mohan - New Age International (P) Limited - Publishers - 3rd edition - 1996.
3. Operations Research – by Dr. S.D.Sharma- Kedarnath - Ramnath& Co - 2012.
3. "Operations Research: An Introduction" – by H.A.Taha - PHI pvt. Ltd. - 6th edition
4. Linear Programming–by G.Hadley.

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III Year – I SEMESTER		L	T	P	C
		3	0	0	3
OBJECT ORIENTED PROGRAMMING THROUGH JAVA (PROFESSIONAL ELECTIVE – I)					

Course Objective: Implementing programs for user interface and application development using core java principles

UNIT-I
Focus on object oriented concepts and java program structure and its installation, Introduction to OOP Introduction, Need of Object Oriented Programming, Principles of Object Oriented Languages, Procedural languages Vs OOP, Applications of OOP, History of JAVA, Java Virtual Machine, Java Features.

UNIT-II
Comprehension of java programming constructs, control structures in Java Programming Constructs Variables , Primitive Datatypes, Identifiers- Naming Conventions, Keywords, Literals, Operators-Binary, Unary and ternary, Expressions, Precedence rules and Associativity, Primitive Type Conversion and Casting, Flow of control Branching, Conditional, loops.,

UNIT-III
Classes and Objects- classes, Objects, Creating Objects, Methods, constructors, Constructor overloading, cleaning up unused objects-Garbage collector, Class variable and Methods-Static keyword, this keyword, Arrays, Command line arguments **Interfaces and exception handling Inheritance:** Types of Inheritance, Deriving classes using extends keyword, Method overloading, super keyword, final keyword, Abstract class Interfaces,

UNIT-IV
Understanding of Thread concepts and I/O in Java MultiThreading: java.lang.Thread, The main Thread, Creation of new threads, Thread priority, Multithreading- Using isAlive() and join(), Syncronization, suspending and Resuming threads, Communication between Threads.

UNIT-V
Being able to build dynamic user interfaces using applets and Event handling in java Swing: Introduction, javax.swing package , JFrame, JApplet, JPanel, Components in swings, Layout Managers, JList and JScroll Pane, Split Pane, JTabbedPane, Dialog Box.

Course Outcomes: By the end of the course student will be able to

- Discuss and understand java programming constructs, Control structures
- Illustrate and experiment Object Oriented Concepts like classes, objects
- Apply Object Oriented Constructs such as Inheritance, interfaces, and exception handling
- Construct applications using multithreading and I/O
- Develop Dynamic User Interfaces using applets and Event Handling in java

Text Books:

1. The Complete Refernce Java, 8ed, Herbert Schildt, TMH
4. Programming in JAVA, Sachin Malhotra, Saurabh choudhary, Oxford.

Reference Books:

1. JAVA Programming, K.Rajkumar.Pearson
2. Core JAVA, Black Book, Nageswara Rao, Wiley, Dream Tech
3. JAVA for Beginners, 4e, Joyce Farrell, Ankit R. Bhavsar, Cengage Learning.
4. Object oriented programming with JAVA, Essentials and Applications, Raj Kumar Bhuyya, Selvi, Chu TMH
5. Introduction to Java programming, 7th ed, Y Daniel Liang, Pearson Core JAVA for Beginners, Rashmi Kanta Das, Vikas.
6. Object Oriented Programming through JAVA , P Radha Krishna , University Press

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III Year – I SEMESTER		L	T	P	C
		0	0	3	1.5
CONTROL SYSTEMS LABORATORY					

Course Objectives:

- To impart hands on experience to understand the performance of basic control system components such as magnetic amplifiers, D.C. servo motors, A.C. Servo motors and Synchros.
- To understand time and frequency responses of control system with and without controllers and compensators.

Any 10 of the following experiments are to be conducted:

1. Time response of Second order system
2. Characteristics of Synchros
3. Effect of P, PD, PI, PID Controller on a second order systems
4. Design of Lag and lead compensation – Magnitude and phase plot
5. Transfer function of DC motor
6. Bode Plot, Root locus, Nyquist Plots for the transfer functions of systems up to 5^{th} order using MATLAB.
7. Controllability and Observability Test using MAT LAB.
8. Temperature controller using PID
9. Characteristics of magnetic amplifiers
10. Characteristics of AC servo motor
11. Characteristics of DC servo motor
12. To study and verify the truth table of logic gates and simple Boolean expressions using PLC.

Course Outcomes:

After the completion of the course the student should be able to:

- Analyze the performance and working Magnetic amplifier, D.C and A.C. servo motors and synchros.
- Design P,PI,PD and PID controllers
- Design lag, lead and lag–lead compensators
- Evaluate temperature control of an oven using PID controller
- Determine the transfer function of D.C Motor
- Analyze the performance of D.C and A.C Servo Motor.
- Test the controllability and observability.
- Judge the stability in time and frequency domain.
- To examine different logic gates and Boolean expressions using PLC.

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III Year –I SEMESTER		L	T	P	C
		0	0	3	1.5
POWER ELECTRONICS LABORATORY					

Course objectives:

- To learn the characteristics of various power electronic devices and analyze firing circuits and commutation circuits of SCR.
- To analyze the performance of single–phase and three–phase full–wave bridge converters with both resistive and inductive loads.
- To understand the operation of AC voltage regulator with resistive and inductive loads.
- To understand the working of Buck converter and Boost converter.
- To understand the working of single-phase & three-phase inverters.

Any 10 of the Following Experiments are to be conducted

1. Characteristics of SCR - Power MOSFET & Power IGBT.
2. R - RC & UJT firing circuits for SCR.
3. Single -Phase semi-converter with R & RL loads.
4. Single -Phase full-converter with R & RL loads.
5. Three- Phase full-converter with R & RL loads.
6. Single-phase dual converter in circulating current & non circulating current mode of operation.
7. Single-Phase AC Voltage Regulator with R & RL Loads.
8. Single-phase step down Cycloconverter with R & RL Loads.
9. Boost converter in Continuous Conduction Mode operation.
10. Buck converter in Continuous Conduction Mode operation.
11. Single -Phase square wave bridge inverter with R & RL Loads.
12. Single - Phase PWM inverter.
13. Three-phase bridge inverter with 120^0 and 180^0 conduction mode
14. SPWM control of Three-phase bridge inverter

Course outcomes:

After the completion of the course the student should be able to:

- Analyse characteristics of various power electronic devices and design firing circuits for SCR.
- Analyse the performance of single–phase dual, three–phase full–wave bridge converters and dual converter with both resistive and inductive loads.
- Examine the operation of Single-phase AC voltage regulator and Cycloconverter with resistive and inductive loads.
- Differentiate the working and control of Buck converter and Boost converter.
- Differentiate the working & control of Square wave inverter and PWM inverter.

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III Year –I SEMESTER		L	T	P	C
		2	0	0	2

SOFT SKILL COURSE
EMPLOYABILITY SKILLS

Preamble: The aim of this course is to enhance learner's knowledge of both soft skills and IT related skills so as to develop attributes that enhances interpersonal communication, earning power and job performance.

Course objectives:

- To enhance the Numerical ability skills such as addition, subtraction, multiplication, division, calculation of percentages, average etc.
- To develop the problem solving skills on time, distance and speed calculations, to improve the basic mathematical skills on arithmetic ability.
- To analyze a candidate's ability to relate a certain given group of items and illustrate it diagrammatically.
- To develop interpersonal skills and adopt good leadership behavior for empowerment of self and others.by managing stress and time effectively.
- To prepare good resume, prepare for interviews and group discussions, and to explore desired career opportunities.

UNIT - I
Numerical ability
Number system, HCF & LCM, Average, Simplification, Problems on numbers Ratio & Proportion, Partnership, Percentages, Profit & Loss

UNIT - II
Arithmetical ability
Problems on ages, Time & Distance, Problems on boats &Steams, Problems on Trains, Time & Work, Pipes & Cistern, Chain Rule.
Allegation, Simple interest and compound interest, Races & Games of skills, Calendar and Clock.

UNIT - III
Logical ability: Permutations and Combination and Probability.
Mensuration: Geometry, Areas, Volumes,
Data interpretation: Tabulation, Bar graphs, Pie charts, line graphs

UNIT - IV
Self-Management Skills
Anger Management, Stress Management, Time Management, Six Thinking Hats, Team Building, Leadership Qualities
Etiquette
Social Etiquette, Business Etiquette, Telephone Etiquette, Dining Etiquette

UNIT - V
Job-Oriented Skills
Group Discussion, Mock Group Discussions, Resume Preparation, Interview Skills, Mock Interviews

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Course outcomes:

After the completion of the course the student should be able to:

- Follow strategies in minimizing time consumption in problem solving Apply shortcut methods to solve problems
- Confidently solve any mathematical problems and utilize these mathematical skills both in their professional as well as personal life.
- Analyze, summarize and present information in quantitative forms including table, graphs and formulas
- Understand the core competencies to succeed in professional and personal life
- Learn and demonstrate a set of practical skills such as time management, self-management, handling conflicts, team leadership, etc.

Text Books:

1. R. S. Aggarwal "Quantitative Aptitude", Revised ed., S Chand publication, 2017 ISBN:8121924987
2. Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011.
3. Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.

Reference Books:

1. S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010.

E-resources and other digital material:

1. https://blog.feedspot.com/aptitude_youtube_channels/
2. https://www.tutorialspoint.com/quantitative_aptitude/
3. https://www.careerbless.com/aptitude/qa/home.php
4. https://www.Indiabix.com
5. https://www.freshersworld.com

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III Year –I SEMESTER		L	T	P	C
		2	0	0	0
ENVIRONMENTAL SCIENCE					

Course Objectives:

The objectives of the course are to impart:

- Overall understanding of the natural resources.
- Basic understanding of the ecosystem and its diversity.
- Acquaintance on various environmental challenges induced due tounplanned anthropogenic activities.
- An understanding of the environmental impact of developmental activities.
- Awareness on the social issues, environmental legislation and global treaties.

UNIT I

Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance – Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects. Role of information technology in environment and human health.

Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem; Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

UNIT II

Natural Resources: Natural resources and associated problems.

Forest resources: Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people.

Water resources: Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems.

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.

Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.

Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.

Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification; Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.

UNIT III

Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity- classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-sports of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts. - Endangered and endemic species of India – Conservation of biodiversity: conservation of biodiversity.

UNIT IV

Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his well being.

Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.

UNIT V

Social Issues and the Environment: Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act - Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Public awareness. Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Green business and Green politics.

The student should Visit an Industry / Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.

Text Books:

1. Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada
2. Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.
3. Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. ManjulaRani; Pearson Education, Chennai

Reference Books:

1. Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, CengageLearning.
2. A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi
3. Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi
4. Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New AgeInternational Publishers, 2014

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III Year –I SEMESTER		L	T	P	C
		0	0	0	1.5
Summer Internship 2 Months (Mandatory) after second year (to be evaluated during V semester					

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III Year – II SEMESTER		L	T	P	C
		3	0	0	3
MICROPROCESSORS AND MICROCONTROLLERS					

Preamble:
Microprocessor and Microcontroller have become important building blocks in digital electronics design. It is important for student to understand the architecture of a microprocessor and its interfacing with various modules. 8086 microprocessor architecture, programming, and interfacing is dealt in detail in this course. Interfacing, PIC, architecture, programming in C.

Course objectives:
- To understand the organization and architecture of Microprocessor
- To understand addressing modes to access memory
- To understand 8051 micro controller architecture
- To understand the programming principles for 8086 and 8051
- To understand the interfacing of Microprocessor with I/O as well as other devices
- To understand how to develop cyber physical systems

UNIT - I
Introduction to Microprocessor Architecture
Introduction and evolution of Microprocessors – Architecture of 8086 – Memory Organization of 8086 – Register Organization of 8086– Introduction to 80286 - 80386 - 80486 and Pentium (brief description about architectural advancements only).

UNIT - II
Minimum and Maximum Mode Operations
Instruction sets of 8086 - Addressing modes – Assembler directives - General bus operation of 8086 – Minimum and Maximum mode operations of 8086 – 8086 Control signal interfacing – Read and write cycle timing diagrams.

UNIT - III
Microprocessors I/O interfacing
8255 PPI– Architecture of 8255–Modes of operation– Interfacing I/O devices to 8086 using 8255– Interfacing A to D converters– Interfacing D to A converters– Stepper motor interfacing– Static memory interfacing with 8086.
Architecture and interfacing of 8251 USART – Architecture and interfacing of DMA controller (8257).

UNIT - IV
8051 Microcontroller
Overview of 8051 Microcontroller – Architecture– Memory Organization – Register set – I/O ports and Interrupts – Timers and Counters – Serial Communication – Interfacing of peripherals- Instruction set.

UNIT - V
PIC Architecture
Block diagram of basic PIC 18 micro controller – registers I/O ports – Programming in C for PIC: Data types - I/O programming - logical operations - data conversion.

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Course Outcomes:

After the completion of the course the student should be able to:

- Know the concepts of the Microprocessor capability in general and explore the evaluation of microprocessors.
- Analyse the instruction sets - addressing modes - minimum and maximum modes operations of 8086 Microprocessors
- Analyse the Microcontroller and interfacing capability
- Describe the architecture and interfacing of 8051 controller
- Know the concepts of PIC micro controller and its programming.

Text Books:

1. Ray and Burchandi - "Advanced Microprocessors and Interfacing" - Tata McGraw–Hill - 3rd edition - 2006.
2. Kenneth J Ayala - "The 8051 Microcontroller Architecture - Programming and Applications" - Thomson Publishers - 2nd Edition.
3. PIC Microcontroller and Embedded Systems using Assembly and C for PIC 18 - -Muhammad Ali Mazidi - RolindD.Mckinay - Danny causey -Pearson Publisher 21st Impression.

Reference Books:

1. Microprocessors and Interfacing - Douglas V Hall - Mc–Graw Hill - 2nd Edition.
2. R.S. Kaler - "A Text book of Microprocessors and Micro Controllers" - I.K. International Publishing House Pvt. Ltd.
3. Ajay V. Deshmukh - "Microcontrollers – Theory and Applications" - Tata McGraw–Hill Companies –2005.
4. Ajit Pal - "Microcontrollers – Principles and Applications" - PHI Learning Pvt Ltd - 2011.

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III Year – II SEMESTER		L	T	P	C
		3	0	0	3
ELECTRICAL MEASUREMENTS AND INSTRUMENTATION					

Preamble:
This course gives an outset on principles of operation and construction of various basic instruments for measurement of different electrical quantities. Familiarization of modern digital measurement systems were also included here.

Course Objectives:
- To understand and analyze the factors that effect the various measuring units.
- To choose the appropriate meters for measuring of voltage, current, power, power factor and energy qualities & understand the concept of standardization.
- Describe the operating principle of AC & DC bridges for measurement of resistance, inductance and capacitance.
- To understand the concept of the transducer and their effectiveness in converting from one form to the other form for the ease of calculating and measuring purposes.
- To understand the operating principles of basic building blocks of digital systems, record and display units.

UNIT - I
Analog Ammeter and Voltmeters
Classification – deflecting - control and damping torques - – PMMC - moving iron type and electrostatic instruments - Construction - Torque equation - Range extension - Errors and compensations - advantages and disadvantages. Instrument transformers: Current Transformer and Potential Transformer-construction - theory - errors-Numerical Problems.

UNIT - II
Analog Wattmeters and Power Factor Meters
Electrodynamometer type wattmeter (LPF and UPF) - Power factor meters: Dynamometer and M.I type (Single phase and Three phase) - Construction - theory - torque equation - advantages and disadvantages.
Potentiometers: Introduction to DC and AC Potentiometers – Construction-working – Applications - Numerical Problems.

UNIT - III
Measurements of Electrical parameters
DC Bridges: Method of measuring low - medium and high resistance - sensitivity of Wheat stone's bridge - Kelvin's double bridge for measuring low resistance - Loss of charge method for measurement of high resistance - Megger – measurement of earth resistance - Numerical Problems.

AC Bridges: Measurement of inductance and quality factor - - Maxwell's bridge - - Hay's bridge - - Anderson's bridge. Measurement of capacitance and loss angle - - Desauty's bridge - Schering Bridge - Wien's bridge - Wagner's earthing device - - Numerical Problems.

UNIT - IV
Transducers
Definition - Classification - Resistive - Inductive and Capacitive Transducer - LVDT - Strain Gauge - Thermistors - Thermocouples - Piezo electric and Photo Diode Transducers - Hall effect sensors- Numerical Problems.

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UNIT - V

Digital meters

Digital Voltmeters – Successive approximation DVM - Ramp type DVM and Integrating type DVM – Digital frequency meter - Digital multimeter - Digital tachometer - Digital Energy Meter - Q meter - Power Analyzer. CRO- measurement of phase difference & Frequency using lissajious patterns - Numerical Problems.

Course Outcomes:

After the completion of the course the student should be able to:

- Know the construction and working of various types of analog instruments.
- Describe the construction and working of wattmeter and power factor meters
- Know the construction and working various bridges for the measurement resistance - inductance and capacitance
- Know the operational concepts of various transducers
- Know the construction and operation digital meters

Text Books:

1. Electrical Measurements and measuring Instruments by E.W. Golding and F.C.Widdis - 5th Edition - Wheeler Publishing.
2. Modern Electronic Instrumentation and Measurement Techniques by A.D. Helfrick and W.D. Cooper - PHI - 5th Edition - 2002.

Reference Books:

2. Electrical & Electronic Measurement & Instruments by A.K.Sawhney Dhanpat Rai & Co. Publications - 19th revised edition - 2011.
3. Electrical and Electronic Measurements and instrumentation by R.K.Rajput - S.Chand - 3rd edition.
3. Electrical Measurements by Buckingham and Price - Prentice – Hall
4. Electrical Measurements by Forest K. Harris. John Wiley and Sons

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III Year – II SEMESTER		L	T	P	C
		3	0	0	3
POWER SYSTEM ANALYSIS					

Preamble:
The course is designed to give students the required knowledge for the design and analysis of power flow studies and faults in electrical power systems. Calculation of power flow in a power system network using various techniques, formation of Z_{bus} and its importance are covered in this course. It also deals with short circuit analysis and analysis of power system for steady state and transient stability.

Course Objectives:
- To develop the impedance diagram (p.u) and formation of Y_{bus}
- To learn the different load flow methods.
- To learn the Z_{bus} building algorithm.
- To learn short circuit calculation for symmetrical faults
- To learn the effect of unsymmetrical faults and their effects.
- To learn the stability of power systems and method to improve stability.

UNIT - I
Circuit Topology & Per Unit Representation
Graph theory definition – Formation of element node incidence and bus incidence matrices – Primitive network representation – Formation of Y_{bus} matrix by singular transformation and direct inspection methods – Per Unit Quantities–Single line diagram – Impedance diagram of a power system – Numerical Problems.

UNIT - II
Power Flow Studies
Necessity of power flow studies – Derivation of static power flow equations – Power flow solution using Gauss-Seidel Method – Newton Raphson Method (Rectangular and polar coordinates form) – Decoupled and Fast Decoupled methods – Algorithmic approach – Numerical Problems on 3–bus system only.

UNIT - III
Z-Bus Algorithm & Symmetrical Fault Analysis
Formation of Z_{bus}**:** Algorithm for the Modification of Z_{bus} Matrix (without mutual impedance) – Numerical Problems.
Symmetrical Fault Analysis:
Reactance's of Synchronous Machine – Three Phase Short Circuit Currents - Short circuit MVA calculations for Power Systems – Numerical Problems.

UNIT - IV
Symmetrical Components
Definition of symmetrical components – symmetrical components of unbalanced three phase systems – Power in symmetrical components – Sequence impedances and Sequence networks: Synchronous generator – Transmission line and transformers – Numerical Problems.
Unsymmetrical Fault analysis
Various types of faults: LG– LL– LLG and LLL on unloaded alternator-Numerical problems.

UNIT - V
Power System Stability Analysis
Elementary concepts of Steady state – Dynamic and Transient Stabilities – Swing equation – Steady state stability – Equal area criterion of stability – Applications of Equal area criterion – Factors affecting transient stability – Methods to improve steady state and transient stability – Numerical problems.

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Course Outcomes:

After the completion of the course the student should be able to:

- Draw impedance diagram for a power system network and calculate per unit quantities.
- Apply the load flow solution to a power system using different methods.
- Form Z_{bus} for a power system networks and analyse the effect of symmetrical faults.
- Find the sequence components for power system Components and analyse its effects of unsymmetrical faults.
- Analyse the stability concepts of a power system.

Text Books:

1. Power System Analysis by Grainger and Stevenson - Tata McGraw Hill.2003
2. Modern Power system Analysis – by I.J.Nagrath & D .P.Kothari: Tata McGraw–Hill Publishing Company - 3rd edition - 2007.

Reference Books:

1. Power System Analysis – by A.R.Bergen - Prentice Hall - 2nd edition - 2009.
2. Power System Analysis by HadiSaadat – Tata McGraw–Hill 3rd edition - 2010.
3. Power System Analysis by B.R.Gupta - A H Wheeler Publishing Company Limited - 1998.
4. Power System Analysis and Design by J.Duncan Glover - M.S.Sarma - T.J.Overbye – Cengage Learning publications - 5th edition - 2011.

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III Year – II SEMESTER		L	T	P	C
		3	0	0	3

SIGNALS AND SYSTEMS
(PROFESSIONAL ELECTIVE – II)

Preamble:
This course aims to lay the foundational aspects of signals and systems in both continuous time and discrete time, in preparation for more advanced subjects in digital signal processing, image processing, and communication theory & control systems.

Course Objectives:
- This gives the basics of signals and systems required for all electrical engineering related courses.
- To understand the behavior of signal in time and frequency domain.
- To understand the characteristics of Linear Time Invariant (LTI) systems.
- Concepts of the correlation and sampling process.
- This give concepts of signals and Systems along with its analysis using different transform techniques.

UNIT – I
Introduction
Definition of Signals and Systems - Classification of Signals - Classification of Systems - Operations on signals: time-shifting - time-scaling - amplitude-shifting - amplitude-scaling. Problems on classification and characteristics of Signals and Systems. Complex exponential and sinusoidal signals - Singularity functions and related functions: impulse function - step function signum function and ramp function. Analogy between vectors and signals - orthogonal signal space - Signal approximation using orthogonal functions - Mean square error - closed or complete set of orthogonal functions - Orthogonally in complex functions. Related Problems.

UNIT – II
Fourier Series And Fourier Transform
Fourier series representation of continuous time periodic signals - properties of Fourier series - Dirichlet's conditions - Trigonometric Fourier series and Exponential Fourier series - Relation between Trigonometric and Exponential Fourier series - Complex Fourier spectrum. Deriving Fourier transform from Fourier series - Fourier transform of arbitrary signal - Fourier transform of standard signals - Fourier transform of periodic signals - properties of Fourier transforms - Fourier transforms involving impulse function and Signum function. Introduction to Hilbert Transform. Related Problems.

UNIT – III
Analysis of Linear Systems
Introduction - Linear system - impulse response - Response of a linear system - Linear time invariant (LTI) system - Linear time variant (LTV) system - Concept of convolution in time domain and frequency domain - Graphical representation of convolution - Transfer function of a LTI system - Related problems. Filter characteristics of linear systems. Distortion less transmission through a system - Signal bandwidth - system bandwidth - Ideal LPF - HPF and BPF characteristics - Causality and Poly-Wiener criterion for physical realization - relationship between bandwidth and rise time.

UNIT – IV
Correlation
Auto-correlation and cross-correlation of functions - properties of correlation function - Energy density spectrum - Parseval's theorem - Power density spectrum - Relation between Convolution and correlation - Detection of periodic signals in the presence of noise by correlation - Extraction of signal from noise by filtering.

Sampling Theorem

Graphical and analytical proof for Band Limited Signals - impulse sampling - Natural and Flat top Sampling - Reconstruction of signal from its samples - effect of under sampling – Aliasing - Introduction to Band Pass sampling - Related problems.

UNIT - V

Laplace Transforms

Introduction - Concept of region of convergence (ROC) for Laplace transforms - constraints on ROC for various classes of signals - Properties of L.T's - Inverse Laplace transform - Relation between L.T's - and F.T. of a signal. Laplace transform of certain signals using waveform synthesis.

Z–Transforms

Concept of Z- Transform of a discrete sequence. Region of convergence in Z-Transform - constraints on ROC for various classes of signals - Inverse Z-transform - properties of Z-transforms. Distinction between Laplace - Fourier and Z transforms.

Course Outcomes:

After the completion of the course the student should be able to:

- Apply the knowledge of various signals and operations.
- Analyze the spectral characteristics of periodic signals using Fourier Analysis.
- Classify the systems based on their properties and determine the response of LSI system using convolution.
- Understand the process of sampling and the effects of under sampling.
- Apply Laplace and z-transforms to analyze signals and Systems (continuous & discrete).

Text Books:

1. Signals - Systems & Communications - B.P. Lathi - BS Publications - 2003.
2. Signals and Systems - A.V. Oppenheim - A.S. Willsky and S.H. Nawab - PHI - 2nd Edition- 1997
3. Signals & Systems - Simon Haykin and Van Veen - Wiley - 2nd Edition - 2007

Reference Books:

1. Principles of Linear Systems and Signals – BP Lathi - Oxford University Press - 2015
2. Signals and Systems – T K Rawat - Oxford University press - 2011.

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III Year – II SEMESTER		L	T	P	C
		3	0	0	3
ELECTRIC DRIVES (PROFESSIONAL ELECTIVE – II)					

Preamble:
This course is an extension of power electronics applications to electric drives. This course covers in detail the application of power electronics converters for speed control of DC & AC motor drives.

Course Objectives:
- To learn the fundamentals of electric drive and different electric braking methods.
- To analyze the operation of three phase converter controlled dc motors and four quadrant operation of dc motors using dual converters.
- To discuss the DC-DCconverter control of dc motors.
- To understand the concept of speed control of induction motor by using AC voltage controllers, voltage source inverters and slip power recovery scheme.
- To learn the speed control mechanism of synchronous motors

UNIT - I
Fundamentals of Electric Drives
Electric drive and its components– Fundamental torque equation – Load torque components – Nature and classification of load torques – Steady state stability – Load equalization– Four quadrant operation of drive (hoist control) – Braking methods**:** Dynamic – Plugging – Regenerative methods.

UNIT - II
Controlled Converter Fed DC Motor Drives
3-phase half and fully-controlled converter fed separately and self-excited DC motor drive – Output voltage and current waveforms – Speed-torque expressions – Speed-torque characteristics – Dual converter fed DC motor drives -Numerical problems.

UNIT - III
DC–DC Converters Fed DC Motor Drives
Single quadrant, two quadrant and four quadrant DC-DC converter fed separately excited and self-excited DC motors – Continuous current mode of operation - Output voltage and current waveforms – Speed–torque expressions and characteristics – Closed loop operation (qualitative treatment only).

UNIT - IV
Stator and Rotor side control of 3-phase Induction motor Drive
Stator voltage control using 3-phase AC voltage regulators – Waveforms –Speed torque characteristics– Variable Voltage Variable Frequency control of induction motor by PWM voltage source inverter – Closed loop V/f control of induction motor drives (qualitative treatment only). Static rotor resistance control – Slip power recovery schemes – Static Scherbius drive – Static Kramer drive – Performance and speed torque characteristics.

UNIT - V
Control of Synchronous Motor Drives
Separate control of synchronous motor – self-control of synchronous motor employing load commutated thyristor inverter - closed loop control of synchronous motor drive (qualitative treatment only)– PMSM (Basic operation only).

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Course Outcomes:

After the completion of the course the student should be able to:

- Explain the fundamentals of electric drive and different electric braking methods.
- Analyze the operation of three-phase converter fed dc motors and four quadrant operations of dc motors using dual converters.
- Describe the DC-DC converter fed control of dc motors in various quadrants of operation
- Know the concept of speed control of induction motor by using AC voltage controllers and voltage source inverters and differentiate the stator side control and rotor side control
- Learn the concepts of speed control of synchronous motor with different methods.

Text Books:

1. Fundamentals of Electric Drives – by G K Dubey - Narosa Publications - 2nd edition – 2002.
2. Power Semiconductor Drives - by S.B.Dewan - G.R.Slemon - A.Straughen - Wiley India - 1984.

Reference Books:

1. Electric Motors and Drives Fundamentals - Types and Apllications - by Austin Hughes and Bill Drury - Newnes.4th edition - 2013.
2. Thyristor Control of Electric drives – Vedam Subramanyam Tata McGraw Hill Publications - 1987.
3. Power Electronic Circuits - Devices and applications by M.H.Rashid - PHI - 3rd edition - 2009.

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III Year – II SEMESTER		L	T	P	C
		3	0	0	3

ADVANCED CONTROL SYSTEMS
(PROFESSIONAL ELECTIVE – II)

Preamble:
This subject aims to study state space, design of state feedback controllers and state observers, describing function and stability analysis including controllability and observability. It also deals with modern control and optimal control systems.

Course Objectives:
- To familiarize the state space representation in controllable, observable, diagonal and Jordan canonical forms.
- Iintroduce the concept of controllability and observability tests through canonical forms and design of state feedback controller by pole placement technique and State Observer design.
- Analysis of a nonlinear system using describing function approach.
- Illustrate the Lypanov's method of stability analysis for linear and non-linear continuous time autonomous systems.
- Formulation of Euler Laugrange equation for the optimization of typical functional and solutions.

UNIT - I
State Space Analysis
State Space Representation – Canonical forms – Controllable canonical form – Observable canonical form - Jordan Canonical Form - Solution of state equation – State transition matrix.

UNIT - II
Controllability - Observability and Design of Pole Placement
Tests for controllability and observability for continuous time systems – Time varying case – Minimum energy control – Time invariant case – Principle of duality – Controllability and observability form Jordan canonical form and other canonical forms – Effect of state feedback on controllability and observability – Design of state feedback control through pole placement.

UNIT - III
Nonlinear Systems
Introduction to nonlinear systems - Types of nonlinearities. Introduction to phase–plane analysis - Singular points; Describing function - basic concepts - Describing functions of non- linearities.

UNIT - IV
Stability analysis by Lyapunov Method
Stability in the sense of Lyapunov – Lyapunov's stability and Lyapunov's instability theorems – Direct method of Lyapunov for the linear and nonlinear continuous time autonomous systems.

UNIT - V
Calculus of Variations
Minimization of functional of single function – Constrained minimization – Minimum principle – Control variable inequality constraints – Control and state variable inequality constraints –Euler lagrangine equation.

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Course Outcomes:

After the completion of the course the student should be able to:

- Analyse different canonical forms - solution of State equation.
- Design of control system using the pole placement technique is given after introducing the concept of controllability and observability.
- Analyze nonlinear system using describing function technique and phase plane analysis.
- Examine the stability analysis using Lyapunov method.
- Illustrate the Minimization of functional using calculus of variation - state and quadratic regulator problems.

Text Books:

1. Modern Control Engineering – by K. Ogata - Prentice Hall of India - 3rd edition - 1998.
2. Automatic Control Systems by B.C. Kuo - Prentice Hall Publication.

Reference Books:

1. Modern Control System Theory – by M. Gopal - New Age International Publishers - 2nd edition - 1996
2. Control Systems Engineering by I.J. Nagarath and M.Gopal - New Age International (P) Ltd.
3. Digital Control and State Variable Methods – by M. Gopal - Tata Mc Graw–Hill Companies - 1997.
4. Systems and Control by Stainslaw H. Zak - Oxford Press - 2003.
5. Optimal control theory: an Introduction by Donald E.Kirk by Dover publications.

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III Year – I SEMESTER		L	T	P	C
		3	0	0	3
SWITCHGEAR AND PROTECTION (PROFESSIONAL ELECTIVE – II)					

Preamble:
In order to supply power from generating end to receiving end several equipments are connected in to the system. In order to protect the equipments and components against various operating conditions and over voltages protective devices are required to be installed in the system. Topics specified in this subject deal with various types of protective equipments and their working principle including limitations etc.

Course Objectives:
- To provide the basic principles and operation of various types of circuit breakers.
- To know the classification, operation and application of different types of electromagnetic protective relays.
- To explain protective schemes for generator and transformers.
- To gain the knowledge of various protective schemes used for feeders and bus bars.
- To explain the principle and operation of different types of static relays.
- To understand different types of over voltages in a power system and principles of different neutral grounding methods.

UNIT–I
Circuit Breakers
Application oriented evolution of Switchgear - Miniature Circuit Breaker(MCB)– Elementary principles of arc interruption– Restriking Voltage and Recovery voltages– Restriking phenomenon - RRRV– Average and Max. RRRV– Current chopping and Resistance switching– Concept of oil circuit breakers– Description and operation of Air Blast– Vacuum and SF_6 circuit breakers– Circuit Breaker ratings and specifications– Concept of Auto reclosing – Application Spectrum Numerical examples

UNIT–II
Electromagnetic Protection
Relay connection – Balanced beam type attracted armature relay - induction disc and induction cup relays–Torque equation - Relays classification–Instantaneous– DMT and IDMT types– Applications of relays**:** Over current and under voltage relays– Directional relays– Differential relays and percentage differential relays– Universal torque equation– Distance relays**:** Impedance– Reactance– Mho and offset mho relays– Characteristics of distance relays and comparison.

UNIT–III
Generator Protection
Protection of generators against stator faults– Rotor faults and abnormal conditions– restricted earth fault and inter turn fault protection– Numerical examples.
Transformer Protection
Percentage differential protection– Design of CT's ratio– Buchholz relay protection–Numerical examples.

UNIT–IV
Feeder and Bus bar Protection & Static Relays:
Over current Protection schemes – PSM - TMS – Numerical examples – Carrier current and three zone distance relay using impedance relays.
Protection of bus bars by using Differential protection.
Static relays**:** Introduction – Classification of Static Relays – Basic Components of Static Relays.

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UNIT–V

Protection against over voltage and grounding

Generation of over voltages in power systems– Protection against lightning over voltages– Valve type and zinc oxide lighting arresters.

Grounded and ungrounded neutral systems – Effects of ungrounded neutral on system performance – Methods of neutral grounding**:** Solid–resistance–Reactance–Arcing grounds and grounding Practices.

Course Outcomes:

After the completion of the course the student should be able to:

- Illustrate the principles of arc interruption for application to high voltage circuit breakers of air - oil - vacuum - SF_6 gas type.
- Analyse the working principle and operation of different types of electromagnetic protective relays.
- Acquire knowledge of protective schemes for generator and transformers for different fault conditions.
- Classify various types of protective schemes used for feeders and bus bar protection and Types of static relays.
- Analyse the operation of different types of over voltages protective schemes required for insulation co–ordination and types of neutral grounding.

Text Books:

1. Power System Protection and Switchgear by Badri Ram and D.N Viswakarma - Tata McGraw Hill Publications - 2nd edition - 2011.
2. Power system protection- Static Relays with microprocessor applications by T.S.Madhava Rao - Tata McGraw Hill - 2nd edition.

Reference Books:

1. Fundamentals of Power System Protection by Paithankar and S.R.Bhide. - PHI - 2003.
2. Art & Science of Protective Relaying – by C R Mason - Wiley Eastern Ltd.
3. Protection and SwitchGear by BhaveshBhalja - R.P. Maheshwari - Nilesh G.Chothani - Oxford University Press - 2013.

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III Year – II SEMESTER		L	T	P	C
		3	0	0	3
BIG DATA ANALYTICS (PROFESSIONAL ELECTIVE – II)					

Course Objectives:

- To understand the competitive advantages of big data analytics
- To understand the big data frameworks
- To learn data analysis methods
- To learn stream computing
- To gain knowledge on Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data analytics

UNIT-I
Introduction To Big Data
Big Data, Definition, Characteristic Features, Big Data Applications, Big Data vs Traditional Data, Risks of Big Data, Structure of Big Data, Challenges of Conventional Systems, Web Data, Evolution of Analytic Scalability.

UNIT-II
Hadoop Framework
Distributed File Systems, Large-Scale File System Organization, HDFS concepts, Map Reduce Execution, Algorithms using Map Reduce, Hadoop YARN.

UNIT-III
Data Analysis
Statistical Methods**:** Regression modelling, Multivariate Analysis, Classification: SVM & Kernel Methods, Rule Mining, Cluster Analysis, Types of Data in Cluster Analysis, Partitioning Methods, Predictive Analytics, Data analysis using R.

UNIT-IV
Mining Data Streams
Streams: Concepts, Stream Data Model and Architecture, Sampling data in a stream, Mining Data Streams and Mining Time-series data, Real Time Analytics Platform (RTAP) Applications, Case Studies, Real Time Sentiment Analysis.

UNIT-V
Big Data Frameworks
Introduction to NoSQL, Aggregate Data Models, Hbase: Data Model and Implementations, Hbase Clients, Examples, Cassandra: Data Model, Examples, Cassandra Clients, Hadoop Integration.

Course Outcomes: At the end of the course, student will be able to

- Understand how to leverage the insights from big data analytics
- Analyze data by utilizing various statistical and data mining approaches
- Perform analytics on real-time streaming data
- Understand the various NoSql alternative database models

Software Links:

1. Hadoop: http://hadoop.apache.org/
2. Hive: https://cwiki.apache.org/confluence/display/Hive/Home
3. Pig latin: http://pig.apache.org/docs/r0.7.0/tutorial.html

Text Books:

1. Big Java 4th Edition, Cay Horstmann, Wiley John Wiley & Sons, INC
2. Hadoop: The Definitive Guide by Tom White, 3rd Edition, O'reilly
3. Hadoop in Action by Chuck Lam, MANNING Publ.

Reference Books:

1. Hadoop in Practice by Alex Holmes, MANNING Publ.
2. Hadoop MapReduce Cookbook, SrinathPerera, ThilinaGunarathne
3. Michael Berthold, David J. Hand, ―Intelligent Data Analysis‖, Springer, Second Edition, 2007.
4. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley

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III Year – II SEMESTER		L	T	P	C
		3	0	0	3

BATTERY MANAGEMENT SYSTEMS AND CHARGING STATIONS
(OPEN ELECTIVE – II)

Preamble:
The objective of this course is to introduce learner to batteries, its parameters, charging requirements and modelling. The course will help learner to understand the types of batteries and their charging methods, develop battery management and modelling algorithms for batteries.

Course objectives:
- Able to understand the working of different batteries for EV applications
- Able to know the fundamentals of battery charging methods and their advantages
- Able to know the different kinds of equipment in charging station
- Able to know the requirements of battery management.
- Able to know method of modelling batteries and their simulation studies.

Unit - I:
EV Batteries
Cells & Batteries, Nominal voltage and capacity, C rate, Energy and power, Cells connected in series, Cells connected in parallel. **Lead Acid Batteries:** Lead acid battery basics, special characteristics of lead acid batteries, battery life and maintenance, Li-ion batteries. **Nickel-based Batteries:** Nickel cadmium, Nickel metal hydride batteries. **Sodium-Based Batteries:**
Introduction, sodium sulphur batteries, sodium metal chloride (Zebra) batteries.
Lithium Batteries: Introduction, the lithium polymer battery, lithium ion battery.

Unit - II:
Battery charging strategies
Charging algorithms for a single battery: Basic terms for charging performance evaluation and characterization, CC charging for NiCd/NiMH batteries, CV charging for lead acid batteries, CC/CV charging for lead acid and Li-ion batteries, MSCC charging for lead acid, NiMH and Li-ion batteries, TSCC/CV charging for Li-ion batteries, CVCC/CV charging for Li-ion batteries, Pulse charging for lead acid, NiCd/NiMH and Li-ion batteries, Charging termination techniques, Comparisons of charging algorithms and new development; Balancing methods for battery pack charging: Battery sorting Overcharge for balancing, Passive balancing, Active balancing.

Unit -III:
Charging Infrastructure
Domestic Charging Infrastructure, Public charging Infrastructure, Normal Charging Station, Occasional Charging Station, Fast Charging Station, Battery Swapping Station, Move-and-charge zone.

Unit - IV:
Battery-Management-System Requirements
Battery-pack topology, BMS design requirements, Voltage sense, Temperature sense, Current sense, Contactor control, Isolation sense, Thermal control, Protection, Charger control, Communication via CAN bus, Log book, SOC estimation, Energy estimation, Power estimation, Diagnostics .

Unit - V:
Battery Modelling
General approach to modelling batteries, simulation model of rechargeable Li-ion battery, simulation model of a rechargeable NiCd battery, Parameterization of NiCd battery model, Simulation examples.

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Course Outcomes:

After the completion of the course the student should be able to:

- Describe the construction and operation of different batteries for EV applications
- Describe charging algorithms of different batteries and balancing methods of battery packs
- Describe the different kinds of infrastructure needed in the charging stations
- Describe the requirements of battery management and their maintenance.
- Obtain the modelling of batteries and develop their simulation models.

Text Books

1. Electric Vehicles Technology Explained by James Larminie Oxford Brookes University, Oxford, UK John Lowry Acenti Designs Ltd., Uk. (Unit-1)
2. Energy Systems for Electric and Hybrid Vehicles by K.T. Chau, IET Publications, First edition, 2016. (Unit-2)

Reference Books:

1. Modern Electric Vehicles Technology by C.C.Chan, K.T Chau, Oxford University Press Inc., New york , 2001. (Unit-3)
2. Battery Management Systems Vol. – II Equivalent Circuits and Methods, by Gregory L.Plett, Artech House publisher, First edition 2016. (Unit-4)
3. Battery Management Systems: design by Modelling by Henk Jan Bergveld, Wanda S. Kruijt, Springer Science & Business Media, 2002. (Unit-5)

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III Year – II SEMESTER		L	T	P	C
		3	0	0	3

FUNDAMENTALS OF UTILIZATION OF ELECTRICAL ENERGY
(OPEN ELECTIVE – II)

Preamble:

In the modern society, every engineer is using electrical energy irrespective of their branch of specialization. To provide knowledge about the various electrical energy utilization technologies to non-electrical engineering students this course is developed. In this course, a detailed description about the illumination requirements and energy storage, various techniques used for heating & welding applications, and brief description about the electric traction are presented. At the end of the course, an insight in to the important techniques of various energy storage systems is also presented.

Course Objectives:

- To study the various types of Illumination equipment, measurement of Illumination, Illumination techniques.
- To know the various technologies used for heating applications using electrical energy.
- To understand the various welding techniques and operations of welding equipment and comparison.
- To know the various systems of traction, equipment used for traction.
- To understand the importance and operation of various Energy storage systems and comparison & applications.

UNIT - I
Illumination fundamentals
Introduction - terms used in illumination–Laws of illumination–Lux meter–Sources of light.
Various Illumination Methods
Tungsten filament lamps and fluorescent lamps - Comparison –Basic principles of light control– Types and design of lighting and flood lighting–LED lighting - Energy conservation.

UNIT - II
Electric Heating
Advantages and methods of electric heating–Resistance heating induction heating and dielectric heating.

UNIT - III
Electric Welding
Electric welding–Resistance and arc welding–Electric welding equipment–Comparison between AC and DC Welding

UNIT - IV
Electric Traction
System of electric traction and track electrification– Review of existing electric traction systems in India– Special features of traction motor– Mechanics of train movement–Speed–time curves for different services – Trapezoidal and quadrilateral speed time curves. Calculations of tractive effort– power – Specific energy consumption for given run–Effect of varying acceleration and braking retardation– Adhesive weight and braking retardation adhesive weight and coefficient of adhesion.

UNIT - V
Introduction to Energy Storage Systems
Need for energy storage - Types of energy storage-Thermal - electrical - magnetic and chemical storage systems - Comparison of energy storage technologies-Applications.

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Course Outcomes:

After the completion of the course the student should be able to:

- Know the concepts of illumination and various illumination methods.
- Know about the resistance - induction and dielectric heating.
- Learn about the resistance and arc welding and welding equipment
- Know about the mechanisms - equipment and technology used in the electric traction.
- Differentiatethe importance of various energy storage systems

Text Books:

1. Electrical Power Systems(Generation, Transmission, Distribution, Protecection and Utilization of Electrical Energy) – Dr. S.L.Uppal and Prof. Sunil S.Rao – Khanna Publisher, 15th edition, 1987.
2. Electric Power Distribution – A S Pabla – McGrawHill.

Reference Books:

1. Generation Distribution and Utilization of Electrical Energy – C.L.Wadhwa- New Age International Publishers- revised third edition.

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III Year – II SEMESTER		L	T	P	C
		3	0	0	3
INDIAN ELECTRICITY ACT (OPEN ELECTIVE – II)					

Preamble:
This course helps the students to learn the electricity policies in generation, transmission and distribution networks. To understand the licensing process, regular commission, legal and special court issues and their solving capabilities.

Course Objectives:
- To acquire knowledge on national policy, plan and joint responsibilities of state and central governments.
- To understand the licensing procedures in transmission and distribution companies.
- To learn the regulatory body rules and protocols.
- To understand the offences and penalties related issues with respect to different tribunals.
- To learn the legal related issues and their resolutions.

UNIT – I
National Electricity Policy and Plan - Generation of Electricity
Electricity Act: commencement - definitions - comments; national policy on standalone systems - non-conventional energy systems - electrification and local distribution for rural areas; joint responsibilities of state and central governments in rural electrification - requirement for setting up of generating station - hydro-electric generation - captive generation; duties of generating companies.

UNIT – II
Licensing -Transmission and Distribution Of Electricity
Licensing: powers - procedures - conditions - amendments - revocation - provisions - directions - suspension and sale; inter-state and intra-state transmission; other provisions relating to transmission; provisions with respect to distribution licenses - electricity traders - supply generally; consumer protection: standard performance.
Electrical Wiring, Estimation & Costing

UNIT – III
Tariff - CEA and Regulatory Commissions
Works of licenses - provisions relating to overhead lines; Constitution and functions of Central Electricity Authority (CEA) - directions and certain powers; Constitution - powers and functions of state and central commissions - other provisions - proceedings and powers of Appropriate commission - Grants - Fund - Accounts Audit and Report.

UNIT – IV
Appellate Tribunal - Reorganisation of Boards - Offences and Penalty
Appellate Tribunal for electricity; investigation and assessment; reorganisation of boards; Offences and penalties.

UNIT – V
Special Courts - Dispute Resolution - Other Provisions and Miscellaneous
Constitution of special courts - procedures - powers - appeal - revision; arbitration; protective clauses; miscellaneous and enactments.

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Course Outcomes:

After the completion of the course the student should be able to:

- Learn the national policy and plan and the joint responsibilities of state and central governments.
- Analyze the licensing and the provisions related to transmission and distribution of electricity.
- Remember the composition and powers of Regulatory commissions and CEA.
- Learn the functions of Appellate Tribunal for electricity.
- Know the constitution procedure and provisions in Special courts and dispute resolutions.

Text Books:

1. The Electricity Act - 2003 {Act 36 of 2003 - dt.2-6-2003 - w.e.f. 10-6-2003 vide S.O. No. 669(E) - dt. 10-6-2003] published by Commercial Law Publishers (I) Pvt. Ltd.

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III Year – II SEMESTER		L	T	P	C
		0	0	3	1.5
ELECTRICAL MEASUREMENTS AND INSRUMENTATION LABORATORY					

Course Objectives:

- To understand students how different types of meters work and their construction.
- To make the students understand how to measure resistance, inductance and capacitance by AC & DC bridges.
- To understand the testing of CT and PT.
- To Understand and the characteristics of Thermo couples, LVDT, Capacitive transducer, piezoelectric transducer.
- To understand the measurement of strain and choke coil parameters.
- To study the procedure for standardization and calibration of various methods.

Any 10 of the following experiments are to be conducted

1. Calibration of dynamometer wattmeter using phantom loading
2. Measurement of resistance using Kelvin's double Bridge and Determination of its tolerance.
3. Measurement of Capacitance using Schering Bridge.
4. Measurement of Inductance using Anderson Bridge.
5. Calibration of LPF Wattmeter by direct loading.
6. Measurement of 3 phase reactive power using single wattmeter method for a balanced load.
7. Testing of C.T. using mutual inductor – Measurement of % ratio error and phase angle of given C.T. by Null deflection method.
8. P.T. testing by comparison – V.G as Null detector – Measurement of % ratio error and phase angle of the given P.T.
9. Determination of the characteristics of a Thermocouple.
10. Determination of the characteristics of a LVDT.
11. Determination of the characteristics for a capacitive transducer.
12. Measurement of strain for a bridge strain gauge.
13. Measurement of Choke coil parameters and single phase power using three voltmeter and three ammeter methods.
14. Calibration of single phase Energy Meter.
15. Dielectric oil Test using HV Kit.
16. Calibration of DC ammeter and voltmeter using Crompton DC Potentiometer.
17. AC Potentiometer: Polar Form / Cartesian Form - Calibration of AC voltmeter - Parameters of choke.

Course Outcomes:

After the completion of the course the student should be able to:

- Know about the phantom loading.
- Learn the calibration process.
- Measure the electrical parameters voltage - current - power - energy and electrical characteristics of resistance - inductance and capacitance.
- Gain the skill knowledge of various brides and their applications.
- Learn the usage of CT's - PT's for measurement purpose.
- Know the characteristics of transducers.
- Measure the strains - frequency and phase difference.

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III Year –II SEMESTER		L	T	P	C
		0	0	3	1.5
MICRO PROCESSORS AND MICRO CONTROLLERS LAB					

Course Objectives:

- To study programming based on 8086 microprocessor and 8051 microcontroller.
- To study 8086 microprocessor based ALP using arithmetic, logical and shift operations.
- To study to interface 8086 with I/O and other devices.
- To study parallel and serial communication using 8051& PIC 18 micro controllers.

Any 10 of the following experiments are to be conducted:

8086 Microprocessor Programs:

1. Arithmetic operations – Two 16-bit numbers and multibyte addition - subtraction - multiplication and division – Signed and unsigned arithmetic operations - ASCII – Arithmetic operations.
2. Logic operations – Shift and rotate – Converting packed BCD to unpacked BCD - BCD to ASCII conversion.
3. Arrange the given array in ascending and descending order
4. Determine the factorial of a given number
5. By using string operation and Instruction prefix**:** Move block - Reverse string Sorting - Inserting - Deleting - Length of the string - String comparison.
6. Find the first and n^{th} number of 'n' natural numbers of a Fibonacci series.
7. Find the number and sum of even and odd numbers of a given array
8. Find the sum of 'n' natural numbers and squares of 'n' natural numbers
9. Arithmetic operations on 8051
10. Conversion of decimal number to hexa equivalent and hexa equivalent to decimal number
11. Find the Sum of elements in an array and also identify the largest & smallest number of a given array using 8051.

Programs on Interfacing:

12. Interfacing 8255–PPI with 8086.
13. Stepper motor control using 8253/8255.
14. Reading and Writing on a parallel port using 8051
15. Timer in different modes using 8051
16. Serial communication implementation using 8051
17. Understanding three memory areas of 00 – FF Using 8051 external interrupts.
18. Traffic Light Controller using 8051.

Course Outcomes:

After the completion of the course the student should be able to:

- Write assembly language program using 8086 microprocessor based on arithmetic - logical - number systems and shift operations.
- Write assembly language programs for numeric operations and array handling problems.
- Write a assembly program on string operations.
- Interface 8086 with I/O and other devices.
- Do parallel and serial communication using 8051 & PIC 18 micro controllers.
- Program microprocessors and microcontrollers for real world applications.

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III Year – II SEMESTER		L	T	P	C
		0	0	3	1.5
POWER SYSTEMS AND SIMULATION LAB					

Course Objectives:

To impart the practical knowledge of functioning of various power system components and determination of various parameters and simulation of load flows, transient stability, LFC and Economic dispatch.

Any of 5 experiments are to be conducted from each section:

Section I: Power Systems Lab:

1. Estimation of sequence impedances of 3-phase Transformer
2. Estimation of sequence impedances of 3-phase Alternator by Fault Analysis
3. Estimation of sequence impedances of 3-phase Alternator by Direct method
4. Estimation of ABCD parameters on transmission line model
5. Performance of long transmission line without compensation
6. Performance of long transmission line with shunt compensation
7. Analyze the Ferranti effect on long transmission line

Section II: Simulation Lab

8. Determination of Y_{bus} using direct inspection method
9. Load flow solution of a power system network using Gauss-Seidel method
10. Load flow solution of a power system network using Newton Raphson method.
11. Formation of Z_{bus} by building algorithm.
12. Economic load dispatch with & without losses
13. Load frequency control of a two area Power System without & with PI controller
14. Transient Stability analysis of single machine connected to an infinite bus (SMIB) using equal area criterion.

Course Outcomes:

After the completion of the course the student should be able to:

- Estimate the sequence impedances of 3-phase Transformer and Alternators
- Evaluate the performance of transmission lines
- Analyse and simulate power flow methods in power systems
- Analyse and simulate the performance of PI controller for load frequency control.
- Analyse and simulate stability studies of power systems

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III Year – II SEMESTER		L	T	P	C
		2	0	0	2

SKILL ADVANCED COURSE
MACHINE LEARNING WITH PYTHON

Course Objectives:
From the course the student will learn

- patterns and concepts from data without being explicitly programmed in various IOT nodes.
- to design and analyze various machine learning algorithms and techniques with a modern outlook focusing on recent advances.
- to explore supervised and unsupervised learning paradigms of machine earning, Deep learning technique and various feature extraction strategies.

UNIT-I
Introduction to Machine Learning with Python
Introduction to Machine Learning, basic terminology, Types of Machine Learning and Applications, Using Python for Machine Learning: Installing Python and packages from the Python Package Index, Introduction to NumPy, SciPy, matplotlib and scikitlearn, Tiny application of Machine Learning.

UNIT-II
Supervised Learning
Types of Supervised Learning, Supervised Machine Learning Algorithms: k-Nearest Neighbors, Linear Models, Naive Bayes Classifiers, Decision Trees, Ensembles of Decision Trees, Kernelized Support Vector Machines, Uncertainty Estimates from Classifiers.

UNIT-III
Unsupervised Learning
Types of Unsupervised Learning, challenges, Preprocessing and scaling, Dimensionality Reduction, Feature Extraction, Manifold Learning, Clustering: K-Means Clustering, Agglomerative Clustering, DBSCAN, Comparing and Evaluating Clustering Algorithms.

UNIT-IV
Representing Data and Engineering Features
Categorical Variables, Binning, Discretization, Linear Models, Trees, Interactions and Polynomials, Univariate Nonlinear Transformations, Automatic Feature Selection. Parameter Selection with Preprocessing, Building Pipelines, The General Pipeline Interface.

UNIT-V
Working with Text Data (Data Visualization)
Types of Data Represented as Strings, Example Application: Sentiment Analysis of Movie Reviews, Representing Text Data as a Bag of Words, Stop Words, Rescaling the Data with tf-idf, Investigating Model Coefficients, Approaching a Machine Learning Problem, Testing Production Systems, Ranking, Recommender Systems and Other kinds of Learning.

Course Outcomes: At the end of the course, student will be able to

- Illustrate and comprehend the basics of Machine Learning with Python
- Demonstrate the algorithms of Supervised Learning and be able to differentiate linear and logistic regressions
- Demonstrate the algorithms of Unsupervised Learning and be able to understand the clustering algorithms
- Evaluate the concepts of binning, pipeline Interfaces with examples
- Apply the sentiment analysis for various case studies



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Text Books:

1. Introduction to Machine Learning with Python: A Guide for Data Scientists, Andreas C. Muller & Sarah Guido, Orielly Publications, 2019.
2. Python Machine Learning, Sebastian Raschka & Vahid Mirjalili, 3rd Edition, 2019.
3. Building Machine Learning Systems with Python, Luis Pedro Coelho, Willi Richert, 2nd Edition, 2015.

Reference Books:

1. Machine Learning, Tom M. Mitchell, Mc Graw-Hill Publication, 2017

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III Year – II SEMESTER		L	T	P	C
		2	0	0	0
RESEARCH METHODOLOGY					

Course objectives:

- To understand the objectives and characteristics of a research problem.
- To analyze research related information and to follow research ethics
- To understand the types of intellectual property rights.
- To learn about the scope of patent rights.
- To understand the new developments in IPR.

UNIT - I

Research problem: Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT - II

Literature study: Effective literature studies approaches, analysis Plagiarism, Research ethics, Technical writing: Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

UNIT - III

Nature of Intellectual Property: Patents, Designs, Trade and Copyright.
Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT - IV

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

UNIT - V

New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc, Traditional knowledge Case Studies, IPR and IITs.

Course Outcomes:

At the end of the course, student will be able to

- Understand objectives and characteristics of a research problem
- Analyze research related information and to follow research ethics.
- Understand the types of intellectual property rights.
- Learn about the scope of IPR.
- Understand the new developments in IPR.

Text Books:

1. Stuart Melville and Wayne Goddard, “Research methodology: an introduction for science & engineering students’”
2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”
3. Ranjit Kumar, 2nd Edition, “Research Methodology: A Step by Step Guide for beginners”

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References Books:

1. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
2. Mayall, "Industrial Design", McGraw Hill, 1992.
3. Niebel, "Product Design", McGraw Hill, 1974.
4. Asimov, "Introduction to Design", Prentice Hall, 1962.
5. Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technological Age", 2016.
6. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

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IV Year – I SEMESTER		L	T	P	C
		3	0	0	3
DIGITAL SIGNAL PROCESSING (PROFESSIONAL ELECTIVE –III)					

Preamble:
The course has been designed to cater to the needs of electronic industry transforms. This course covers basic concepts of signal processing, various transformation techniques. It provides students to relies about different filter structure and also coding of speech signals.

Course Objectives:

- To explore the basic concepts of digital signal processing.
- To connect the time domain signal to frequency domain signals using fourier transform.
- To understand the basic structures of IRR systems.
- To understand and design FIR Digital filters.
- To explore the concepts of multiple sampling rates for DSP.

UNIT - I
Introduction
Introduction to Digital Signal Processing: Discrete time signals & sequences - Classification of Discrete time systems - stability of LTI systems - Invertability - Response of LTI systems to arbitrary inputs. Solution of Linear constant coefficient difference equations. Frequency domain representation of discrete time signals and systems. Review of Z-transforms - solution of difference equations using Z-transforms - System function.

UNIT - II
Discrete Fourier Transforms and FFT Algorithms
Discrete Fourier Series representation of periodic sequences -Properties of Discrete Fourier Series - Discrete Fourier transforms: Properties of DFT - linear filtering methods based on DFT - Fast Fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms - Inverse FFT.

UNIT - III
Design and Realizations of IIR Digital Filters
Analog filter approximations – Butter worth and Chebyshev - Design of IIR Digital filters from analog filters - Design Examples. Analog and Digital frequency transformations.
Basic structures of IIR systems – Direct-Form Structures - Transposed Structures - Cascade-Form Structures - Parallel-Form Structures Lattice and Lattice-Ladder Structures.

UNIT - IV
Design and Realizations of FIR Digital Filters
Characteristics of FIR Filters with Linear Phase - Frequency Response of Linear Phase FIR Filters - Design of FIR Digital Filters using Window Techniques and Frequency Sampling technique - Comparison of IIR & FIR filters.
Basic structures of FIR systems – Direct-Form Structure - Cascade-Form Structures Linear Phase Realizations - Lattice structures.

UNIT - V
Multirate Digital Signal Processing
Introduction-Decimation –Interpolation-Sampling Rate Conversion by a Rational Factor-Implementation of sampling rate converters-Applications of Multirate Signal Processing-Digital Filter Banks.

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Course Outcomes:

After the completion of the course the student should be able to:

- Know the concepts of Digital signal processing - frequency domain representation &z-transform.
- Compute discrete Fourier transform and fast fourier transforms for different sequences.
- Design IIR filters through analog filter approximation and basic structure of IIR filters.
- Design FIR filters with window techniques and basic structure of FIR filters.
- Learn the concepts of Multirate Signal Processing.

Text Books:

1. Digital Signal Processing - Principles - Algorithms - and Applications: John G. Proakis - Dimitris G.Manolakis - 4th Edition - Pearson Education / PHI - 2007.
2. Discrete Time Signal Processing – A.V.Oppenheim and R.W. Schaffer - PHI.
3. Digital Signal Processing: A Computer based approach. Sanjit K Mitra - 4th Edition - TMH - 2014.

Reference Books:

1. Digital Signal Processing: Andreas Antoniou - TATA McGraw Hill - 2006
2. Digital Signal Processing: MH Hayes - Schaum's Outlines - TATA Mc-Graw Hill - 2007.
3. DSP Primer - C. Britton Rorabaugh - Tata McGraw Hill - 2005.
4. Fundamentals of Digital Signal Processing using Matlab – Robert J. Schilling - Sandra L.Harris - Thomson - 2007.
5. Digital Signal Processing – Alan V. Oppenheim - Ronald W. Schafer - PHI Ed. - 2006.
6. Digital Signal Processing – K Raja Rajeswari - 1st edition - I.K. International Publishing - House - 2014.

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IV Year – I SEMESTER		L	T	P	C
		3	0	0	3

RENEWABLE AND DISTRIBUTED ENERGY TECHNOLOGIES
(PROFESSIONAL ELECTIVE – III)

Preamble:
To impart knowledge on various renewable sources such as solar, wind and hydel perspectives.
To know the requirements of various hybrid sources as distributed energy technologies.

Course Objectives:
- To understand the basic concepts on wind energy systems with concept on aerodynamics, horizontal and vertical axis wind turbines.
- To understand the various relations between speed, power and energy in the wind systems.
- It provides the knowledge in fundamentals of solar energy systems, various components of solar thermal systems, applications in the relevant fields and design of PV systems.
- To understand the Hydel system components and their design concepts. To get an idea on different other sources like tidal, geothermal and gas based units.
- To understand the use of various renewable sources as distributed generators.

UNIT – I
Brief idea on renewable and distributed sources - their usefulness and advantages; Wind Energy Systems: Estimates of wind energy potential - wind maps - Instrumentation for wind velocity measurements - Aerodynamic and mechanical aspects of wind machine design - Conversion to electrical energy - Aspects of location of wind farms.

UNIT – II
Wind speed and energy - Speed and power relations - Power extraction from wind - Tip speed ratio (TSR) - Functional structure of wind energy conversion systems - Pitch and speed control - Power-speed-TSR characteristics - Fixed speed and variable speed wind turbine control - Power optimization - Electrical generators - Self-Excited and Doubly-Fed Induction Generators operation and control.

UNIT – III
Solar PV Systems: Present and new technological developments in photovoltaic - estimation of solar irradiance - components of solar energy systems - solar-thermal system applications to power generation - heating - Types of PV systems - Modelling of PV cell - current-voltage and power-voltage characteristics - Effects of temperature - Solar array simulator - Sun tracking - Peak power operations - PV system - MPPT techniques - Effects of partial shading on the characteristic curves and associated MPPT techniques - Solar park design outline.

UNIT – IV
Hydel Power: Water power estimates - use of hydrographs - hydraulic turbine - characteristics and part load performance - design of wheels - draft tubes and penstocks - plant layouts; Brief idea of other sources viz. - tidal - geothermal - gas-based - etc.

UNIT - V
Requirements of hybrid/combined use of different renewable and distributed sources - Need of energy storage; Control of frequency and voltage of distributed generation in Stand-alone and Grid-connected mode - use of energy storage and power electronics interfaces for the connection to grid and loads - Design and optimization of size of renewable sources and storages.

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Course Outcomes:

After the completion of the course the student should be able to:

- Illustrate basic concepts of renewable and distributed sources
- Demonstrate the components of wind energy conversion systems.
- Model PV systems and analyse MPPT Techniques.
- Illustrate the concept of Energy Production from Hydro - Tidal and Geothermal.
- Distinguish between standalone and grid connected DG systems and design hybrid renewable energy systems.

Text Books & Reference Books:

1. Math J. Bollen - Fainan Hassan 'Integration of Distributed Generation in the Power System' - IEEE Press - 2011.
2. Loi Lei Lai and Tze Fun Chan 'Distributed Generation: Induction and Permanent Magnet Generators' - Wiley-IEEE Press - 2007.
3. Studies' Craig Anderson and Rudolf I. Howard 'Wind and Hydropower Integration: Concepts - Considerations and Case - Nova Publisher - 2012.
4. Amanda E. Niemi and Cory M. Fincher 'Hydropower from Small and Low-Head Hydro Technologies' - Nova Publisher - 2011.
6. D. Yogi Goswami - Frank Kreith and Jan F. Kreider 'Principles of Solar Engineering' - Taylor & Francis 2000.
7. G. N. Tiwari 'Solar Energy Technology' - Nova Science Publishers - 2005.
8. Math J. Bollen - Fainan Hassan 'Integration of Distributed Generation in the Power System' - IEEE Press - 2011.
9. S. Heier and R. Waddington 'Grid Intergration of Wind Energy Conversion Systems' – Wiley - 2006.

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IV Year –I SEMESTER		L	T	P	C
		3	0	0	3
FLEXIBLE ALTERNATING CURRENT TRANSMISSION SYSTEMS (PROFESSIONAL ELECTIVE – III)					

Preamble:
Flexible Alternating Current Transmission System controllers have become a part of modern power system. It is important for the student to understand the principle of operation of series and shunt compensators by using power electronics. As the heart of many power electronic controllers is a voltage source converter (VSC), the student should be acquainted with the operation and control of VSC. The modern power electronic controllers are also introduced.

Course Objectives:
- To learn the basics of power flow control in transmission lines using FACTS controllers
- To explain operation and control of voltage source converter.
- To learn the method of shunt compensation using static VAR compensators.
- To learn the methods of compensation using series compensators
- To explain operation of Unified Power Flow Controller (UPFC) and Interline Power flow Controller (IPFC).

UNIT - I
Introduction to FACTS
Power flow in an AC System – Loading capability limits – Dynamic stability considerations – Importance of controllable parameters – Basic types of FACTS controllers – Benefits from FACTS controllers – Requirements and characteristics of high power devices – Voltage and current rating – Losses and speed of switching – Parameter trade–off devices.

UNIT - II
Voltage source and Current source converters
Voltage source converter (VSC) – Single phase full-wave bridge converter – Square wave voltage harmonics for a single–phase bridge converter – Three–phase full-wave bridge converter - Transformer connections for 12 pulse operation.
Current Source Converter (CSC)-Three–phase current source converter – Comparison of current source converter with voltage source converter.

UNIT - III
Shunt Compensators
Objectives – Mid–point voltage regulation for line segmentation – End of line voltage support to prevent voltage instability – Improvement of transient stability – Power oscillation damping.

Variable Impedance Type VAR Generator: Thyristor Switched/Controlled Reactor (TSR/TCR) – Thyristor Switched Capacitor (TSC) – Fixed Capacitor–Thyristor Controlled Reactor (FC-TCR) - Thyristor Switched Capacitor and Thyristor Controlled Reactor (TSC–TCR) - Switching Converter type VAR generator.
Principle of operation and comparison of SVC and STATCOM.

UNIT - IV
Series Compensators
Concept of series capacitive compensation – Improvement of transient stability – Power oscillation damping – Functional requirements. Variable Impedance type series compensators – GTO Thyristor controlled Series Capacitor (GSC) – Thyristor Switched Series Capacitor (TSSC) and Thyristor Controlled Series Capacitor (TCSC) - Switching Converter type Series Compensation – Static Synchronous Series Compensator.

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UNIT - V

Combined Compensators

Schematic and basic operating principles of unified power flow controller (UPFC) and Interline power flow controller (IPFC) – Controller applications of transmission lines.

Course Outcomes:

After the completion of the course the student should be able to:

- Know the concepts of facts controller and power flow control in transmission line.
- Demonstrate operation and control of voltage source converter and know the concepts current source converter.
- Analyse compensation by using different compensators to improve stability and reduce power oscillations in the transmission lines.
- Know the concepts methods of compensations using series compensators.
- Analyse operation of Unified Power Flow Controller (UPFC) and Interline power flow controller (IPFC).

Text Books:

1. "Understanding FACTS" N.G.Hingorani and L.Guygi, IEEE Press.Indian Edition is available:— Standard Publications, 2001.

Reference Books:

1. "Flexible ac transmission system (FACTS)" Edited by Yong Hue Song and Allan T Johns, Institution of Electrical Engineers, London.
2. Thyristor-based FACTS Controllers for Electrical Transmission Systems, by R. Mohan Mathur and Rajiv K.Varma, Wiley.

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IV Year – I SEMESTER		L	T	P	C
		3	0	0	3

POWER SYSTEM DEREGULATION
(PROFESSIONAL ELECTIVE – III)

Preamble:
This aim of this course is to enhance competition and bring consumers new choices and economic benefits. The electricity industry is evolving into a distributed and competitive industry in which market forces drive the price of electricity and reduce the net cost through increased competition. The process has, obviously, necessitated reformulation of established models of power system operation and control activities.

Course Objectives:
- To provide in-depth knowledge of operation of deregulated electricity market systems.
- To calculate Available Transfer Capability (ATC) using different mechanisms
- To examine typical issues in electricity markets and how these are handled world –wide in various markets.
- To learn importance effects and classification of congestion management methods.
- To know the information about various ancillary services and markets in national international scenario

UNIT – I
Need and conditions for deregulation. Introduction of Market structure - Market Architecture - Spot market - forward markets and settlements. Review of Concepts marginal cost of generation - least-cost operation - incremental cost of generation. Power System Operation - Power Exchange.

UNIT – II
Electricity sector structures and Ownership /management - the forms of Ownership and management. Different structure model like Monopoly model - Purchasing agency model - wholesale competition model - Retail competition model - Definition of Available Transfer Capability (ATC) - computation of ATC.

UNIT – III
Framework and methods for the analysis of Bilateral and pool markets - LMP based markets.
Auction models and price formation - price based unit commitment - country practices.

UNIT – IV
Transmission network and market power. Power wheeling transactions and marginal costing - transmission costing. Congestion management methods- market splitting - counter-trading; Effect of congestion on LMPs- country practices.

UNIT – V
Ancillary Services and System Security in Deregulation. Classifications and definitions - AS management in various markets- country practices. Technical - economic - & regulatory issues involved in the deregulation of the power industry.

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Course Outcomes:

After the completion of the course the student should be able to:

- Know the essential and operation of deregulated electricity market systems.
- Learn about the different structure model.
- Analyze various types of electricity market operational and control issues using new mathematical models.
- Analyse LMP's wheeling transactions and congestion management.
- Analyze impact of ancillary services.

Text Books:

1. Power System Economics: Designing markets for electricity - Steven Stoft - wiley publishers - 2002.
2. Operation of restructured power systems - K. Bhattacharya - M.H.J. Bollen and J.E. Daalder – Springer - 2012.

Reference Books:

1. Power generation - operation and control - -J. Wood and B. F. Wollenberg - Wiley – 1998.
2. Market operations in electric power systems - M. Shahidehpour - H. Yaminand Z. Li – Wiley - 2003.
3. Fundamentals of power system economics - S. Kirschen and G. Strbac - Wiley - 2nd edition - 2018.
4. Optimization principles: Practical Applications to the Operation and Markets of the Electric Power Industry - N. S. Rau - IEEE Press series on Power Engineering.
5. "Competition and Choice in Electricity" by Sally Hunt and Graham Shuttleworth - Wiley publishers - 1997.

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IV Year –I SEMESTER		L	T	P	C
		3	0	0	3
DATA BASE MANAGEMENT SYSTEMS (Professional Elective –III)					

Course Objectives:
To learn the principles of systematically designing and using large scale Database Management Systems for various applications.

UNIT-I
Overview of Database System
Database System Applications, Purpose of Database Systems, View of Data, Database Languages, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Data Mining and Informational Retrieval, Specialty Databases, Database Users and Administrators, History of Database Systems**. [Text Book -2]**

UNIT-II
Introduction to Database Design
Database Design and ER Diagrams, Entities, Attributes and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design with the ER Model, Extended ER features **[Text Book -1]**

UNIT-III
Relational Model
Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity Constraints, Querying Relational Data, Logical Database Design: ER to Relational, Introduction to Views, Destroying/Altering Tables and Views **[Text Book -1]**

UNIT-IV
SQL: Queries, Constraints, Triggers
The Form of a Basic SQL Query, UNION, INTERSECT and EXCEPT, Nested Queries, Aggregate Operators, Null Values, Complex Integrity Constraints in SQL, Triggers, Exceptions, Procedures, Functions **[Text Book -1]**

UNIT-V
Normal Forms
Introduction to Schema Refinement, Functional Dependencies, Reasoning about FDs, Normal Forms, Properties of Decompositions, Normalization. **[Text Book -1]**

Course Outcomes: At the end of the course, student will be able to

- Illustrate the concept of databases, database management systems, database languages, database structures and their work
- Apply ER modeling and Relational modeling for designing simple databases.
- Summarize the concepts related to relational model and SQL and Write database queries using relational algebra and structured query language.
- Design and develop databases from the real world by applying the concepts of Normalization.
- Outline the issues associated with Transaction Management and Recovery, Tree Structured Indexing



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Text Books:

1. Data base Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke, Mc Graw-Hill
2. Data base System Concepts, 6/e, Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Mc Graw-Hill

Reference Books:

1. Database Systems, 6/e Ramez Elmasri, Shamkant B. Navathe, Pearson
2. Introduction to Database Systems, 8/e, C J Date, Pearson
3. Database Systems, 9/e, Carlos Coronel, Steven Morris, Peter Rob, Cengage

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IV Year – I SEMESTER		L	T	P	C
		3	0	0	3
HYBRID ELECTRIC VEHICLES (PROFESSIONAL ELECTIVE –IV)					

Preamble:
This course aims to study and understand merits of electric and hybrid electric vehicles. It also deals with different power electronic converters and battery storage systems for electric and hybrid electric vehicles.

Course Objectives:
- To familiarize the students with the need and advantages of electric and hybrid electric vehicles.
- To know various architectures of hybrid electric vehicles.
- To understand the power management of plug in electric vehicles.
- To study and understand different power converters used in electrical vehicles.
- To familiarize with different batteries and other storage systems.

UNIT - I
Introduction
Fundamentals of vehicle - components of conventional vehicle and propulsion load; Drive cycles and drive terrain; Concept of electric vehicle and hybrid electric vehicle; History of hybrid vehicles - advantages and applications of Electric and Hybrid Electric Vehicles.

UNIT - II
Hybridization of Automobile
Architectures of HEVs - series and parallel HEVs - complex HEVs. Plug-in hybrid vehicle(PHEV) - constituents of PHEV - comparison of HEV and PHEV; Extended range hybrid electric vehicles(EREVs) - blended PHEVs - Fuel Cell vehicles and its constituents.

UNIT - III
Special Machines for EV and HEVs
Characteristics of traction drive - requirement of electric motors for EV/HEVs. Induction Motor drives - their control and applications in EV/HEVs. Permanent magnet Synchronous motor: configuration - control and applications in EV/HEVs. Brushless DC Motors: Advantages - control of application in EV/HEVs. Switch reluctance motors: Merits limitations - converter configuration - control of SRM for EV/HEVs.

UNIT - IV
Power Electronics in HEVs
Boost and Buck-Boost converters - Multi Quadrant DC-DC converters - DC-AC Inverter for EV and HEV applications - Three Phase DC-AC inverters - Voltage control of DC-AC inverters using PWM - EV and PHEV battery chargers.

UNIT - V
Energy Sources for HEVs
Energy Storage - Battery based energy storage and simplified models of battery - fuel cells - their characteristics and simplified models - super capacitor based energy storage - its analysis and simplified models - flywheels and their modeling for energy storage in EV/HEV - Hybridization of various energy storage devices.

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Course Outcomes:

After the completion of the course the student should be able to:

- Know the concept of electric vehicles and hybrid electric vehicles.
- Familiar with different configuration of hybrid electric vehicles.
- Choose an effective motor for EV and HEV application
- Understand the power converters used in hybrid electric vehicles
- Know different batteries and other energy storage systems.

Text Books

1. Ali Emadi - Advanced Electric Drive Vehicles - CRC Press - 2014.
2. Iqbal Hussein - Electric and Hybrid Vehicles: Design Fundamentals - CRC Press - 2003.

Reference Books:

1. MehrdadEhsani - YimiGao - Sebastian E. Gay - Ali Emadi - Modern Electric - Hybrid Electric and Fuel Cell Vehicles: Fundamentals - Theory and Design - CRC Press - 2004.
2. James Larminie - John Lowry - Electric Vehicle Technology Explained - Wiley - 2003.
3. H. Partab: Modern Electric Traction - DhanpatRai& Co - 2007.

Research Books:

1. Pistooa G. - “Power Sources - Models - Sustanability - Infrstructure and the market” - Elsevier 2008
2. Mi Chris - Masrur A. - and Gao D.W. - “ Hybrid Electric Vehicle: Principles and Applications with Practical Perspectives” 1995.

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IV Year –I SEMESTER		L	T	P	C
		3	0	0	3
HIGH VOLTAGE ENGINEERING (PROFESSIONAL ELECTIVE – IV)					

Preamble:
With the growth of power, HV power transmission has become an important subject. The performance of generating equipment requires knowledge of different phenomena occurring at higher voltage. Thus evaluations of various insulating materials are required for protection of HV equipments. Keeping this in view the course is designed to understand various phenomena related to breakdown study and withstand characteristics of insulating materials. The course also describes the generation and measurement of DC, AC and Impulse voltages.

Course Objectives:
- To understand HV breakdown phenomena in gases.
- To understand the breakdown phenomenon of liquids and solid dielectrics.
- To acquaint with the generating principle of operation and design of HVDC, AC voltages.
- To understand the generating principles of Impulse voltages & currents.
- To understand various techniques for AC, DC and Impulse measurements of high voltages and currents.

UNIT - I
Break down phenomenon in Gaseous:
Insulating Materials: Types - applications and properties. Gases as insulating media – Collision process – Ionization process – Townsend's criteria of breakdown in gases and its limitations – Streamers Theory of break down – Paschen's law- Paschens curve.

UNIT - II
Break down phenomenon in Liquids:
Liquid as Insulator – Pure and commercial liquids – Breakdown in pure and commercial liquids.
Break down phenomenon in Solids:
Intrinsic breakdown – Electromechanical breakdown – Thermal breakdown –Breakdown of composite solid dielectrics.

UNIT - III
Generation of High DC voltages:
Voltage Doubler Circuit - Voltage Multiplier Circuit – Vande- Graaff Generator.
Generation of High AC voltages:
Cascaded Transformers – Resonant Transformers –Tesla Coil

UNIT - IV
Generation of Impulse voltages:
Specifications of impulse wave – Analysis of RLC circuit only- Marx Circuit.
Generation of Impulse currents:
Definitions – Circuits for producing Impulse current waves – Wave shape control - Tripping and control of impulse generators.

UNIT - V
Measurement of High DC & AC Voltages:
Resistance potential divider - Generating Voltmeter - Capacitor Voltage Transformer (CVT) - Electrostatic Voltmeters – Sphere Gaps.

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Measurement of Impulse Voltages & Currents:
Potential dividers with CRO - Hall Generator - Rogowski Coils.

Course Outcomes:
After the completion of the course the student should be able to:

- Recognise the dielectric properties of gaseous materials used in HV equipment.
- Differentiate the break down phenomenon in liquid and solid dielectric materials.
- Acquaint with the techniques of generation of high AC and DC voltages
- Acquaint with the techniques of generation of high Impulse voltages and currents.
- Getting the knowledge of measurement of high AC - DC - Impulse voltages and currents.

Text Books:

1. High Voltage Engineering: Fundamentals by E.Kuffel - W.S.Zaengl - J.Kuffel by Elsevier - 2nd Edition.
2. High Voltage Engineering and Technology by Ryan - IET Publishers - 2nd edition.

Reference Books:

1. High Voltage Engineering by M.S.Naidu and V. Kamaraju – TMH Publications - 3rd Edition.
2. High Voltage Engineering by C.L.Wadhwa - New Age Internationals (P) Limited – 1997.
3. High Voltage Insulation Engineering by RavindraArora - Wolfgang Mosch - New Age International (P) Limited - 1995.

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IV Year –I SEMESTER		L	T	P	C
		3	0	0	3
PROGRAMMABLE LOGIC CONTROLLERS AND APPLICATIONS (PROFESSIONAL ELECTIVE –IV)					

Preamble:
Technological advances in recent years have resulted in the development of the programmable logic controllers (PLCS) and a consequence resolution of control engineering. This course is an introduction topic and aims to ease the tasks of students coming first into constant in the PLCs. It addresses the different nomenclature and programs forms with examples**.**

Course Objectives:
- To understand the various components of PLC systems and ladder diagrams.
- To know the programming instructions and registers in the PLC.
- To understand the use and applications of timer and counter functions.
- To familiar the data handling function and this application.
- To understand and implementation of analog operations and PID modules.

UNIT – I
Introduction to PLC systems
I/O modules and interfacing - CPU processor - programming Equipment - programming formats - construction of PLC ladder diagrams - Devices connected to I/O Modules. Digital logic gates - programming in the Boolean algebra system - conversion examples Ladder Diagrams for process control: Ladder diagrams & sequence listings - ladder diagram construction and flowchart for spray process system.

UNIT – II
PLC Programming: Input instructions - outputs - operational procedures - programming examples using contacts and coils. Drill press operation.
PLC Registers: Characteristics of Registers - module addressing - holding registers - Input Registers - Output Registers.

UNIT – III
PLC Functions: Timer functions & Industrial applications - counters - counter function industrial applications - Arithmetic functions - Number comparison functions - number conversion functions.

UNIT – IV
Data Handling functions: SKIP - Master control Relay - Jump - Move - FIFO - FAL - ONS - CLR & Sweep functions and their applications. Bit Pattern and changing a bit shift register - sequence functions and applications - controlling of two-axis & three axis Robots with PLC - Matrix functions.

UNIT – V
Analog PLC operation: Analog modules & systems - Analog signal processing - Multi bit Data Processing - Analog output Application Examples - PID principles - position indicator with PID control - PID Modules - PID tuning - PID functions.

Course Outcomes:
After the completion of the course the student should be able to:
- Illustrate I/O modules of PLC systems and ladder diagrams
- Demonstrate various types registers and programming instructions.
- Examine various types of PLC functions and its applications.
- Assess different data handling functions and its applications.
- Describe the analog operations and PID modules.

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Text books:

1. Programmable Logic Controllers- Principles and Applications by John W. Webb & Ronald A. Reiss - Fifth Edition - PHI
2. Programmable Logic Controllers- Programming Method and Applications –JR.Hackworth &F.D Hackworth Jr. –Pearson - 2004

Reference Books:

1. Introduction to Programmable Logic Controllers- Gary A. Dunning - 3rd edition - Cengage Learning - 2005.
2. Programmable Logic Controllers –W.Bolton - 5th Edition - Elsevier publisher - 2009.

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IV Year –I SEMESTER		L	T	P	C
		3	0	0	3
CLOUD COMPUTING WITH AWS **(PROFESSIONAL ELECTIVE –IV)**					

Course Objectives:

This course is intended to analyze the basics of cloud computing, and make aware students with diversified technologies working for cloud architecture. Course will be focusing on architecture, service models, privacy & security in cloud.

UNIT-I

Introduction of Cloud Computing: What is Cloud Computing, How it works, Types of Cloud, Goals & Challenges, Leveraging Cloud Computing, Cloud Economics and Total Cost of Ownership

UNIT-II

Cloud Service Models Software as a Service (SaaS): Introduction, Challenges in SaaS Model, SaaS Integration Services, Advantages and Disadvantages. Infrastructure As a Services (IaaS): Introduction, Virtual Machines, VM Migration Services, Advantages and Disadvantages. Platform As a service (PaaS): Introduction, Integration of Private and Public Cloud, Advantages and Disadvantages.

UNIT-III

Virtualization and Abstraction: What is Virtualization and how abstraction is provided in cloud? Advantages and Disadvantages, Types of Hypervisor, and Load balancing.

UNIT-IV

Amazon Web Services Getting started with AWS, AWS Compute, Storage, and Networking, AWS Security, Identity, and Access Management, AWS Database Options, AWS Elasticity and Management Tools

UNIT-V

Architecting on AWS Introduction to System Design: AWS Essentials Review and System Design for High Availability, Automation and Serverless Architectures: Event-Driven Scaling, Well-Architected Best Practices: Security, Reliability, Performance Efficiency, Cost Optimization and Deployment and Implementation: Design Patterns and Sample Architectures

Course Outcomes:

Upon completion of this course, the students will be able to

- Understand and analyze the architecture of Cloud (Analyze).
- Identify and apply deployment and management options of AWS Cloud Architecture (Apply).
- Design architectures to decouple infrastructure and reduce interdependencies (Create).

Text books:

1. Judith Hurwitz, R Bloor, M.Kanfman, F.Halper “Cloud Computing for Dummies”, Wiley India Edition, First Edition
2. Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, ”Cloud Computing: Principles and Paradigms”, Wiley Publication, 2011

Reference Books:

1. Tim Mather, SubraKumara swamy, Shahed Latif, "Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance", O'ReillyMedia Inc, 2009
2. Mickey Iqbal 2010, " IT Virtualization Best Practices: A Lean, Green Virtualized Data Center Approach", MC Press
3. Frank H. P. Fitzek, Marcos D. Katz, "Mobile Clouds: Exploiting Distributed Resources in Wireless, Mobile and Social Networks", Wiley Publications, ISBN: 978-0-470- 97389-9, Jan 2014.

e-Books:

1. https://www.manning.com/books/exploring-cloud-computing (Paid Version)

Supplementary Resources:

1. NPTEL online course : https://onlinecourses.nptel.ac.in/noc17_cs23/preview
2. MOOC : https://www.edx.org/micromasters/cloud-computing
3. Coursera: https://www.coursera.org/specializations/cloud-computing
4. AWS Academy: AWS Cloud Computing Architecture at https://aws.amazon.com/training/awsacademy/cloud-computing-architecture/

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IV Year –I SEMESTER		L	T	P	C
		3	0	0	3
DEEP LEARNING TECHNIQUES (PROFESSIONAL ELECTIVE –IV)					

Course Objectives: At the end of the course, the students will be expected to:

- Learn deep learning methods for working with sequential data,
- Learn deep recurrent and memory networks,
- Learn deep Turing machines,
- Apply such deep learning mechanisms to various learning problems.
- Know the open issues in deep learning, and have a grasp of the current research directions.

UNIT-I
Fundamentals of Deep Learning
Artificial Intelligence, History of Machine learning: Probabilistic Modeling, Early Neural Networks, Kernel Methods, Decision Trees, Random forests and Gradient Boosting Machines, **Fundamentals of Machine Learning:** Four Branches of Machine Learning, Evaluating Machine learning Models, Overfitting and Underfitting. **[Text Book 2]**

UNIT-II
Introducing Deep Learning
Biological and Machine Vision, Human and Machine Language, Artificial Neural Networks, Training Deep Networks, Improving Deep Networks. **[Text Book3]**

UNIT-III
Neural Networks
Anatomy of Neural Network, Introduction to Keras: Keras, TensorFlow, Theano and CNTK, Setting up Deep Learning Workstation, Classifying Movie Reviews: Binary Classification, Classifying newswires: Multiclass Classification. **[Text Book 2]**

UNIT-IV
Convolutional Neural Networks
Nerual Network and Representation Learing, Convolutional Layers, Multichannel Convolution Operation, **Recurrent Neural Networks:** Introduction to RNN, RNN Code, PyTorch Tensors: Deep Learning with PyTorch, CNN in PyTorch. **[Text Book 3]**

UNIT-V
Interactive Applications of Deep Learning
Machine Vision, Natural Language processing, Generative Adversial Networks, Deep Reinforcement Learning. **[Text Book 1]**
Deep Learning Research: Autoencoders**,** Deep Generative Models: Boltzmann Machines Restricted Boltzmann Machines, Deep Belief Networks. **[Text Book 1]**

Course Outcomes: After the completion of the course, student will be able to

- Demonstrate the fundamental concepts learning techniques of Artificial Intelligence, Machine Learning and Deep Learning.
- Discuss the Neural Network training, various random models**.**
- Explain the Techniques of Keras, TensorFlow, Theano and CNTK
- Classify the Concepts of CNN and RNN
- Implement Interactive Applications of Deep Learning.

Text Books:

1. Deep Learning- Ian Goodfellow, Yoshua Bengio and Aaron Courvile, MIT Press, 2016
2. Deep Learning with Python - Francois Chollet, Released December 2017, Publisher(s): Manning Publications, ISBN: 9781617294433
3. Deep Learning Illustrated: A Visual, Interactive Guide to Artificial Intelligence - Jon Krohn, Grant Beyleveld, Aglaé Bassens, Released September 2019, Publisher(s): Addison-Wesley Professional, ISBN: 9780135116821
4. Deep Learning from Scratch - Seth Weidman, Released September 2019, Publisher(s): O'Reilly Media, Inc., ISBN: 9781492041412

Reference Books:

1. Artificial Neural Networks, Yegnanarayana, B., PHI Learning Pvt. Ltd, 2009.
2. Matrix Computations, Golub, G.,H., and Van Loan,C.,F, JHU Press,2013.
3. Neural Networks: A Classroom Approach, Satish Kumar, Tata McGraw-Hill Education, 2004.

Web Link:

1. Swayam NPTEL: Deep Learning: https://onlinecourses.nptel.ac.in/noc22_cs22/preview

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IV Year –I SEMESTER		L	T	P	C
		3	0	0	3
POWER SYSTEM OPERATION AND CONTROL (PROFESSIONAL ELECTIVE –V)					

Preamble:
This subject deals with economic operation of Power Systems, Hydrothermal scheduling and modeling of turbines, generators and automatic controllers. It emphasizes on single area and two area load frequency control and reactive power control.

Course Objectives:
- To understand optimal dispatch of generation with and without losses.
- To understand the optimal scheduling of hydro thermal systems.
- To understand the optimal unit commitment problem.
- To understand the load frequency control for single area system with and without controllers
- To understand the load frequency control for two area system with and without controllers
- To understand the reactive power control and compensation of transmission lines.

UNIT - I
Economic Operation of Power Systems
Optimal operation of Generators in Thermal power stations - – Heat rate curve – Cost Curve – Incremental fuel and Production costs – Input–output characteristics – Optimum generation allocation with line losses neglected – Optimum generation allocation including the effect of transmission line losses – Loss Coefficients – General transmission line loss formula.

UNIT - II
Hydrothermal Scheduling
Mathematical Formulation – Solution Technique.
Unit Commitment
Need for unit commitment – Constraints in unit commitment – Cost function formulation – Solution methods – Priority ordering – Dynamic programming.

UNIT – III
Load Frequency Control-I
Modelling of steam turbine – Generator – Mathematical modelling of speed governing system – Transfer function – Necessity of keeping frequency constant. Definitions of Control area – Single area control system – Block diagram representation of an isolated power system – Steady state analysis – Dynamic response – Uncontrolled case. Proportional plus Integral control of single area and its block diagram representation – Steady state response.

UNIT - IV
Load Frequency Control-II
Block diagram development of Load Frequency Control of two area system uncontrolled case and controlled case – Tie-line bias control – Load Frequency Control and Economic dispatch control.

UNIT - V
Compensation in Power Systems
Overview of Reactive Power control – Reactive Power compensation in transmission systems – Advantages and disadvantages of different types of compensating equipment for transmission systems – Load compensation – Specifications of load compensator – compensated transmission lines. Introduction of FACTS devices – Need of FACTS controllers – Types of FACTS devices.

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Course Outcomes:

After the completion of the course the student should be able to:

- Compute optimal load scheduling of Generators.
- Formulate hydrothermal scheduling and unit commitment problem..
- Analyse effect of Load Frequency Control for single area systems
- Analyse effect of Load Frequency Control for two area systems
- Describe the effect of reactive power control for transmission lines.

Text Books:

1. Power Generation - Operation and Control by Allen J Wood - Bruce F WollenBerg 3rd Edition - Wiley Publication 2014.
2. Electric Energy systems Theory – by O.I.Elgerd - Tata McGraw–hill Publishing Company Ltd. - Second edition.
3. Modern Power System Analysis – by I.J.Nagrath&D.P.Kothari Tata McGraw Hill Publishing Company Ltd - 2nd edition.

Reference Books:

1. Power System Analysis and Stability by S.S.Vadhera - Khanna Publications - 4th edition - 2005.
2. Power System Analysis by Grainger and Stevenson - Tata McGraw Hill.
3. Power System Analysis by HadiSaadat – – Tata McGraw–Hill 3rd edition - 2010.
4. Power System stability & control - Prabha Kundur - TMH - 1994.

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IV Year –I SEMESTER		L	T	P	C
		3	0	0	3
SWITCHED MODE POWER CONVERSION (PROFESSIONAL ELECTIVE –V)					

Preamble:
This course is highly relevant to students who are interested in analysis, design and control of switch mode converters.

Course Objectives:
- To illustrate CCM and DCM modes of operation of non-isolated switched mode converters.
- To illustrate the working of isolated switched mode converters.
- To analyze ZVS and ZCS operation of buck, boost converters.
- To learn about the control schemes & design aspects of transformers, inductors and capacitors.
- To model the converters and design controller for closed loop operation of switched mode converters.

UNIT – I
Non-Isolated Switch Mode Converters
Control of DC-DC converters: Buck converters - Boost converters - Buck-Boost converter - CUK Converter - continuous and discontinuous operation - Converter realization with non-ideal components.

UNIT – II
Isolated Switched Mode Converters
Forwarded converter - flyback converter - push-pull converter - half-bridge converter - full bridge converter.

UNIT – III
Resonant Converters
Basic resonant circuit concepts - series resonant circuits - parallel resonant circuits - zero current switching quasi-resonant buck converter - zero current switching quasi-resonant boost converter - zero voltage switching quasi-resonant buck converter - zero voltage switching quasi-resonant boost converter.

UNIT – IV
Control Schemes of Converters and Magnetic Design
Voltage mode control - Current mode control - Current control mode instability.
Magnetic Design: Transformer design - inductor and capacitor design.

UNIT – V
Modelling of Converters and Controller Design Based on Linearization:
Formulation of large signal models for buck and boost converters using state space analysis-derivation of averaged large signal model using circuit averaging method-small signal model derivation- average switch modelling technique to obtain small signal models of buck and boost converters- Transfer function of converters-Controller design based on linearization.

Course Outcomes:
After the completion of the course the student should be able to:
- Design and analyse the operation of non-isolated switch mode converters.
- Analyze the operation of isolated switch mode converters.
- Illustrate the operation of resonant converters.
- Analyse the control schemes of converters and design transformer and inductor.
- Model the converters and design controller for closed loop operation.

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Text Books:

1. Fundamentals of Power Electronics- Erickson - Robert W. - Maksimovic - Dragan - Springer - 2011.
2. Power switching converters- Simon Ang - Alejandro Oliva - CRC Press - 2010.
3. Power Electronics: Essentials & Applications- L. Umanand, S.P. Bhat, John Wiley & Sons Australia, 1992.

Reference Books:

1. Switching Power Supply Design- Abraham I. Pressman - McGraw-Hill Ryerson - Limited - 1991.
2. Power Electronics: converters Applications & Design – Mohan - Undeland - Robbins-Wiley publications.
3. Design of Magnetic Components for Switched Mode Power Converters- Z Umanand - S.P. Bhat - John Wiley & Sons Australia - 1992.
4. Elements of Power Electronics – Philip T. Krein - Oxford University press - 2014.

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IV Year – I SEMESTER		L	T	P	C
		3	0	0	3

AI APPLICATIONS TO ELECTRICAL ENGINEERING
(PROFESSIONAL ELECTIVE – V)

Preamble:
This course introduces the basics of Neural Networks and essentials of Artificial Neural Networks with Single Layer and Multilayer Feed Forward Networks. Also deals with Associate Memories and introduces Fuzzy sets and Fuzzy Logic system components. The Neural Network and Fuzzy Network system application to Electrical Engineering is also presented. This subject is very important and useful for doing Project Work.

Course Objectives:
- To understand artificial neuron models & learning methods of ANN.
- To utilize different algorithms of ANN.
- To distinguish between classical and fuzzy sets.
- To illustrated different modules of fuzzy controller.
- To analyze applications of neural networks and fuzzy logic.

UNIT – I
Introduction
Artificial Neural Networks (ANN) – Humans and computers – Biological neural networks – ANN Terminology – Models of Artificial neuron – activation functions – typical architectures – biases and thresholds – learning strategy(supervised - unsupervised and reinforced) – Neural networks learning rules. Single layer feed forward neural networks: concept of pattern and its types - perceptron training and classification using Discrete and Continuous perceptron algorithms– linear separability- XOR function.

UNIT – II
Multi-layer feed forward networks
Generalized delta rule– Back Propagation algorithm– Radial Basis Function (RBF) network - Kohonen's self-organizing feature maps (KSOFM) - Learning Vector Quantization (LVQ) – Bidirectional Associative Memory (BAM) – Hopfield Neural Network.

UNIT – III
Classical Sets and Fuzzy Sets
Introduction to classical sets- properties - Operations and relations - Fuzzy sets - Operations - Properties - Fuzzy relations - Cardinalities - Membership functions.

UNIT – IV
Fuzzy Logic Modules
Fuzzification - Membership value assignment - development of rule base and decision making system - Defuzzification to crisp sets - Defuzzification methods.

UNIT – V
Applications
Neural network applications: Load flow studies - load forecasting - reactive power control.
Fuzzy logic applications: Economic load dispatch - speed control of DC motors - single area and two area load frequency control.

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Course Outcomes:

After the completion of the course the student should be able to:

- Analyse different models of artificial neuron & Use learning methods of ANN.
- Evaluate different paradigms of ANN.
- Classify between classical and fuzzy sets.
- Illustrate different modules of Fuzzy logic controller.
- Apply Neural Networks and fuzzy logic for real-time applications.

Text Books:

1. Introduction to Artificial Neural Systems - Jacek M. Zuarda - Jaico Publishing House - 1997.
2. Neural Networks - Fuzzy logic - Genetic algorithms: synthesis and applications by Rajasekharanand Pai – PHI Publication.

Reference Books:

1. Artificial Neural Network – B.Yegnanarayana - PHI - 2012.
2. Fuzzy logic with Fuzzy Applications – T.J Ross – Mc Graw Hill Inc - 1997.
3. Introduction to Neural Networks using MATLAB 6.0 – S N Sivanandam - SSumathi - S N Deepa TMGH
4. Introduction to Fuzzy Logic using MATLAB – S N Sivanandam - SSumathi - S N Deepa Springer - 2007.

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IV Year –I SEMESTER		L	T	P	C
		3	0	0	3
DATA SCIENCE (PROFESSIONAL ELECTIVE –V)					

Course Objectives:
From the course the student will learn
- Provide you with the knowledge and expertise to become a proficient data scientist.
- Demonstrate an understanding of statistics and machine learning concepts that are vital for data science;
- Produce Python code to statistically analyze a dataset;
- Critically evaluate data visualizations based on their design and use for communicating stories from data

UNIT-I
Introduction to Core Concepts and Technologies
Introduction, Terminology, data science process, data science toolkit, Types of data, Example applications.

UNIT-II
Data Collection and Management
Introduction, Sources of data, Data collection and APIs, Exploring and fixing data, Data storage and management, using multiple data sources.

UNIT-III
Data Analysis
Introduction, Terminology and concepts, Introduction to statistics, Central tendencies and distributions, Variance, Distribution properties and arithmetic, Basic machine learning algorithms, Linear regression, SVM, Naive Bayes.

UNIT-IV:
Data Visualization
Introduction, Types of data visualization, Data for visualization- Data types, Data encodings, Retinal variables, Mapping variables to encodings, Visual encodings.

UNIT-V
Applications of Data Science
Technologies for visualization, Bokeh (Python), recent trends in various data collection and analysis techniques, various visualization techniques, application development methods of used in data science.

Course Outcomes:
By the end of the course, student will be able to
- Acquire the knowledge and expertise to become a proficient data scientist
- Demonstrate an understanding of statistics and machine learning concepts that are vital for data science
- Explain how data is collected, managed and stored for data science
- Interpret the key concepts in data science, including their real-world applications and the toolkit used by data scientists
- Illustrate data collection and management scripts using MongoDB



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Text Books:

1. "The Art of Data Science", 1st edition, Roger D. Peng and Elizabeth matsui, Lean Publications, 2015
2. "Algorithms for Data Science", 1st edition, Steele, Brian, Chandler, John, Reddy, Swarna, springers Publications, 2016

Reference Books:

1. Doing Data Science: Straight Talk From The Frontline, 1st edition, Cathy O'Neil and Rachel Schutt, O'Reilly, 2013
2. Mining of Massive Datasets, 2nd edition, Jure Leskovek, Anand Rajaraman and Jeffrey Ullman, v2.1, Cambridge University Press, 2014

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IV Year –I SEMESTER		L	T	P	C
		3	0	0	3
MEAN STACK TECHNOLOGIES (PROFESSIONAL ELECTIVE –V)					

Course Objectives:

- To Learn the basics of Web Designing using HTML, DHTML, and CSS
- To learn the basics about Client side scripts and Server side scripts

UNIT I
HTML & DHTML
Introduction, HTML Formatting, Hyper-Links, Lists, Tables, Images, Forms, Frames, Cascading Style sheets, Types, XML, Document type definition, XML Schemas, Document Object model, HTML and Scripting Access, Rollover Buttons, Moving objects with DHTML, Ramifications of DHTML.

UNIT II
Introduction to Client Side scripting
JavaScript, Control statements, Functions, Arrays, Objects, Events, Dynamic HTML with Java Script, AJAX: Ajax Client Server Architecture, XML Http Request Object, Call Back Methods.

UNIT III
Web Application
Web servers, IIS (XAMPP, LAMPP) and Tomcat Servers, Server Side Scripting, Java Servlets, Java Server Pages, Java Server Faces, JSF Components, Session Tracking, Cookies.

UNIT- IV: PHP Programming
Basic Syntax, Defining variable and constant, PHP Data types, Operator and Expression, Operator Precedence, Decisions and Loop, Functions & Recursion, String Processing and Regular Expressions, Form Processing, Working with file and Directories, Cookies.

UNIT- V
JDBC
Database Connectivity with MySQL, Servlets, JSP, PHP, MongoDB, NOSQL Database, Fundamentals of JQuery and Bootstrap.
Case Studies - Student information system, Health Management System

Course Outcomes: At the end of the course, student will be able to

- Describe basics of Web Designing using HTML, DHTML, and CSS
- Build real world applications using client side and server side scripting languages
- Design and develop applications using web servers
- Analyze the basics of PHP programming
- Apply Database connectivity with case study for student Information System and Health Management system

Text Books:

1. Paul J. Deitel, Harvey M. Deitel, Abbey Deitel, “Internet & World Wide Web How to Program”, Fifth Edition, Deitel Series, 2012.
2. Jason Gilmore, “Beginning PHP and MySQL from Novice to Professional”, Fourth Edition, Apress Publications, 2010.



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Reference Books:

1. Brown, Ethan, "Web Development with Node and Express: Leveraging the JavaScript Stack", O'Reilly Media, 2019. CSE Dept. Flexible Curriculum NITTUGCSE19 95.
2. Anthony, Accomazzo, Murray Nathaniel, Lerner Ari, "Fullstack React: The Complete Guide to React JS and Friends", Fullstack.io, 2017.
3. Kozlowski, Pawel, "Mastering Web Application Development with Angular JS", Packt Publishing Ltd., 2013.
4. Robert W. Sebesta, "Programming with World Wide Web", Fourth Edition, Pearson, 2008.
5. David William Barron, "The World of Scripting Languages", Wiley Publications, 2000.
6. Dayley B., "Node.js, MongoDB, and AngularJS Web Development", Addison-Wesley Professional, 2014.
7. Vainikka J., "Full-Stack Web Development using Django REST Framework and React", 2018

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IV Year – I SEMESTER		L	T	P	C
		3	0	0	3

CONCEPTS OF MICROPROCESSORS AND MICROCONTROLLERS
(OPEN ELECTIVE –III)

Preamble:
Microprocessor and Microcontroller have become important building blocks in digital electronics design. It is important for student to understand the architecture of a microprocessor and its interfacing with various modules. 8086 microprocessor architecture, programming, and interfacing is dealt in detail in this course. Interfacing, PIC, architecture, programming in C.

Course objectives:
- To understand the organization and architecture of Microprocessor.
- To understand addressing modes to access memory.
- To understand the interfacing of Microprocessor with I/O as well as other devices
- To understand 8051 micro controller architecture
- To understand interfacing of 8051 and their applications.

UNIT – I
Introduction to Microprocessor Architecture
Introduction and evolution of Microprocessors – Architecture of 8086 – Memory Organization of 8086 – Register Organization of 8086– Introduction to 80286 - 80386 - 80486 and Pentium (brief description about architectural advancements only).

UNIT – II
Minimum and Maximum Mode Operations
Instruction sets of 8086 - Addressing modes – Assembler directives - General bus operation of 8086 – Minimum and Maximum mode operations of 8086 – 8086 Control signal interfacing – Read and write cycle timing diagrams.

UNIT – III
Microprocessors I/O Interfacing
8255 PPI– Architecture of 8255–Modes of operation – Interfacing I/O devices to 8086 using 8255 – Interfacing A to D converters – Interfacing D to A converters – Stepper motor interfacing– Static memory interfacing with 8086.

UNIT – IV
8051 Microcontroller
Overview of 8051 Microcontroller – Architecture – Signal description – Register set – Memory and I/O addressing.

UNIT - V
8051 Interfacing and Applications
Instruction set – I/O ports and Interrupts – Timers and Counters – Serial Communication – Interfacing of peripherals – Applications of microcontrollers.

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Course Outcomes:

After the completion of the course the student should be able to:

- Know the concepts of the Microprocessor capability in general and explore the evaluation of microprocessors.
- Analyse the instruction sets - addressing modes - minimum and maximum modes operations of 8086 Microprocessors
- Analyse the Microcontroller and interfacing capability.
- Describe the architecture and interfacing of 8051 controller.
- Know the concepts of PIC micro controller and its programming.

Text Books:

1. Ray and Burchandi - "Advanced Microprocessors and Interfacing" - Tata McGraw–Hill - 3rd edition - 2006.
2. Kenneth J Ayala - "The 8051 Microcontroller Architecture - Programming and Applications" - Thomson Publishers - 2nd Edition.

Reference Books:

1. Microprocessors and Interfacing - Douglas V Hall - Mc–Graw Hill - 2nd Edition.
2. R.S. Kaler - "A Text book of Microprocessors and Micro Controllers" - I.K. International Publishing House Pvt. Ltd.

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IV Year – II SEMESTER		L	T	P	C
		3	0	0	3
FUNDAMENTALS OF ELECTRIC VEHICLES (OPEN ELECTIVE-III)					

Preamble:
This course aims to study and understand merits of electric and hybrid electric vehicles. It also deals with different power electronic converters and battery storage systems for electric and hybrid electric vehicles.

Course Objectives:
- To familiarize the students with the need and advantages of electric and hybrid electric vehicles.
- To understand various power converters used in electric vehicles.
- To know various architecture of hybrid electric vehicles.
- To be familiar all the different types of motors suitable for electric vehicles.
- To have knowledge on latest developments in strategies and other storage systems.

UNIT – I
Introduction
Fundamentals of vehicles - Components of conventional vehicles - drawbacks of conventional vehicles – Need for electric vehicles - History of Electric Vehicles – Types of Electric Vehicles – Advantages and applications of Electric Vehicles.

UNIT – II
Components of Electric Vehicles
Main components of Electric Vehicles – Power Converters - Controller and Electric Traction Motor – Rectifiers used in EVs – Bidirectional DC–DC Converters – Voltage Source Inverters – PWM inverters used in EVs.

UNIT – III
Hybrid Electric Vehicles
Evolution of Hybrid Electric Vehicles – Advantages and Applications of Hybrid Electric Vehicles – Architecture of HEVs - Series and Parallel HEVs – Complex HEVs – Range extended HEVs – Examples - Merits and Demerits.

UNIT – IV
Motors for Electric Vehicles
Characteristics of traction drive - requirements of electric machines for EVs – Different motors suitable for Electric and Hybrid Vehicles – Induction Motors – Synchronous Motors – Permanent Magnetic Synchronous Motors – Brushless DC Motors – Switched Reluctance Motors (Construction details and working only)

UNIT – V
Energy Sources for Electric Vehicles
Batteries - Types of Batteries – Lithium-ion - Nickel-metal hydride - Lead-acid – Comparison of Batteries - Battery Management System – Ultra capacitors – Flywheels – Fuel Cell – it's working.

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Course Outcomes:

After the completion of the course the student should be able to:

- Illustrate different types of electric vehicles.
- Select suitable power converters for EV applications.
- Design HEV configuration for a specific application.
- Choose an effective method for EV and HEV applications.
- Analyse a battery management system for EV and HEV.

Text Books

1. Iqbal Hussein - Electric and Hybrid Vehicles: Design Fundamentals - CRC Press - 2021.
2. Denton - Tom. Electric and hybrid vehicles. Routledge - 2020.

Reference Books:

1. Kumar - L. Ashok - and S. Albert Alexander. Power Converters for Electric Vehicles. CRC Press - 2020.
2. Chau - Kwok Tong. Electric vehicle machines and drives: design - analysis and application. John Wiley & Sons - 2015.
3. Berg - Helena. Batteries for electric vehicles: materials and electrochemistry. Cambridge university press - 2015.
4. NPTEL \ SWAYAM.

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IV Year – II SEMESTER		L	T	P	C
		3	0	0	3
CONCEPTS OF INTERNET OF THINGS (OPEN ELECTIVE-III)					

Course Objectives:
From the course the student will learn
- the application areas of IOT
- the revolution of Internet in Mobile Devices, Cloud & Sensor Networks
- building blocks of Internet of Things and characteristics

UNIT–I
The Internet of Things-
An Overview of Internet of things, Internet of Things Technology, behind IoTs Sources of the IoTs, Examples OF IoTs, Design Principles For Connected Devices, Internet connectivity, **Application Layer Protocols-** HTTP, HTTPS, FTP

UNIT–II
Business Models for Business Processes in the Internet of Things, IoT/M2M systems LAYERS AND designs standardizations, Modified OSI Stack for the IoT/M2M Systems ,ETSI M2M domains and High-level capabilities, Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability.

UNIT-III
Design Principles for the Web Connectivity for connected-Devices, Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected-Devices.

UNIT-IV
Data Acquiring, Organizing and Analytics in IoT/M2M, Applications/Services/Business Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in the Internet Of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.

UNIT-V
Data Collection, Storage and Computing Using a Cloud Platform for IoT/M2M Applications/Services, Data Collection, Storage and Computing Using cloud platform Everything as a service and Cloud Service Models, IOT cloud-based services using the Xively (Pachube/COSM), Nimbits and other platforms Sensor, Participatory Sensing, Actuator, Radio Frequency Identification, and Wireless, Sensor Network Technology, Sensors Technology, Sensing the World.

Course Outcomes:
By the end of the course, student will be able to
- Review Internet of Things (IoT).
- Demonstrate various business models relevant to IoT.
- Construct designs for web connectivity
- Organize sources of data acquisition related to IoT, integrate to enterprise systems.
- Describe IoT with Cloud technologies.

Text Books:

1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education
2. Internet of Things, A.Bahgya and V.Madisetti, Univesity Press, 2015

Reference Books:

1. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley
2. Getting Started with the Internet of Things, CunoPfister , Oreilly

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IV Year – II SEMESTER		L	T	P	C
		3	0	0	3

CONCEPTS OF POWER SYSTEM ENGINEERING
(OPEN ELECTIVE-IV)

Preamble:
This course introduces the basic concepts and knowledge regarding the power system engineering. The Course is giving the concepts of power generation, power transmission and distribution. It also covers protection, economics and power factor improvement concepts. This subject is very much useful to gain knowledge in the power systems.

Course Objectives:
- To understand the types of electric power plants and their working principles.
- To understand the concepts of electric power transmission and distribution.
- To gain the knowledge of protection and grounding of power system components.
- To know the economic aspects of electrical energy.
- To learn the importance of power factor improvement and voltage control.

UNIT - I
Power Generation Concepts & Types
Generation and sources of Energy – working principle and Schematic diagram approach of Thermal Power Plant – Hydro Power Plant - Nuclear Power Plant – Gas Power Plants – Comparison between Power Plants.

UNIT - II
Transmission and Distribution Concepts
Types of Conductors Materials – Constants of Transmission Line – Classification of Overhead Transmission Lines – Performance of Short Transmission Lines – Simple Problems.
Basic concept of Sub Station – Distribution Systems – Connection Schemes of Distribution Systems – Structure of Cables – Differences between Overhead & Underground systems.

UNIT - III
Protection and Grounding
List of Faults – Basic concepts of fuse – Circuit Breakers – Relays – SF_6 Circuit Breakers – Vacuum Circuit Breakers – Operation of Lightning Arrester – Grounding and its advantages - Methods of Neutral Grounding: Resistance - Reactance and Resonant Grounding – Numerical Problems.

UNIT - IV
Economic Aspects
Definitions of Load - Load & Load Duration Curves - Load Factor - Demand Factor – Utilization Factor – Types of Tariff - Cost of Electrical Energy – Expression for Cost of Electrical Energy – Numerical Problems

UNIT - V
Power Factor Improvement and Voltage Control
Power Factor – Effects and Causes of low Power Factor- Shunt & Series Capacitor Compensation - Numerical Problems – Need of Voltage Control – Types of Voltage regulating Devices.

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Course Outcomes:

After the completion of the course the student should be able to:

- Know the concepts of power generation by various types of power plants.
- Learn about transmission line concepts and distribution systems schemes.
- Learn about protection equipments and grounding methods of power system.
- Know the economic aspects of electrical energy and their importance.
- Know the importance of power factor improvement and voltage control in power systems.

Text Books:

1. Principles of Power System by V.K.Mehata - Rohit Mehata - S.Chand Publishers.

Reference Books:

1. Electrical Power Systems by C.L.Wadwa - New Age International Publishers.

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IV Year – II SEMESTER		L	T	P	C
		3	0	0	3

CONCEPTS OF SMART GRID TECHNOLOGIES
(OPEN ELECTIVE-IV)

Preamble:
To impart the student to have an basic information of latest technologies on electrical power system scenario.

Course Objectives:
- To understand the basic concepts of smart grid.
- To understand various smart grid technologies and its usage in smart applications.
- To realize substation automation with intelligent sensors and have an idea on battery energy storage systems.
- To have basic knowledge on micro grids and DG's.
- To have an idea on communication technologies used in smart grid.

UNIT – I
Introduction to Smart Grid
Evolution of Electric Grid - Concept of Smart Grid - Definitions - Need of Smart Grid - Functions of Smart Grid - Opportunities & Barriers of Smart Grid - Difference between conventional & smart grid - Concept of Resilient & Self-Healing Grid - Present development & International policies on Smart Grid.

UNIT – II
Smart Grid Technologies: Part 1
Introduction to Smart Meters - Real Time Pricing - Smart Appliances - Automatic Meter Reading(AMR) - Outage Management System(OMS) - Plug in Hybrid Electric Vehicles(PHEV) - Vehicle to Grid - Smart Sensors - Home & Building Automation - Phase Shifting Transformers - Net Metering.

UNIT – III
Smart Grid Technologies: Part 2
Smart Substations - Substation Automation - Feeder Automation. Geographic Information System(GIS) - Intelligent Electronic Devices (IED) & their application for monitoring & protection.

Smart storage like Battery Energy Storage Systems (BESS) - Super Conducting Magnetic Energy Storage Systems (SMES) - Pumped Hydro - Compressed Air Energy Storage (CAES)

UNIT – IV
Micro grids and Distributed Energy Resources
Concept of micro grid - need & applications of microgrid - formation of microgrid - Issues of interconnection - protection & control of microgrid - Integration of renewable energy sources - Demand Response.

UNIT - V
Information and Communication Technology for Smart Grid
Advanced Metering Infrastructure (AMI) - Home Area Network (HAN) - Neighborhood Area Network (NAN) - Wide Area Network (WAN).

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Course Outcomes:

After the completion of the course the student should be able to:

- Know the concepts of smart grids and analyse the smart grid policies and developments in smart grids.
- Develop concepts of smart grid technologies in hybrid electrical vehicles etc.
- Know the concepts of smart substations - feeder automation - Battery Energy storage systems etc.
- Analyse micro grids and distributed generation systems.
- Analyse the effect of power quality in smart grid and to understand latest developments in ICT for smart grid.

Text Books:

1. Integration of Green and Renewable Energy in Electric Power Systems - by Ali Keyhani - Mohammad N. Marwali - Min Dai Wiley - 2009.
2. The Smart Grid: Enabling Energy Efficiency and Demand Response - by Clark W.Gellings - Fairmont Press - 2009.
3. 3. Smart Grid: Technology and Applications - by Janaka B. Ekanayake - Nick Jenkins - Kithsiri Liyanage - Jianzhong Wu - Akihiko Yokoyama - Wiley publishers - 2012.
4. Smart Grids by Jean-Claude Sabonnadière - NouredineHadjsaïd - Wiley publishers – 2013.
5. Smart Power: Climate Changes - the Smart Grid - and the Future of Electric Utilities - by Peter S. Fox Penner - Island Press; 1st edition - 8 Jun 2010
6. Microgrids and Active Distribution Networks by S. Chowdhury - S. P. Chowdhury - P.Crossley - Institution of Engineering and Technology - 30 Jun 2009

Reference Books:

1. The Advanced Smart Grid: Edge Power Driving Sustainability:1 by Andres Carvallo - John Cooper - Artech House Publishers July 2011
2. Control and Automation of Electric Power Distribution Systems (Power Engineering) by James Northcote - Green - Robert G. Wilson - CRC Press - 2017.
3. Substation Automation (Power Electronics and Power Systems) by Mladen Kezunovic - Mark G. Adamiak - Alexander P. Apostolov - Jeffrey George Gilbert - Springer - 2010.
4. Electrical Power System Quality by R. C. Dugan - Mark F. McGranghan - Surya Santoso - H. Wayne Beaty - McGraw Hill Publication - 2nd Edition.

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IV Year –I SEMESTER		L	T	P	C
		3	0	0	3
UNIVERSAL HUMAN VALUES-2: UNDERSTANDING HARMONY					

Course objective: To develop a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence, to understand (or developing clarity) of the harmony in the human being, family, society and nature/existence, to strengthen self-reflection and to develop the commitment and courage to act.

UNIT-1:
Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

1) Purpose and motivation for the course, recapitulation from Universal Human Values-I
2) Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration
3) Continuous Happiness and Prosperity- A look at basic Human Aspirations
4) Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority
5) Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6) Method to fulfill the above human aspirations: understanding and living in harmony at various levels. Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

UNIT- 2:
Understanding Harmony in the Human Being - Harmony in Myself!

1) Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
2) Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
3) Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
4) Understanding the characteristics and activities of 'I' and harmony in 'I'
5) Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
6) Programs to ensure Sanyam and Health. Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

UNIT-3:
Understanding Harmony in the Family and Society- Harmony in Human Relationship

1) Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
2) Understanding the meaning of Trust; Difference between intention and competence
3) Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
4) Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
5) Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family. Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.

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UNIT-4:

Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

1) Understanding the harmony in the Nature
2) Interconnectedness and mutual fulfilment among the four orders of nature recyclability and self regulation in nature
3) Understanding Existence as Co-existence of mutually interacting units in allpervasive space
4) Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

UNIT-5:

Implications of the above Holistic Understanding of Harmony on Professional Ethics

1) Natural acceptance of human values
2) Definitiveness of Ethical Human Conduct
3) Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
4) Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
5) Case studies of typical holistic technologies, management models and production systems
6) Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations
7) Include practice: Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

TEXT BOOKS:

1) Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

REFERENCE BOOKS:

1) Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2) Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3) The Story of Stuff (Book).
4) The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5) Small is Beautiful - E. F Schumacher.
6) Slow is Beautiful - Cecile Andrews.
7) Economy of Permanence - J C Kumarappa .
8) Bharat Mein Angreji Raj - PanditSunderlal .
9) Rediscovering India - by Dharampal .
10) Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi.
11) India Wins Freedom - Maulana Abdul Kalam Azad.
12) Vivekananda - Romain Rolland (English).
13) Gandhi - Romain Rolland (English).

Course outcome: Students will be able to discuss a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence, to explain (or developing clarity) of the harmony in the human being, family, society and nature/existence, to strengthen self-reflection and to judge the commitment and courage to act.

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IV Year –I SEMESTER		L	T	P	C
		0	0	4	2
SKILL ADVANCED COURSE **MACHINE LEARNING WITH PYTHON LAB**					

Course Objectives:
This course will enable students to learn and understand different Data sets in implementing the machine learning algorithms.

Requirements: Develop the following program using Anaconda/ Jupiter/ Spider and evaluate ML models.

Experiment-1:
Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.

Experiment-2:
For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.

Experiment-3:
Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

Experiment-4:
Exercises to solve the real-world problems using the following machine learning methods: a) Linear Regression b) Logistic Regression c) Binary Classifier

Experiment-5: Develop a program for Bias, Variance, Remove duplicates , Cross Validation
Experiment-6: Write a program to implement Categorical Encoding, One-hot Encoding

Experiment-7:
Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.

Experiment-8:
Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions.

Experiment-9: Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

Experiment-10:
Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.

Experiment-11: Apply EM algorithm to cluster a Heart Disease Data Set. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.

Experiment-12: Exploratory Data Analysis for Classification using Pandas or Matplotlib.

Experiment-13:
Write a Python program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set

Experiment-14:
Write a program to Implement Support Vector Machines and Principle Component Analysis

Experiment-15:
Write a program to Implement Principle Component Analysis

Course Outcomes (Cos): At the end of the course, student will be able to

- Implement procedures for the machine learning algorithms
- Design and Develop Python programs for various Learning algorithms
- Apply appropriate data sets to the Machine Learning algorithms
- Develop Machine Learning algorithms to solve real world problems

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IV Year –I SEMESTER		L	T	P	C
		0	0	0	3
INDUSTRIAL / RESEARCH INTERNSHIP 2 MONTHS (MANDATORY) AFTER THIRD YEAR (TO BE EVALUATED DURING VII SEMESTER)					

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IV Year –II SEMESTER		L	T	P	C
		-	-	-	12
PROJECT WORK, SEMINAR AND INTERNSHIP IN INDUSTRY (6 MONTHS)					

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II Year – II SEMESTER		L	T	P	C
		3	0	0	3
COMMUNICATION SYSTEMS **(Honors Engineering Course)**					

Preamble:
Awareness on the concepts and working of communication blocks is inevitable for an electrical engineering student to excel in smart grid applications.

Course Objectives:
- To develop a fundamental understanding on communication systems with emphasis on analog and digital modulation techniques.
- To get introduced to the basics of error control coding techniques.

Unit – I:
Basic blocks of Communication System
Analog Modulation - Principles of Amplitude Modulation, DSBSC, SSB-SC and VSB-SC, AM transmitters and receivers.

Unit- II
Angle Modulation - Frequency and Phase Modulation
Transmission Bandwidth of FM signals, Methods of generation and detection, FM Transmitters and Receivers.

Unit–III
Sampling theorem - Pulse Modulation Techniques
PAM, PWM and PPM concepts - PCM system – Data transmission using analog carriers (BASK, BFSK, BPSK, QPSK).

UNIT -IV
Error control coding techniques
Linear block codes- Encoder and decoder, Cyclic codes – Encoder, Syndrome Calculator, Convolution codes.

UNIT -V
Modern Communication Systems
Microwave communication systems, Optical communication system, Satellite communication system, Mobile communication system.

Course Outcomes:
After the completion of the course the student should be able to:
- Understand the basics of communication system, analog and digital modulation techniques.
- Apply the knowledge of digital electronics and understand the error control coding techniques.
- Summarize different types of communication systems and its requirements.

Text Books:
1. Simon Haykins, ‘Communication Systems’, John Wiley, 3rd Edition, 1995.
2. D.Roddy & J.Coolen, ‘Electronic Communications’, Prentice Hall of India, 4th Edition, 1999.
3. Kennedy G, ‘Electronic Communication System’, McGraw Hill, 1987.



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Reference Books:

1. Shulin Daniel, 'Error Control Coding', Pearson, 2nd Edition, 2011.
2. B.P. Lathi and Zhi Ding, 'Modern Digital and Analog Communication Systems', OUP USA Publications, 4th Edition, 2009.

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II Year – II SEMESTER		L	T	P	C
		3	0	0	3

ELECTRICAL WIRING, ESTIMATION AND COSTING
(Honors Engineering Course)

Preamble:
This course covers the topics on simple electrical connections design considerations of electrical installations and study of different types of electrical installations. It also covers the components of substations and various motor control circuits.

Course Objectives:
- Introduce the electrical symbols and simple electrical circuits
- Able to learn the design of electrical installations.
- Able to learn the design of electrical installation for different types of buildings and small industries.
- Learn the basic components of electrical substations.
- Familiarize with the motor control circuits

UNIT - I
Electrical Symbols and Simple Electrical Circuits
Identification of electrical symbols - Electrical wiring Diagrams - Methods of representation of wiring diagrams - introduction to simple light and fan circuits - system of connection of appliances and accessories.

UNIT - II
Design Considerations of Electrical Installations
Electric supply system - Three-phase four wire distribution system - protection of electric installation against overload - short circuit and earth fault - earthing - neutral and earth wire - types of loads - systems of wiring - permissible of voltage drops and sizes of wires - estimating and costing of electrical installations.

UNIT - III
Electrical Installation for Different Types of Buildings and Small Industries
Electrical installations for electrical buildings - estimating and costing of material - simple examples on electrical installation for residential buildings - electrical installations for commercial buildings - electrical installation for small industries-case study.

UNIT - IV
Substations
Introduction - types of substations - outdoor substations-pole mounted type - indoor substations-floor mounted type - simple examples on quantity estimation-case study.

UNIT - V
Motor control circuits
Introduction to AC motors - starting of three phase squirrel cage induction motors - starting of wound rotor motors - starting of synchronous motors - contractor control circuit components - basic control circuits - motor protection.

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Course Outcomes:

After the completion of the course the student should be able to:

- Demonstrate the various electrical apparatus and their interconnections.
- Examine various components of electrical installations.
- Estimate the cost for installation of wiring for different types of building and small industries.
- Illustrate the components of electrical substations.
- Design suitable control circuit for starting of three phase induction motor and synchronous motor.

Text Books:

1. Electrical Design and Estimation Costing - K. B. Raina and S.K.Bhattacharya – New Age International Publishers - 2007.

References Books:

1. Electrical wiring estimating and costing – S.L.Uppal and G.C.Garg – Khanna publishers - 6th edition - 1987.
2. A course in electrical installation estimating and costing – J.B.Gupta –Kataria SK & Sons - 2013.

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II Year –II SEMESTER		L	T	P	C
		3	0	0	3
ELECTRICAL DISTRIBUTION SYSTEMS **(Honors Engineering Course)**					

Preamble:
This subject deals with the general concept of distribution system, substations and feeders as well as discusses distribution system analysis, protection and coordination, voltage control and power factor improvement.

Course Objectives
- To learn different factors of distribution system.
- To learn and design aspects of the substations and distribution systems.
- To learn the concepts of voltage drop and power loss.
- To learn the distribution system protection and its coordination.
- To learn the effect of compensation for power factor improvement.
- To learn the effect of voltage control on distribution system.

UNIT - I
General Concepts
Introduction to distribution systems - Distribution system losses – Coincidence factor – Contribution factor – loss factor – Relationship between the load factor and loss factor – Numerical Problems – Load Modeling and Characteristics – Classification and characteristics of loads (Residential - commercial - Agricultural and Industrial).

UNIT - II
Substations
Selection for location of substations - Rating of distribution substation – Service area with 'n' primary feeders – K- Factors - Benefits and methods of optimal location of substations.
Distribution Feeders
Design Considerations of distribution feeders**:** Radial and loop types of primary feeders – Voltage levels – Feeder loading – Basic design practice of the secondary distribution system.

UNIT - III
System Analysis
Voltage drop and power – loss calculations**:** Derivation for voltage drop and power loss in lines – Uniformly distributed loads and non-uniformly distributed loads – Three phase balanced primary lines – and Non three phase balanced primary lines.

UNIT - IV
Protection
Objectives of distribution system protection –Time current characteristics – Protective devices**:** Principle of operation of fuses – Circuit reclosures – Line sectionaliser and circuit breakers - Earth leakage circuit breakers – Protection schemes of parallel & Ring-main feeders.
Coordination of protective devices
General coordination procedure –Various types of co-ordinated operation of protective devices - Residual Current Circuit Breaker.

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UNIT - V

Compensation for Power Factor Improvement

Capacitive compensation for power factor control – Different types of power capacitors – shunt and series capacitors – Effect of shunt capacitors (Fixed and switched) – Power factor correction – Capacitor allocation – Economic justification – Procedure to determine the best capacitor location.

Voltage Control

Equipment for voltage control – Effect of series capacitors – Effect of AVB/AVR – Line drop compensation.

Course Outcomes:

After the completion of the course the student should be able to:

- Discriminate various factors of distribution system - load modelling and characteristic of loads.
- Know the concept of design considerations of substation and feeders.
- Determine the voltage drop and power loss for different types of distribution loads.
- Analyse the protection and its coordination for distribution systems.
- Analyse the effect of compensation for p.f improvement and voltage improvement.

Text Book:

1. "Electric Power Distribution system - Engineering" – by Turan Gonen - McGraw–hill - 2nd edition - 2008.

Reference Books:

1. Electrical Distribution Systems by Dale R.Patrick and Stephen W.Fardo - CRC press - 2nd edition.
2. Electric Power Distribution – by A.S. Pabla - Tata McGraw–hill Publishing Company - 4th edition - 1997.
3. Electrical Power Distribution Systems by V.Kamaraju - Right Publishers.

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III Year – I SEMESTER		L	T	P	C
		3	0	0	3
ADVANCED COMPUTER NETWORKS **(Honors Engineering Course)**					

Preamble:
This course aim to provide a board coverage of new advanced topics in the fields of computer networks such as wireless networks, mobile networks, VPN networks, transport layer and application layers protocols.

Course Objectives:
- To know the various networks layers and protocols.
- To represents the IPv6 Addressing and Transition from IPv4 to IPv6 protocols.
- To discuss unicast and multicasting routing protocols.
- To know the different transport layer protocols-UDP, TCP & SCTP services.
- To understand the application layer protocols like WWW, HTTP, FTP etc.

UNIT – I
Network Layer and Protocols
IP Addressing: Address Space – Notations – Addressing – Networking – Network Address Translation (NAT).
Internet Protocol (IP): Datagram Format – Fragmentation – Options.
ICMPv4: Messages – Debugging Tools – ICMP Checksum.
Mobile IP: Addressing – Agents – Three Phases – Inefficiency in Mobile IP.
Virtual Private Network: VPN Technology.

UNIT – II
Next Generation IP
IPv6 Addressing: Representation – Address space – Allocation – Auto configuration – Renumbering.
Transition from IPv4 to IPv6: Dual Stack – Tunneling – Header Translation.
IPv6 Protocol: Packet Format – Extension Header.

UNIT – III
Unicast and Multicast Routing Protocols
Introduction: Inter-domain – Intra-domain Routing**.**
Routing Algorithms: Distance Vector Routing – Bellman-Ford Algorithm – Link State Routing – Path Vector Routing.
Unicast Routing Protocols: Internet Structure – Routing Information Protocol (RIP) – Open Shortest Path First (OSPF) – Border Gateway Protocol Version 4 (BGP4).
Introduction: Unicast – Multicast and Broadcast.
Intradomain Multicast Protocols: Multicast Distance Vector (DVMRP) – Multicast Link State (MOSPF) – Protocol Independent Multicast (PIM).

UNIT – IV
Transport Layer Protocols
User Datagram Protocol: User Datagram – UDP Services – UDP Applications.
Transmission Control Protocol: TCP Services – TCP features – Segment – A TCP Connection – State Transition Diagram – Windows in TCP – Flow Control – Error Control – TCP Congestion Control – TCP Timers – Options.
SCTP: SCTP Services – SCTP Features – Packet Format – An SCTP Association – Flow Control – Error Control.

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UNIT – V

Application Layer Protocols

World Wide Web and HTTP **– File Transfer:** FTP and TFTP **– Electronic mail:** Architecture – Web-Based Mail – Email Security – SMTP – POP – IMAP and MIME – SNMP. **DNS:** Concept of Domain name space – DNS operation. **DHCP:** Static and Dynamic Allocation – DHCP operation. **Remote Login:** TELNET and SSH.

Course Outcomes:

After the completion of the course the student should be able to:

- Implement various networks layers protocols.
- Configure TPV6 protocol.
- Apply the concepts of unicast and multicast routing protocol.
- Configure the transport layers protocols like UDP, TCP, SCTP Services.
- Determine application layer services working with the client server para diagrams like WWW, HTTP, FTP, e-mail, SNMP, DHCP.

Text Book:

1. "Data Communication and Networking" by Forouzan Behrouz.A, McGraw Hill Education, New Delhi, 2005.
2. "Internetworking with TCP/IP, Volume-I", 4th Edition by Comer Douglas E., Prentice Hall of India Private Limited, New Delhi, 2014.
3. "Computer Networks, 4th Edition" by Tanenbaum Andrew .S, PHI Learning, New Delhi, 2014.
4. "Advanced Computer Network" by B.M. Harwani and DT Editorial services, Dreamtech New Delhi, 2014.
5. "Computer Networks-Principles, Technologies and Protocols for Network Design" by Natalia Olifer, Victor Olifer, Wiley Publishers.

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III Year – I SEMESTER		L	T	P	C
		3	0	0	3
POWER QUALITY **(Honors Engineering Course)**					

Preamble:
Power quality is a major problem for utilities and customers. Customers using sensitive critical loads need quality power for proper operation of the electrical equipment. It is important for the student to learn the power quality issues and improvement measures provided by the utility companies. This course covers the topics on voltage and current imperfections, harmonics, voltage regulation, power factor improvement, distributed generation, power quality monitoring and measurement equipment.

Course Objectives:
- To learn different types of power quality phenomena.
- To identify sources for voltage sag, voltage swell, interruptions, transients, long duration over voltages and harmonics in a power system.
- To describe power quality terms and know the power quality standards.
- To learn the principle of voltage regulation and power factor improvement methods.
- To explain the relationship between distributed generation and power quality.
- To understand the power quality monitoring concepts and the usage of measuring instruments.

UNIT - I
Introduction - Terms & Definitions
Overview of power quality – Concern about the power quality – General classes of power quality and voltage quality problems – Transients – Long–duration voltage variations – Short–duration voltage variations – Voltage unbalance – Waveform distortion – Voltage fluctuation – Power frequency variations – Voltage Sags – Voltage Swell.

UNIT - II
Transient Over Voltages
Sources of Transient Over voltages - Principles of Over voltage protection- Devices for Over voltage protection – Utility Capacitor Switching Transients - Utility System Lightning Protection – Managing Ferro resonance – Switching Transient Problems with Loads.

UNIT - III
Long – Duration Voltage Variations
Principles of regulating the voltage – Device for voltage regulation – Utility voltage regulator application – Capacitor for voltage regulation – End–user capacitor application – Regulating utility voltage with distributed resources – Flicker

UNIT - IV
Harmonic distortion and solutions
Voltage distortion vs. Current distortion –Harmonic indices: THD - TDD and True Power Factor– Sources of harmonics – Effect of harmonic distortion – Impact on capacitors, transformers, motors and meters – Concept of Point of common coupling – Passive and active filtering – Numerical problems.

UNIT - V
Distributed Generation and Monitoring
Resurgence of distributed generation – DG technologies – Interface to the utility system – Power quality issues and operating conflicts – DG on low voltage distribution networks.

Monitoring
Power quality monitoring and considerations – Historical perspective of PQ measuring instruments – PQ measurement equipment – Assessment of PQ measuring data.

Course Outcomes:
After the completion of the course the student should be able to:

- Differentiate between different types of power quality problems.
- Explain the sources of voltage sag - voltage swell - interruptions - transients - long duration over voltages and harmonics in a power system.
- Explain the principle of voltage regulation and improvement methods.
- Analyse voltage distortion and current distortion and their indices.
- Know the concepts of distributed generation technologies and power quality monitoring.

Textbooks:

1. Electrical Power Systems Quality - Dugan R C - McGranaghan M F - Santoso S - and Beaty H W - Second Edition - McGraw–Hill - 2012 - 3rd edition.
2. Electric power quality problems –M.H.J.Bollen IEEE series-Wiley india publications - 2011.
3. Power Quality Primer - Kennedy B W - First Edition - McGraw–Hill - 2000.

Reference Books:

1. Understanding Power Quality Problems: Voltage Sags and Interruptions - Bollen M HJ - First Edition - IEEE Press; 2000.
2. Power System Harmonics - Arrillaga J and Watson N R - Second Edition - John Wiley & Sons - 2003.
3. Electric Power Quality control Techniques - W. E. Kazibwe and M. H. Sendaula - Van Nostrad Reinhold - New York.
4. Power Quality C.Shankaran - CRC Press - 2001
5. Harmonics and Power Systems –Franciso C.DE LA Rosa–CRC Press (Taylor & Francis)
6. Power Quality in Power systems and Electrical Machines–EwaldF.fuchs - Mohammad A.S.Masoum–Elsevier.

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III Year – I SEMESTER		L	T	P	C
		3	0	0	3

SPECIAL ELECTRICAL MACHINES
(Honors Engineering Course)

Preamble:
This is an advanced course on electrical machines. Students will be exposed to various special machines which are gaining importance in industry. This course covers topics related to principles, performance and applications of these special machines including switched reluctance motors, stepper motors, permanent magnet dc motors and linear motors.

Course Objective:
- To explain operation and control of switched reluctance motor.
- To understand the performance and control of stepper motors, and their applications.
- To describe the operation and characteristics of permanent magnet dc motor.
- To distinguish between brush dc motor and brush less dc motor**.**
- To explain the theory of travelling magnetic field and applications of linear motors.

UNIT - I
Permanent Magnet Materials and PMDC motors
Introduction - classification of permanent magnet materials used in electrical machines - minor hysteresis loop and recoil line - Stator frames of conventional dc machines - Development of electronically commutated dc motor from conventional dc motor – Permanent magnet materials and characteristics - B-H loop and demagnetization characteristics-high temperature effects-reversible losses - Irreversible losses - Mechanical properties - handling and magnetization - Application of permanent magnets in motors - power density - operating temperature range - severity of operation duty- Hysteresis - Eddy current Motors.

UNIT - II
Stepper Motors
Principle of operation of Stepper Motor – Constructional details - Classification of stepper motors – Different configuration for switching the phase windings - Control circuits for stepper motors – Open loop and closed loop control of two phase hybrid stepping motor.

UNIT - III
Switched Reluctance Motors
Construction and Principle of operation of Switched Reluctance Motor – Comparison of conventional and switched reluctance motors – Design of stator and rotor pole arcs.
Torque producing principle and torque expression – Different converter configurations for SRM – Drive and power circuits for SRM – Position sensing of rotor – Applications of SRM.

UNIT - IV
Permanent Magnet Brushless DC Motor
Principle of operation of BLDC motor - Types of constructions - Surface mounted and interior type permanent magnet DC Motors - Torque and EMF equations for Square wave & Sine wave for PMBLDC Motor – Torque - Speed characteristics of Square wave & Sine wave for PMBLDC Motor - Merits & demerits of Square wave & Sine wave for PMBLDC Motor - Performance and efficiency – Applications.



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UNIT - V

Linear Induction Motors (LIM)

Construction– principle of operation – Double sided LIM from rotating type Induction Motor – Schematic of LIM drive for traction – Development of one sided LIM with back iron - equivalent circuit of LIM.

Course Outcomes:

After the completion of the course the student should be able to:

- Learn merits of PMDC motor
- Choose best control scheme for stepper motor
- Construct the various converter circuits for Switched Reluctance Motors.
- Analyse the characteristics of Brushless dc Motor.
- Understand the operation of Linear Induction Motors.

Text Books:

1. Brushless Permanent magnet and reluctance motor drives, Clarenden press, T.J.E. Miller, 1989, Oxford.
2. Special electrical Machines, K.Venkata Ratnam, University press, 2009, New Delhi.

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III Year – II SEMESTER		L	T	P	C
		3	0	0	3

DIGITAL CONTROL SYSTEMS
(Honors Engineering Course)

Preamble:
In recent years digital controllers have become popular due to their capability of accurately performing complex computations at high speeds and versatility in leading nonlinear control systems. In this context, this course focuses on the analysis and design of digital control systems.

Course objectives:
- To understand the concepts of digital control systems and assemble various components associated with it. Advantages compared to the analog type.
- The theory of z–transformations and application for the mathematical analysis of digital control systems.
- To represent the discrete–time systems in state–space model and evaluation of state transition matrix, the design of state feedback control by "the pole placement method.", design of state observers.
- To examine the stability of the system using different tests and study the conventional method of analyzing digital control systems in the w–plane.
- Design of state feedback controller through pole placement.

UNIT - I
Introduction to Signal Processing
Introduction to analog and digital control systems – Advantages of digital systems – Typical examples – Continuous and Discrete Time Signals – Sample and hold devices – Sampling theorem and data reconstruction – Frequency domain characteristics of zero order hold.

UNIT - II
Z–Transformations
Z–Transforms – Theorems – Finding inverse Z–transforms – Formulation of difference equations and solving – Block diagram representation – Pulse transfer functions and finding open loop and closed loop responses.

UNIT - III
State Space Analysis and the Concepts of Controllability and Observability
State space representation of discrete time systems – Solving Discrete Time state space equations – State transition matrix and its properties – Discretization of continuous time state equations – Concepts of controllability and observability – Tests(without proof).

UNIT - IV
Stability Analysis
Mapping between the S–Plane and the Z–Plane – Primary strips and Complementary strips – Stability criterion – Modified Routh's stability criterion and Jury's stability test.
Design of Discrete–Time Control Systems By Conventional Methods
Transient and steady state specifications – Design using frequency response in the w–plane for lag and lead compensators – Root locus technique in the z–plane.

UNIT - V
State Feedback Controllers and State Observers
Design of state feedback controller through pole placement – Necessary and sufficient conditions – Ackerman's formula – Design of state observers (Full Order and Reduced Order).

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Course Outcomes:

After the completion of the course the student should be able to:

- Illustrate advantages of digital systems, sampling and data reconstruction.
- Calculate Z Transform and Inverse Z Transfer function, pulse transfer functions of open and closed loop response.
- Construct various canonical forms and concepts of controllability and observability.
- Compute the absolute and relative stability of discrete time systems using Routh Stability criterion and Root Locus, Design lag and lead compensators to improve system performance using bode diagrams.
- Design of state feedback controllers and state observers.

Text Book:

1. Discrete–Time Control systems – K. Ogata - Pearson Education/PHI - 2nd Edition.
2. Digital Control and State Variable Methods by M.Gopal - TMH - 4th Edition.

Reference Books:

1. Digital Control Systems - Kuo - Oxford University Press - 2nd Edition - 2003.

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III Year – II SEMESTER		L	T	P	C
		3	0	0	3

ANALYSIS OF POWER ELECTRONIC CONVERTERS
(Honors Engineering Course)

Preamble:
The usage of power electronics in day to day life has increased in recent years. It is important for students to analyze the power electronic converters in detail. This course covers characteristics of semiconductor devices and operation of AC-DC converters, PWM inverters & multilevel inverters.

Course Objectives:
- To learn the characteristics of switching devices & functionality of gate drive circuits.
- To illustrate the working of AC-DC converters.
- To learn functionality of PWM inverters in controlling the voltage and mitigating the harmonics.
- To understand the basic concepts of multi-level inverters.
- To learn PWM control of CHB and diode clamped multi-level inverters.

UNIT – I
Overview of Switching Devices
Power MOSFET, IGBT, GTO -static and dynamic characteristics, gate drive circuits for switching devices.

UNIT – II
AC-DC Converters
Single-phase fully-controlled converters with RL load– Continuous and Discontinuous load current operation-Evaluation of input power factor and harmonic factor Power factor improvements using extinction angle control, symmetrical angle control, PWM control. Three-Phase AC-DC fully-controlled Converters with RL load- Continuous and Discontinuous load current operation-Evaluation of input power factor and harmonic factor -three-phase dual converters.

UNIT – III
PWM Inverters
Operation of single-phase inverters -Voltage control of single-phase inverters - phase displacement Control –Bipolar PWM – Unipolar PWM- staircase PWM. Voltage Control of Three-Phase Inverters-Sinusoidal PWM- Third Harmonic PWM- Space Vector Modulation- Comparison of PWM Techniques-Three phase current source inverters-Variable dc link inverter.

UNIT – IV
Multilevel Inverters
Introduction, Multilevel Concept, Types of Multilevel Inverters- Diode-Clamped Multilevel Inverter, Principle of Operation, Features of Diode-Clamped Inverter- Flying-Capacitors Multilevel Inverter-Principle of Operation, Features of Flying-Capacitors Inverter- Cascaded H-bridge Multilevel Inverter, Principle of Operation, Features of Cascaded H-bridge Inverter- Comparisons of Multilevel inverters.

UNIT – V
PWM Multilevel Inverters
CHB Multilevel Inverter: SHE PWM- Phase shifted PWM-Level shifted PWM- Diode clamped Multilevel inverter: SHE PWM-Sinusoidal PWM- Space vector PWM-Capacitor voltage balancing.

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Course Outcomes:

After the completion of the course the student should be able to:

- Describe and analyze the characteristics of Switching devices
- Demonstrate the operation and perform harmonic analysis of AC-DC power converters.
- Analyze the operation of single-phase and three-phase inverters with PWM control.
- Illustrate the principles of operation of multilevel inverters.
- PWM Control of CHB and diode clamped multilevel inverters.

Text Books

1. Power Electronics: Converters, Applications, and Design- Ned Mohan, Tore M. Undeland, William P. Robbins, John Wiley& Sons, 2nd Edition, 2003.
2. Power Electronics-Md.H.Rashid –Pearson Education Third Edition- First IndianReprint-2008.
3. HIGH-POWER CONVERTERS AND AC DRIVES – Bin Wu, Wiley-IEEE Press, 2006.

Reference Books:

1. Elements of Power Electronics – Philip T. Krein, Oxford University press, 2014.
2. Power Converter Circuits – William Shepherd & Li Zhang-Yes Dee CRC Press, 2004.
3. Power Electronics Daniel W. Hart - McGraw-Hill, 2011.

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III Year – II SEMESTER		L	T	P	C
		3	0	0	3

HVDC TRANSMISSION
(Honors Engineering Course)

Preamble:
With the increasing power generation in the country and long distance power transmission, it is necessary that power should be transmitted at extra and ultra high voltage. The topics dealt in this subject relate to analysis of HVDC converters, control of HVDC converters and their protection.

Course Objectives:
- To analyse the operation of HVDC converters.
- To learn the principles of HVDC system control.
- To learn about converters faults and protection schemes of HVDC systems.
- To understand the requirements of reactive power control and filtering technique in HVDC system.
- To learn about MTDC systems and DC circuit breakers.

UNIT - I
DC Power Transmission Technology
Introduction - Historical Development - Comparison of AC and DC transmission - types of DC links - Existing HVDC Projects in INDIA. Modern Trends in HVDC Technology.

Analysis of HVDC Converters
Three Phase 6-Pulse bridge converter - simplified analysis - waveform with and without overlap - Current and voltage relationship - Equivalent circuits of converters - Analysis of a 12 pulse converters.

UNIT - II
HVDC System Control
Principles of DC link control - converter control characteristics - constant current and constant extinction angle control - constant ignition angle control - starting and stopping of HVDC link - power control & power reversal in HVDC link.

UNIT - III
Converter Faults and Protection
Over voltages in converter station - Surge arrestors - Protection against over voltages and over currents. Converter faults - Protection against faults in voltage source converter-Smoothing Reactor - Transient over voltages for DC line – Protection of DC lines.

UNIT - IV
Reactive Power Control
Sources of reactive power - Static VAR system – SVC and STATCOM - Reactive power control during transients.

Harmonics & Filters
Generation of harmonics – Types and design of various AC filters - DC filters – Active Filters.

UNIT - V
Multi Terminal HVDC Systems & DC Circuit Breakers
Types of MTDC systems - Control and Protection of MTDC system – HVDC insulation – DC line insulators – DC breakers – Characteristics and types of DC breakers.

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Course Outcomes:

After the completion of the course the student should be able to:

- Learn the basic concepts of HVDC Transmission & their converters.
- Understand the HVDC System Control Strategies with respect to protection.
- Understand the concepts of HVDC systems protection.
- Understand the various sources of reactive power
- Understand the Multi Terminal HVDC Systems.

Text Book

1. K. R. Padiyar - "HVDC Power Transmission Systems Technology and System Interactions" - New Age International (p) Limited - New Delhi - 2003.
2. Edward Wilson Kimbark - "Direct current Transmission" - Wiley Interscience - Vol. I - New York - 1971.

Reference Books

1. Vijay K. Sood - "HVDC and FACTS Controller: Application of Static Converters in power systems" - IEEE Power Electronics and Power Systems series - Kluwer Academic publishers - Boston - First edition January 2004.
2. C. Adamson and N.G. Hingorani - "High voltage DC power Transmission" - Garraway Limited - England - 1960.
3. Mohan - Undeland and Robbins - "Power Electronics Converters - Applications and Design - John Wiley & Son - Inc. - 2003.
4. J. Arrialga - "HVDC Transmission" - Peter Peregrinus Ltd. - London - 1983.

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IV Year – I SEMESTER		L	T	P	C
		3	0	0	3

EHVAC TRANSMISSION
(Honors Engineering Course)

Preamble:
This course gives the essence in the basic concepts of extra high voltage AC transmission. It also emphasis on the behavior of the line parameters for extra high voltages. The voltage gradients of the transmission line conductors gradients, the effect of corona, electrostatic field calculation, travelling wave theory concept, voltage control when the lines carriers extra high voltages and also to minimize power quality issues by using reactive power compensation.

Course Objectives:
- To calculate the transmission line parameters.
- To calculate the field effects on EHV and UHV AC lines.
- To have knowledge of corona, RI and audible noise in EHV and UHV lines.
- To have knowledge of voltage control in EHV and UHV transmission systems.
- To have knowledge of various reactive power compensating systems in EHV lines.

UNIT – I:
E.H.V. A.C. Transmission, line trends and preliminary aspects, standard transmission voltages – power handling capacities and line losses – mechanical aspects. Calculation of line resistance and inductance: resistance of conductors, temperature rise of conductor and current carrying capacity. Properties of bundled conductors and geometric mean radius of bundle, inductance of two conductor lines and multi conductor lines, Maxwell's coefficient matrix. Line capacitance calculation. capacitance of two conductor line, and capacitance of multi conductor lines, potential coefficients for bundled conductor lines, sequence inductances and capacitances and diagonalization.

UNIT – II:
Calculation of electro static field of AC lines - Effect of high electrostatic field on biological organisms and human beings. Surface voltage Gradient on conductors, surface gradient on two conductor bundle and cosine law, maximum surface voltage gradient of bundle with more than 3 sub conductors, Mangolt formula.

UNIT – III:
Corona : Corona in EHV lines – corona loss formulae – attenuation of traveling waves due to corona – Audio noise due to corona, its generation, characteristics and limits, measurement of audio noise.

UNIT – IV:
Power Frequency voltage control : Problems at power frequency, generalized constants, No load voltage conditions and charging currents, voltage control using synchronous condenser, cascade connection of components : Shunt and series compensation, sub synchronous resonance in series – capacitor compensated lines

UNIT – V:
Reactive power compensating systems: Introduction, SVC schemes, Harmonics injected into network by TCR, design of filters for suppressing harmonics injected into the system, Introduction to STATCOM.

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Course Outcomes:
After the completion of the course the student should be able to:

- Calculate the transmission line parameters.
- Calculate the field effects on EHV and UHV AC lines.
- Determine the corona, RI and audible noise in EHV and UHV lines.
- Analyze voltage control and compensation problems in EHV and UHV transmission systems.
- Understand reactive power compensation using SVC and TCR

Text Books:

1. Extra High Voltage AC Transmission Engineering – Rakesh Das Begamudre, Wiley Eastern ltd., New Delhi – 1987.
2. EHV Transmission line reference book – Edison Electric Institute (GEC) 1986.

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IV Year – I SEMESTER		L	T	P	C
		3	0	0	3
SMART GRID TECHNOLOGIES **(Honors Engineering Course)**					

Preamble:
The make radical transformation with the need to decarbonize electricity supply and to replace ageing assets to harness new information for better power system reliability and efficient.

Course Objectives:
- To understand concept of smart grid and their basic developments.
- To understand smart grid technologies and its usage in applications of introduction to smart grid technologies for electric vehicles.
- To have knowledge on smart substations, feeder automation and application for monitoring and protection.
- To have knowledge on micro grids and distributed energy resources.
- To deal power quality aspects in smart grid with information and communication technology.

UNIT - I
Introduction to Smart Grid
Evolution of Electric Grid - Concept of Smart Grid - Definitions - Need of Smart Grid - Functions of Smart Grid - Opportunities & Barriers of Smart Grid - Difference between conventional & smart grid - Concept of Resilient & Self-Healing Grid - Present development & International policies on Smart Grid. Case study of Smart Grid.

UNIT - II
Smart Grid Technologies: Part 1
Introduction to Smart Meters - Real Time Pricing - Smart Appliances - Automatic Meter Reading(AMR) - Outage Management System(OMS) - Plug in Hybrid Electric Vehicles(PHEV) - Vehicle to Grid - Smart Sensors - Home & Building Automation - Phase Shifting Transformers - Net Metering.

UNIT - III
Smart Grid Technologies: Part 2
Smart Substations - Substation Automation - Feeder Automation. Geographic Information System (GIS) - Intelligent Electronic Devices (IED) & their application for monitoring & protection.
Smart storage like Battery Energy Storage Systems (BESS) - Super Conducting Magnetic Energy Storage Systems (SMES) - Pumped Hydro - Compressed Air Energy Storage (CAES) - Wide Area Measurement System (WAMS) - Phase Measurement Unit (PMU).

UNIT - IV
Micro grids and Distributed Energy Resources
Concept of micro grid - need & applications of microgrid - formation of microgrid - Issues of interconnection - protection & control of microgrid - Integration of renewable energy sources - Demand Response.

UNIT - V
Power Quality Management in Smart Grid
Power Quality & EMC in Smart Grid - Power Quality issues of Grid connected Renewable Energy Sources - Power Quality Conditioners for Smart Grid - Web based Power Quality monitoring - Introduction to Power Quality Audit.

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Information and Communication Technology for Smart Grid
Advanced Metering Infrastructure (AMI) - Home Area Network (HAN) - Neighborhood Area Network (NAN) - Wide Area Network (WAN).

Course Outcomes:
After the completion of the course the student should be able to:

- Know the concept of smart grid and analyse the smart grid policies and developments in smart grids.
- Develop concepts of smart grid technologies in hybrid electrical vehicles etc.
- Know the concepts of smart substations - feeder automation - Battery Energy storage systems etc.
- Analyse micro grids and distributed generation systems.
- Analyse the effect of power quality in smart grid and to understand latest developments in ICT for smart grid.

Text Books:

1. Integration of Green and Renewable Energy in Electric Power Systems - by Ali Keyhani - Mohammad N. Marwali - Min Dai Wiley - 2009.
2. The Smart Grid: Enabling Energy Efficiency and Demand Response - by Clark W. Gellings - Fairmont Press - 2009.
3. Smart Grid: Technology and Applications - by Janaka B. Ekanayake - Nick Jenkins - Kithsiri Liyanage - Jianzhong Wu - Akihiko Yokoyama - Wiley publishers - 2012.
4. Smart Grids by Jean-Claude Sabonnadière - NouredineHadjsaïd - Wiley publishers - 2013.
5. Smart Power: Climate Changes - the Smart Grid - and the Future of Electric Utilities - by Peter S. Fox Penner - Island Press; 1st edition - 8 Jun 2010
6. Microgrids and Active Distribution Networks by S. Chowdhury - S. P. Chowdhury - P.Crossley - Institution of Engineering and Technology - 30 Jun 2009
7. Smart Grids (Power Engineering)by Stuart Borlase CRC Press.

Reference Books:

1. The Advanced Smart Grid: Edge Power Driving Sustainability:1 by Andres Carvallo - John Cooper - Artech House Publishers July 2011
2. Control and Automation of Electric Power Distribution Systems (Power Engineering) by James Northcote - Green - Robert G. Wilson - CRC Press - 2017.
3. Substation Automation (Power Electronics and Power Systems) by MladenKezunovic - Mark G. Adamiak - Alexander P. Apostolov - Jeffrey George Gilbert - Springer - 2010.
4. Electrical Power System Quality by R. C. Dugan - Mark F. McGranghan - Surya Santoso - H. Wayne Beaty - McGraw Hill Publication - 2nd Edition.
5. Communication and Networking in Smart Grids by Yang Xiao - CRC Press - 2012.

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IV Year – I SEMESTER		L	T	P	C
		3	0	0	3
POWER ELECTRONIC CONTROL OF ELECTRIC DRIVES **(Honors Engineering Course)**					

Preamble:
This course covers in detail advanced speed control techniques of induction motor, PMSM, BLDC & SRM motors.

Course Objectives:
- To learn principles of vector control of induction motor drive.
- To illustrate sensor less control technique for speed control of induction motor drive.
- To illustrate the concepts of direct control of induction motor drive.
- To learn the modeling aspects and control strategies of PMSM and BLDC motors.
- To learn the basics of SRM control.

UNIT - I
Vector Control of Induction Motor Drive:
Principle of scalar and vector control, direct vector control, indirect vector control, rotor flux oriented control, stator flux oriented control, air gap flux oriented control, decoupling circuits.

UNIT - II
Sensor less Control of induction Motor Drive:
Advantages of speed sensor less control, voltage current based speed sensor less control, MRAS-model reference adaptive systems, Extended Kalman filter observers.

UNIT - III
Direct Torque Control of Induction Motor Drive:
Principle of Direct torque control (DTC), concept of space vectors, DTC control strategy of induction motor, comparison between vector control and DTC, applications, space vector modulation based DTC of induction motors.

UNIT - IV
Control of Permanent Magnet Synchronous Machines (PMSM) and Brushless DC (BLDC) Motor Drives:
Advantages and limitations of Permanent magnet machines, operating principle of PMSM, modeling of PMSM, operating principle BLDC motor, modeling of BLDC motor, similarities and difference between PMSM and BLDC motors , need for position sensing in BLDC motors, control strategies for PMSM and BLDC, methods of reducing torque ripples of BLDC motor.

UNIT - V
Control of Switched Reluctance Motor (SRM) Drive:
SRM structure, Merits and limitations, stator excitation, converter topologies, SRM waveforms, Torque control schemes, speed control of SRM, torque ripple minimization, instantaneous -torque control using current controllers and flux controllers

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Course Outcomes:

After the completion of the course the student should be able to:

- Understand the concepts of vector control methods for Induction Motor drive systems.
- Understand the principle of sensor less control of Induction Motor drive.
- Understand the principle of DTC of Induction Motor drive.
- Learn the modeling & control aspects of PMSM and BLDC Motor drives.
- Understand the construction operation and control aspects of SRM.

Text Books:

1. Bose B. K., "Power Electronics and Variable Frequency Drives",IEEE Press, Standard Publisher Distributors. 2001.
2. Power electronic converters applications and design-Mohan, Undeland, Robbins-Wiley publications

Reference Books:

1. Krishnan R., “Electric Motor Drives – Modeling, Analysis and Control”, Prentice Hall of India Private Limited.
2. Switched Reluctance Motors and Their Control- T. J. E. Miller, Magna Physics, 1993.



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II Year – II SEMESTER		L	T	P	C
		3	0	0	3
FUNDAMENTALS OF ELECTRICAL CIRCUITS **(Minors Engineering Course)**					

Preamble:
Electrical circuit analysis is one of the most vital aspects of electrical & electronics engineering. Understanding how components work individually and collectively is the basis for designing electrical & electronics circuits. This course covers the aspects of various circuit components, laws, network theorems and analysis of single phase & three phase AC systems.

Course Objectives
- To learn about passive elements, sources, node and mesh analysis.
- To understand the basic concepts of single-phase AC systems.
- To learn network theorems and their applications to analyze electrical circuits.
- To analyze three-phase balanced and unbalanced circuits
- To perform transient analysis of RL, RC & RLC circuits

UNIT - I
Introduction to Electrical Circuits
Basic Concepts of passive elements of R, L, C and their V-I relations, Sources (dependent and independent), Kirchoff's laws, Network reduction techniques (series, parallel, series - parallel, star-to-delta and delta-to-star transformation), source transformation technique, nodal analysis and mesh analysis to DC networks with dependent and independent voltage and current sources.

UNIT - II
Single Phase A.C Systems
Periodic waveforms (determination of rms, average value and form factor), concept of phasor, phase angle and phase difference – waveforms and phasor diagrams for lagging, leading networks, complex and polar forms of representations-node and mesh analysis.

Steady state analysis of R, L and C circuits, power factor and its significance, real, reactive and apparent power, waveform of instantaneous power and complex power .

UNIT - III
Network theorems (DC & AC Excitations)
Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem, Reciprocity theorem, Millman's theorem and compensation theorem.

UNIT - IV
Balanced and Unbalanced Three phase circuits
Analysis of three phase balanced circuits:
Phase sequence, star and delta connection of sources and loads, relation between line and phase voltages and currents, analysis of balanced three-phase circuits, measurement of active and reactive power.
Analysis of three phase unbalanced circuits:
Loop method, Star-Delta transformation technique, two wattmeter method for measurement of three phase power.

UNIT - V
Transient Analysis in DC & AC Circuits
Transient response of First order (R-L, R-C) and second order (R-L-C) circuits using Laplace transforms.

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Course Outcomes:

After the completion of the course the student should be able to:

- Understand about the basic elements of electrical circuits.
- Learn to do steady state analysis of single-phase AC systems.
- Apply network theorems to analyze electrical circuits.
- Learn to analyze three-phase balanced and unbalanced circuits
- Perform transient analysis of different RL, RC & RLC circuits

Text Books:

1. Engineering Circuit Analysis by William Hayt and Jack E.Kemmerley, McGraw Hill Company, 9th edition, 2018.
2. Fundamentals of Electrical Circuits by Charles K.Alexander and Mathew N.O.Sadiku, McGraw Hill Education (India), 6th edition, 2019

Reference Books:

1. Network analysis: Van Valkenburg: Prentice-Hall of India Private Ltd, 3rd edition, 2019.
2. Electric Circuits by David A. Bell, Oxford publications, 7th edition, 2009.
3. Circuit Theory (Analysis and Synthesis) by A.Chakrabarthi, Dhanpat Rai & Co, 7th - Revised edition, 2018).

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II Year – II SEMESTER		L	T	P	C
		3	0	0	3
CONCEPTS OF ELECTRICAL MEASUREMENTS **(Minors Engineering Course)**					

Preamble:
The development of technologies in the measurement system leads on the periphery of interest. It provides a vital knowledge on analog & digital measuring Instruments.

Course Objectives:
- Interpret the working principles of various analog measuring Instruments.
- To understand the concept behind power and Energy measurements procedures.
- Calculate the resistance, inductance and capacitance using various bridges.
- Evaluate the importance and understand the concept of various transducers.
- To understand the various types of digital meters and their functionality.

UNIT – I
Analog Ammeter and Voltmeters
Classification – deflecting - control and damping torques – Construction of PMMC - Moving Iron and Electrodynamo instruments - Torque equation - Errors and Compensation – Numerical Problems.

UNIT – II
Analog Wattmeters and Energy Meters
Electrodynamometer type wattmeter (LPF and UPF) - Induction Type Energy meters-Construction and working - Errors and Compensation– Numerical Problems.

UNIT – III
Measurements of Electrical parameters
DC Bridges: Measurement of Resistance – Kelvin's double bridge - Wheatstone bridge – Numerical Problems.
AC Bridges: Measurement of inductance and quality factor - Maxwell's bridge - measurement of capacitance - Schering Bridge– Numerical Problems.

UNIT – IV
Transducers
Classification - Resistive (Strain Gauge) - Inductive (LVDT) and Capacitive (Piezo electric) Transducer – Numerical Problems.

UNIT – V
Digital Meters
Successive approximation Digital Voltmeter — Digital frequency meter - Digital multimeter - Digital Energy Meter.

Course Outcomes:
After the completion of the course the student should be able to:
- Choose right type of instrument for measurement of ac and dc voltage and current.
- Analyse the operation of wattmeter and energy meter.
- Differentiate the operation of AC and DC bridges.
- Describe the operation various Transducers.
- Know the importance of Digital Meters and their working principles.

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Text Books:

1. Electrical & Electronic Measurement & Instruments by A.K.Sawhney Dhanpat Rai & Co.Publications - 19th revised edition - 2011.
2. Electronic Instrumentation by H.S.Kalsi - THM.

Reference Books:

1. Electrical Measurements and measuring Instruments by E.W. Golding and F.C.Widdis - 5th Edition - Wheeler Publishing.
2. Modern Electronic Instrumentation and Measurement Techniques by A.D. Helfrick and W.D. Cooper - PHI - 5th Edition - 2002.
3. Electrical and Electronic Measurements and instrumentation by R.K.Rajput - S.Chand - 3rd edition.

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III Year – I SEMESTER		L	T	P	C
		3	0	0	3
ANALYSIS OF LINEAR SYSTEMS **(Minors Engineering Course)**					

Preamble:
This course introduces the basics of Electrical Networks, state space analysis, applications of Laplace, Fourier series and Fourier transform. It also deals with Z-Transforms and testing of polynomial and network synthesis.

Course Objectives: formulate

- To formulate state equation for electrical networks and analysis simple networks with state variable approach.
- To analyze the signals applied to electrical networks and theorems.
- To examine the applications of Fourier series, Fourier transform to simple circuits.
- To know the distinction between Laplace, Fourier and Z-Transforms.
- To evaluate testing of polynomials and network synthesis of LC, RC and RL networks.

UNIT - I
State Variable Analysis
Choice of state variables in Electrical networks-Formulation of state equations for Electrical networks-Equivalent source method. Network topological method - Solution of state equations-Analysis of simple networks with state variable approach.

UNIT - II
Laplace Transform Applications
Application of Laplace transform methods of analysis:
Response of RL, RC and RLC networks to step, ramp, pulse and impulse functions, shifting and scaling theorems-Laplace transform of periodic functions-Convolution theorem-Convolution integral-Applications.

UNIT - III
Application of Fourier Series and Fourier Transform
Fourier Series: RMS, average value of a non-sinusoidal periodic wave form-Expression for power with non sinusoidal voltage and current-Power factor-Effect of harmonics-Analysis of simple circuits with non-sinusoidal inputs.
Fourier Transform: Representation of non-periodic functions-Fourier integral-Fourier transform-Graphical Representation-Properties of Fourier transforms-Parseval's theorem-Fourier transform of constant, unit step, unit impulse, unit ramp signals and exponential functions-relationship with Laplace transform.

UNIT - IV
Z-Transforms
Fundamental difference between continuous and discrete time signals, discrete time complex, exponential and sinusoidal signals, periodicity of discrete time complex exponential, concept of Z-Transform of a discrete sequence. Distinction between Laplace, Fourier and Z-Transforms. Region of convergence in Z-Transforms, constraints on ROC for various classes of signals, Inverse Z-Transform properties of Z-Transforms.

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UNIT - V

Testing of Polynomials and Network synthesis:

Elements of realisability-Hurwitz polynomials-positive real functions-Properties-Testing-Sturm's Test, examples.

Network synthesis:

Synthesis of one port LC networks-Foster and Cauer methods-Synthesis of RL and RC one port networks-Foster and Cauer methods.

Course Outcomes:

After the completion of the course the student should be able to:

- Solve problems involving continuous time signals and linear systems.
- Use the Laplace transform to analyse signals, linear circuits and systems.
- Use the Fourier series and transform to analyse signals.
- Solve problems involving discrete time signals and linear systems.
- Illustrate testing of polynomials and network synthesis of LC, RC and RL networks.

Text Books:

1. Signals, Systems and Communications by B.P. Lathi, BS Publications 2003.
2. Network Analysis and Synthesis – B C Kuo
3. Network Analysis and Synthesis – Umesh Sinha- Satya Prakashan Publications

Reference Books:

1. Linear System Analysis – A N Sripathi, New Age International
2. Network and Systems – D Roy Chowdhary, New Age International
3. Engineering Network Analysis and Filter Desgin- Gopal G Bhise & Umesh

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III Year – I SEMESTER		L	T	P	C
		3	0	0	3
ENERGY AUDITING, CONSERVATION AND MANAGEMENT **(Minors Engineering Course)**					

Preamble:

This course is developed to cater the current needs of the industry. This course covers topics on Energy Audit, methodology, energy efficient lighting system, Energy Instruments and Economic Analysis. The student will learn various improvement techniques, energy efficiency in HVAC systems.

Course Objectives:

- To understand basic concepts of Energy Audit & various Energy conservation schemes.
- To design energy an energy management program.
- To understand concept of Energy Efficient Motors and lighting control efficiencies.
- To estimate/calculate power factor of systems and propose suitable compensation techniques.
- To calculate life cycle costing analysis and return on investment on energy efficient technologies.

Unit–I
Basic Principles of Energy Audit
Energy audit- definitions - concept - types of audit - energy index - cost index - pie charts - Sankey diagrams and load profiles - Energy conservation schemes- Energy audit of industries- energy saving potential - energy audit of process industry - thermal power station - building energy audit - Conservation of Energy Building Codes (ECBC-2017) -

Unit–II:
Energy Management
Principles of energy management - organizing energy management program - initiating - planning - controlling - promoting - monitoring - reporting. Energy manager - qualities and functions - language - Questionnaire – check list for top management.

Unit–III:
Energy Efficient Motors and Lighting
Energy efficient motors - factors affecting efficiency - loss distribution - constructional details - characteristics – variable speed - RMS - voltage variation-voltage unbalance-over motoring-motor energy audit. lighting system design and practice - lighting control - lighting energy audit.

Unit–IV
Power Factor Improvement And Energy Instruments
Power factor – methods of improvement - location of capacitors - Power factor with non-linear loads - effect of harmonics on p.f - p.f motor controllers – Energy Instruments- watt meter - data loggers - thermocouples - pyrometers - lux meters - tongue testers.

Unit–V
Economic Aspects and Their Computation
Economics Analysis depreciation Methods - time value of money - rate of return - present worth method - replacement analysis - lifecycle costing analysis – Energy efficient motors. Calculation of simple payback method - net present value method- Power factor correction - lighting – Applications of life cycle costing analysis - return on investment.

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Course Outcomes:

After the completion of the course the student should be able to:

- Understand the principles of energy audit along with various Energy related terminologies.
- Asses the role of Energy Manager and Energy Management program.
- Design a energy efficient motors and good lighting system.
- Analyse the methods to improve the power factor and identify the energy instruments for various real time applications.
- Evaluate the computational techniques with regard to economic aspects.

Text Books:

1. Energy management by W.R.Murphy&G.Mckay Butter worth - Heinemann publications - 1982.
2. Energy management hand book by W.CTurner - John wiley and sons - 1982.

Reference Books:

1. Energy efficient electric motors by John.C.Andreas - Marcel Dekker Inc Ltd-2nd edition - 1995
2. Energy management by Paul o' Callaghan - Mc-graw Hill Book company-1st edition - 1998
3. Energy management and good lighting practice : fuel efficiency- booklet12-EEO

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III Year – II SEMESTER		L	T	P	C
		3	0	0	3

EVOLUTIONARY ALGORITHMS
(Minors Engineering Course)

Preamble:
Evolutionary algorithms use mechanisms inspired by nature and they can be used to solve optimization problems through process that emulate the behaviors of living organisms. In this course students learn different evolutionary algorithms and their applications to solve standard single-objective test problems.

Course Objectives:
- To classify optimization problems and learn the features of soft computing algorithms.
- To learn the steps of GA and PSO algorithms and their applications to solve Rosenbrock & Rastrigin function test problems.
- To learn HSA and ABC algorithms & their application to solve Rosenbrock & Rastrigin function test problems.
- To illustrate the steps of SFLA & Bat optimization algorithms & their application to solve standard single objective test problems.
- To learn the basic concepts of multi-objective optimization & steps of NSGA-II algorithm.

UNIT - I
Fundamentals of Soft Computing Techniques
Definition-Classification of optimization problems- Unconstrained and Constrained optimization Optimality conditions- Soft computing techniques- Conventional Computing versus Soft Computing - Classification of meta-heuristic techniques - Single solution based and population based algorithms – Exploitation and exploration in population based algorithms - Discrete and continuous optimization problems - Single objective and multi-objective problems.

UNIT - II
Genetic Algorithm and Particle Swarm Optimization
Genetic algorithms- Genetic Algorithm versus Conventional Optimization Techniques - Genetic representations and selection mechanisms; Genetic operators- different types of crossover and mutation operators -Bird flocking and Fish Schooling – anatomy of a particle- equations based on velocity and positions -PSO topologies - control parameters – GA and PSO algorithms for solving standard Rosenbrock, Rastrigin function test problems.

UNIT - III
Harmony Search Optimization and Artificial Bee Colony Algorithms
Harmony Search algorithm – steps – Harmony memory initialization, New harmony improvisation, Harmony memory update – Improved Harmony search algorithm.
Task partitioning in honey bees - Balancing foragers and receivers - Artificial bee colony (ABC) algorithms-HSA and ABC algorithms to solve Rosenbrock & Rastrigin function test problems.

UNIT - IV
Shuffled Frog-Leaping Algorithm and Bat Optimization Algorithm
Bat Algorithm- Echolocation of bats- Behaviour of microbats- Acoustics of Echolocation- Movement of Virtual Bats- Loudness and Pulse Emission- Shuffled frog algorithm-virtual population of frogs-comparison of memes and genes -memeplex formation- memeplex updation- BA and SFLA algorithms to solve Rosenbrock & Rastrigin function test problems..



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UNIT - V

Multi Objective Optimization

Multi-Objective optimization Introduction- Concept of Pareto optimality - Non-dominant sorting technique-Pareto fronts-best compromise solution-min-max method-NSGA-II algorithm and application to solve general two objective optimization problem.

Course Outcomes:

After the completion of the course the student should be able to:

- State and formulate the optimization problem, without and with constraints, by using design variables.
- Apply GA and PSO algorithms to solve single objective optimization problems
- Apply HSA and ABC algorithms to solve single objective optimization problems
- Apply Bat and SFL algorithms to solve single objective optimization problems
- Formulate multi-objective optimization problem and use NSGA-II to solve two objective optimization problem

Text Books

1. Xin-She Yang, „Recent Advances in Swarm Intelligence and Evolutionary Computation", Springer International Publishing, Switzerland, 2015.
2. Kalyanmoy Deb „Multi-Objective Optimization using Evolutionary Algorithms", John Wiley & Sons, 2001.
3. James Kennedy and Russel E Eberheart, „Swarm Intelligence", The Morgan Kaufmann Series in Evolutionary Computation, 2001.

Reference Books:

1. Eric Bonabeau, Marco Dorigo and Guy Theraulaz, „Swarm Intelligence-From natural to Artificial Systems", Oxford university Press, 1999.
2. David Goldberg, „Genetic Algorithms in Search, Optimization and Machine Learning", Pearson Education, 2007.
3. Konstantinos E. Parsopoulos and Michael N. Vrahatis, „Particle Swarm Optimization and Intelligence: Advances and Applications", InformatIon scIence reference, IGI Global, , 2010.
4. N P Padhy, „Artificial Intelligence and Intelligent Systems", Oxford University Press, 2005.

Reference Papers:

1. "Shuffled frog-leaping algorithm: a memetic meta-heuristic for discrete optimization" by Muzaffar eusuff, Kevin lansey and Fayzul pasha, Engineering Optimization, Taylor & Francis, Vol. 38, No. pp.129–154, March 2006.
2. "A New Metaheuristic Bat-Inspired Algorithm" by Xin-She Yang, Nature Inspired Cooperative Strategies for Optimization (NISCO 2010) (Eds. J. R. Gonzalez et al.), Studies in Computational Intelligence, Springer Berlin, 284, Springer, 65-74 (2010).
3. K. Nekooei, M. M. Farsangi, H. Nezamabadi-Pour and K. Y. Lee, "An Improved Multi-Objective Harmony Search for Optimal Placement of DGs in Distribution Systems," in *IEEE Transactions on Smart Grid*, vol. 4, no. 1, pp. 557-567, March 2013, doi: 10.1109/TSG.2012.2237420.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA–533003, Andhra Pradesh, India
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

III Year – II SEMESTER		L	T	P	C
		3	0	0	3
FUNDAMENTALS OF POWER ELECTRONICS **(Minors Engineering Course)**					

Preamble:
The usage of power electronics in day to day life has increased in recent years. It is important for student to understand the fundamental principles behind all power electronic converters. This course covers characteristics of semiconductor devices and operation of ac/dc, dc/dc, ac/ac and dc/ac converters. The importance of using pulse width modulated techniques to obtain high quality power supply (dc/ac converter) is also discussed in detail in this course.

Course Objectives:
- To know the characteristics of various power semiconductor devices.
- To learn the operation of single phase full–wave converters and perform harmonic analysis of input current.
- To learn the operation of three phase full–wave converters and AC/AC converters.
- To learn the operation of different types of DC-DC converters.
- To learn the operation of PWM inverters for voltage control and harmonic mitigation.

UNIT – I
Power Semi-Conductor Devices
Silicon controlled rectifier (SCR) – Two transistor analogy - Static and Dynamic characteristics
Static and Dynamic Characteristics of Power MOSFET and Power IGBT– Gate Driver Circuits for Power MOSFET and IGBT - Numerical problems.

UNIT – II
Single-phase AC-DC Converters
Single-phase half wave controlled rectifiers - R load and RL load with and without freewheeling diode - Single-phase fully controlled bridge converter with R load - RL load and RLE load - Continuous and Discontinuous conduction - Expression for output voltages – Single-phase Semi-Converter with R load - RL load and RLE load – Continuous and Discontinuous conduction - Harmonic Analysis - Numerical Problems.

UNIT – III
Three-phase AC-DC Converters & AC – AC Converters
Three-phase fully controlled rectifier with R and RL load - Three-phase semi converter with R and RL load - Expression for Output Voltage - Harmonic Analysis - Numerical Problems.
AC-AC power control by phase control with R and RL loads - Expression for rms output voltage- Numerical problems.

UNIT – IV
DC–DC Converters
Analysis of Buck - Boost and Buck-Boost converters in Continuous Conduction Mode (CCM) and Discontinuous Conduction Modes (DCM) - Output voltage equations using volt-sec balance in CCM & DCM – Expressions for output voltage ripple and inductor current ripple- Numerical Problems.

UNIT - V
DC–AC Converters
Introduction - Single-phase half bridge and full bridge inverters with R and RL loads – Three-phase square wave inverters - 120^0 conduction and 180^0 conduction modes of operation - PWM inverters - Sinusoidal Pulse Width Modulation - Numerical Problems.

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Course Outcomes:

After the completion of the course the student should be able to:

- Illustrate the static and dynamic characteristics SCR - Power MOSFET and Power IGBT.
- Analyse the operation of phase controlled rectifiers.
- Analyse the operation of Three-phase full–wave converters - AC Voltage Controllers and Cyclo-converters.
- Examine the operation and design of different types of DC-DC converters.
- Analyse the operation of PWM inverters for voltage control and harmonic mitigation.

Text Books:

1. Power Electronics: Converters - Applications and Design by Ned Mohan - Tore M Undeland - William P Robbins - John Wiley & Sons.
2. Power Electronics: Circuits - Devices and Applications – by M. H. Rashid - Prentice Hall of India - 2nd edition - 1998
3. Power Electronics: Essentials & Applications by L. Umanand - Wiley - Pvt. Limited - India - 2009.

Reference Books:

1. Elements of Power Electronics–Philip T.Krein. Oxford University Press; Second edition
2. Power Electronics – by P.S.Bhimbra - Khanna Publishers.
3. Power Electronics: by Daniel W.Hart - Mc Graw Hill.

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IV Year – I SEMESTER		L	T	P	C
		3	0	0	3
NEURAL NETWORKS AND FUZZY LOGIC (Minors Engineering Course)					

Preamble:
This course introduces the basics of Neural Networks and essentials of Artificial Neural Networks with Single Layer and Multilayer Feed Forward Networks. Also deals with Associate Memories and introduces Fuzzy sets and Fuzzy Logic system components. The Neural Network and Fuzzy Network system application to Electrical Engineering is also presented. This subject is very important and useful for doing Project Work.

Course Objectives:
- To understand artificial neuron models & learning methods of ANN.
- To utilize different algorithms of ANN.
- To distinguish between classical and fuzzy sets.
- To illustrated different modules of fuzzy controller.
- To analyze applications of neural networks and fuzzy logic.

UNIT - I
Introduction
Artificial Neural Networks (ANN) – Humans and Computers – Biological Neural Networks – ANN Terminology – Models of Artificial Neuron – activation functions – typical architectures – biases and thresholds – learning strategy(supervised - unsupervised and reinforced) – Neural networks learning rules.

UNIT - II
Feed Forward Networks:
Single Layer Feed Forward Neural Networks: Concept of Pattern And Its Types - Perceptron Training and Classification Using Discrete and Continuous Perceptron Algorithms– Linear Separability- XOR Function.

UNIT - III
ANN Paradigms
Multi-layer feed forward networks –Generalized delta rule– Back Propagation algorithm – Radial Basis Function (RBF) network - Kohonen's self-organizing feature maps (KSOFM) – Bidirectional Associative Memory (BAM).

UNIT - IV
.Classical and Fuzzy Sets
Introduction to classical sets- properties - Operations and relations;
Fuzzy sets - Operations - Properties - Fuzzy relations - Cardinalities - Membership functions.

UNIT - V
Fuzzy Logic Modules
Fuzzification - Membership value assignment - development of rule base and decision making system - Defuzzification to crisp sets - Defuzzification methods.

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Course Outcomes:

After the completion of the course the student should be able to:

- Analyse different models of artificial neuron.
- Illustrate training and classification using perceptron algorithms.
- Evaluate different paradigms of ANN.
- Classify between classical and fuzzy sets.
- Analyse various modules of Fuzzy logic controller.

Text Books:

1. Introduction to Artificial Neural Systems - Jacek M. Zuarda - Jaico Publishing House - 1997.
2. Neural Networks -Fuzzy logic - Genetic algorithms: synthesis and applications by Rajasekharan and Pai – PHI Publication.

Reference Books:

1. Artificial Neural Network – B.Yegnanarayana - PHI - 2012.
2. Fuzzy logic with Fuzzy Applications – T.J Ross – Mc Graw Hill Inc - 1997.
3. Introduction to Neural Networks using MATLAB 6.0 – S N Sivanandam – S. Sumathi - S N Deepa TMGH
4. Introduction to Fuzzy Logic using MATLAB – S N Sivanandam – S. Sumathi - S N Deepa Springer - 2007.

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

IV Year – I SEMESTER		L	T	P	C
		3	0	0	3

CONCEPTS OF ELECTRIC DRIVES AND ITS APPLICATIONS
(Minors Engineering Course)

Preamble:
This course covers in detail the basic speed control techniques of DC and AC motors using power electronic converters.

Course Objectives:
- To learn the fundamentals of electric drive & different electric braking methods.
- To analyse the operation of phase controlled converter fed DC motor drives.
- To analyze the operation of DC-DC converter fed DC motor drives.
- To illustrate the speed control of induction motor by stator and rotor side control.
- To learn the speed control mechanism of synchronous motors.

UNIT – I
Fundamentals of Electric Drives
Electric drive and its components– Fundamental torque equation – Load torque components – Nature and classification of load torques – Steady state stability – Load equalization– Four quadrant operation of drive (hoist control) – Braking methods**:** Dynamic – Plugging – Regenerative methods.

UNIT – II
Controlled Converter Fed DC Motor Drives
3-phase half and fully-controlled converter fed separately and self-excited DC motor drive – Output voltage and current waveforms – Speed-torque expressions – Speed-torque characteristics -Numerical problems.

UNIT – III
DC–DC Converters Fed DC Motor Drives
Single quadrant – Two quadrant and four quadrant DC-DC converter fed separately excited and self-excited DC motors – Continuous current mode of operation - Output voltage and current waveforms – Speed–torque expressions and characteristics.

UNIT – IV
Stator and Rotor side control of 3-phase Induction motor Drive
Stator voltage control using 3-phase AC voltage regulators – Waveforms –Speed torque characteristics– Variable Voltage Variable Frequency control of induction motor by PWM voltage source inverter. Static rotor resistance control– Static Scherbius drive – Static Kramer drive – Performance and speed torque characteristics.

UNIT - V
Control of Synchronous Motor Drives
Separate control of synchronous motor – self-control of synchronous motor employing load commutated thyristor inverter - closed loop control of synchronous motor drive (qualitative treatment only).

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Course Outcomes:

After the completion of the course the student should be able to:

- Explain the fundamentals of electric drive and different electric braking methods.
- Analyze the operation of Three-phase converter fed dc motors and four quadrant operations of dc motors using dual converters.
- Describe the DC-DC converter control of dc motors in various quadrants of operation
- Understand `the concept of speed control of induction motor by using AC voltage controllers, voltage source inverters and rotor side control.
- Understand the speed control mechanism of synchronous motors.

Text Books:

1. Fundamentals of Electric Drives – by G K Dubey - Narosa Publications - 2nd edition 2002.
2. Power Semiconductor Drives - by S.B.Dewan - G.R.Slemon - A.Straughen - Wiley-India - 1984.

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DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE STRUCTURE AND SYLLABUS

For UG – R20

B. TECH - INFORMATION TECHNOLOGY

(Applicable for batches admitted from 2020-2021)

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DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE STRUCTURE

I Year – I SEMESTER						
S. No	**Course Code**	**Courses**	**L**	**T**	**P**	**Credits**
1	HS	Communicative English	3	0	0	3
2	BS	Mathematics - I (Calculus And Differential Equations)	3	0	0	3
3	BS	Applied Physics	3	0	0	3
4	ES	Programming for Problem Solving using C	3	0	0	3
5	ES	Computer Engineering Workshop	1	0	4	3
6	HS	English Communication Skills Laboratory	0	0	3	1.5
7	BS	Applied Physics Lab	0	0	3	1.5
8	ES	Programming for Problem Solving using C Lab	0	0	3	1.5
Total Credits			**19.5**			

I Year – II SEMESTER						
S. No	**Course Code**	**Courses**	**L**	**T**	**P**	**Credits**
1	BS	Mathematics – II (Linear Algebra And Numerical Methods)	3	0	0	3
2	BS	Applied Chemistry	3	0	0	3
3	ES	Computer Organization	3	0	0	3
4	ES	Python Programming	3	0	0	3
5	ES	Data Structures	3	0	0	3
6	BS	Applied Chemistry Lab	0	0	3	1.5
7	ES	Python Programming Lab	0	0	3	1.5
8	ES	Data Structures Lab	0	0	3	1.5
9	MC	Environment Science	2	0	0	0
Total Credits			**19.5**			

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II Year – I SEMESTER						
S.No	**Course Code**	**Courses**	**L**	**T**	**P**	**Credits**
1	BS	Mathematics III	3	0	0	3
2	IT	Object Oriented Programming through C++	3	0	0	3
3	IT	Operating Systems	3	0	0	3
4	IT	Database Management Systems	3	0	0	3
5	IT	Discrete Mathematics and Graph Theory	3	0	0	3
6	IT	Object Oriented Programming through C++ Lab	0	0	3	1.5
7	IT	Operating Systems Lab	0	0	3	1.5
8	IT	Database Management Systems Lab	0	0	3	1.5
9	SO	**Skill Oriented Course I** 1) Animations- 2D Animation 2) Distributed Technologies- NoSQL	0	0	4	2
10	MC	Constitution of India	2	0	0	0
Total Credits			**21.5**			

II Year – II SEMESTER						
S.No	**Course Code**	**Courses**	**L**	**T**	**P**	**Credits**
1	BS	Statistics with R	2	0	2	3
2	IT	Principles of Software Engineering	3	0	0	3
3	IT	Automata Theory and Compiler Design	3	0	0	3
4	ES	Java Programming	3	0	0	3
5	HS	Managerial Economics and Financial Accountancy	3	0	0	3
6	IT	UML Lab	0	1	2	2
7	IT	FOSS Lab	0	0	2	1
8	ES	Java Programming Lab	0	0	3	1.5
9	SO	**Skill Oriented Course II** 1) Animations- 3D Animation **OR** 2) Distributed Technologies- MongoDB	0	0	4	2
Total Credits			**21.5**			
10	Minor	Object Oriented Programming through C++[$]	3	0	2	3+1
11	Honors	Any course from the Pool, as per the opted track	4	0	0	4

$- Integrated Course

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III B. Tech – I Semester						
S.No	**Course Code**	**Courses**	**Hours per week**			**Credits**
			L	**T**	**P**	**C**
1	PC	Computer Networks	**3**	**0**	**0**	**3**
2	PC	Design and Analysis of Algorithms	**3**	**0**	**0**	**3**
3	PC	Data Mining Techniques	**3**	**0**	**0**	**3**
4	Open Elective/Job Oriented	**Open Elective-I** Open Electives offered by other departments/ DevOps (Job Oriented course)	**3**	**0**	**0**	**3**
5	PE	**Professional Elective-I** 1. Artificial Intelligence 2. Agile Software Process 3. Distributed Systems 4. Advanced Unix Programming	**3**	**0**	**0**	**3**
6	PC	Data Mining Techniques with R Lab	**0**	**0**	**3**	**1.5**
7	PC	Computer Networks Lab	**0**	**0**	**3**	**1.5**
8	SO	**Skill Oriented Course - III** 1.Animation course: Animation Design **OR** 2. Continuous Integration and Continuous Delivery using DevOps	**0**	**0**	**4**	**2**
9	MC	Employability Skills-I	**2**	**0**	**0**	**0**
10	PR	**Summer Internship 2 Months(Mandatory) after second year(to be evaluated during V semester**	**0**	**0**	**0**	**1.5**
Total credits						**21.5**
11	Minor	Computer Networks[$]	3	0	2	3+1
12	Honors	Any course from the Pool, as per the opted track	4	0	0	4

$- Integrated Course

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DEPARTMENT OF INFORMATION TECHNOLOGY

III B. Tech – II Semester						
S.No	**Course Code**	**Courses**	**Hours per week**			**Credits**
			L	**T**	**P**	**C**
1	PC	Machine Learning	**3**	**0**	**0**	**3**
2	PC	Big Data Analytics	**3**	**0**	**0**	**3**
3	PC	Cryptography and Network Security	**3**	**0**	**0**	**3**
4	PE	**Professional Elective-II** 1.Mobile Computing 2.MEAN Stack Development 3. Design Patterns 4.Scripting Languages	**3**	**0**	**0**	**3**
5	Open Elective/ Job Oriented	**Open Elective-II** Open Electives offered by other departments	**3**	**0**	**0**	**3**
6	PC	Big Data Analytics lab	**0**	**0**	**3**	**1.5**
7	PC	Machine Learning using Python Lab	**0**	**0**	**3**	**1.5**
8	PC	Cryptography and Network Security Lab	**0**	**0**	**3**	**1.5**
9	SO	**Skill Oriented Course - IV** 1.Data Science: Natural Language Processing **OR** 2.Video Analytics	**0**	**0**	**4**	**2**
10	MC3201	Employability skills-II	**2**	**0**	**0**	**0**
Total credits						**21.5**
Industrial/Research Internship(Mandatory) 2 Months during summer vacation						
11	Minor	Data Structures and Algorithms$	3	0	2	3+1
12	Honors	Any course from the Pool, as per the opted track	4	0	0	4
Minor course through SWAYAM			**-**	**-**	**-**	**2**

$- Integrated Course

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DEPARTMENT OF INFORMATION TECHNOLOGY

IV B. Tech –I Semester						
S.No	**Course Code**	**Course Title**	**Hours per week**			**Credits**
			L	**T**	**P**	**C**
1	PE	**Professional Elective-III** 1.Cloud Computing 2. Artificial Neural Networks 3. Internet of Things (IoT) 4.Cyber Security & Forensics	**3**	**0**	**0**	**3**
2	PE	**Professional Elective-IV** 1. Deep Learning Techniques 2. Social Networks Analysis 3. Advanced Databases 4.MOOCS-NPTEL/SWAYAM	**3**	**0**	**0**	**3**
3	PE	**Professional Elective-V** 1.Block-Chain Technologies 2.M-Commerce 3.Ethical Hacking 4.MOOCS-NPTEL/SWAYAM	**3**	**0**	**0**	**3**
4	Open Elective /Job Oriented	**Open Elective-III** Open Electives offered by other departments	**2**	**0**	**2**	**3**
5	Open Elective /Job Oriented	**Open Elective-IV** Open Electives offered by other departments	**2**	**0**	**2**	**3**
6	HS	Universal Human Values 2: Understanding Harmony	**3**	**0**	**0**	**3**
7	SO	PYTHON: Deep Learning **OR** Secure Coding Techniques **OR** APSSDC offered Courses	**0**	**0**	**4**	**2**
8	PR	**Industrial/Research Internship 2 months (Mandatory) after third year (to be evaluated during VII semester**	**0**	**0**	**0**	**3**
					Total credits	**23**
11	Minor	Software Engineering[$] / any other from PART-B (For Minor)	3	0	2	3+1
12	Honors	Any course from the Pool, as per the opted track	4	0	0	4
		Minor course through SWAYAM	**-**	**-**	**-**	**2**

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IV B. Tech –II Semester						
S.No	**Course Code**	**Course Title**	**Hours per week**			**Credits**
			L	**T**	**P**	**C**
1	Project	Major Project Work, Seminar Internship	**-**	**-**	**-**	**12**
					Total credits	**12**

Note:

1. ***For integrated courses***: Theory and laboratory exams will be conducted separately, and the student concern will get credits if successfully completes both theory and laboratory. Only external exam will be conducted for Laboratory component. Credit based weightage shall be considered while awarding the grade.
2. ***For MOOC courses***: Based on the students interest, student can register and complete a 12 week course one year in advance, by prior information to the concern.

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DEPARTMENT OF INFORMATION TECHNOLOGY

SUGGESTED COURSES FOR HONORS PROGRAM

POOL1- AI & ML 1. Mathematics for Machine Learning 2. Text Mining and Time Series Analysis 3. Natural Language Processing 4. Reinforcement Learning	**POOL2- Systems Engineering** 1. Internet of Things 2. Data Communications and Information Coding Theory 3. Service Oriented Architectures 4. Design of Secure Protocols 5. Network Coding
POOL3- Information Security 1. Principles of Cyber Security 2. Computational Number Theory 3. Cryptanalysis 4. Elliptic Curve Cryptography 5. Introduction to Quantum Computing and Quantum Cryptography 6. Public Key Infrastructure and Trust Management 7. Information Security Analysis and Audit 8. Cloud and IoT Security 9. Web Security 10. Block Chain Architecture Design and Use Cases	**POOL4 – Data Science** 1. Data Visualization 2. Statistical Foundations for Data Science 3. Mining Massive Data Sets 4. Medical Image Data Processing

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DEPARTMENT OF INFORMATION TECHNOLOGY

SUGGESTED COURSES FOR MINOR ENGINEERING IN IT

Note:

1. Any THREE courses *(Any FOUR courses in case of MOOCS)* need to be studied from PART-A.
2. Any ONE course (*If it is in Regular Mode*) need to be studied from PART-B.
3. TWO, NPTEL courses of EIGHT week duration covering a total of 4 credits (offered by the department of CSE/IT only), Student can register at any time after the completion of II B.Tech. I Sem.
4. Students can pursue suggested MOOC Courses via NPTEL from II B.Tech II Sem and onwards, by prior information to the concern.
5. If sufficient numbers of students are not opted, as per the guidelines, dept can suggest students to pursue under MOOCS. In this case, department/students can select course such that there will not be any duplication.

Eligibility for Minor in IT:

PART A						
Regular Mode				**MOOCS***		
S.No	**Subject**	**L-T-P**	**Credits**	**Course available in NPTEL**	**NPTEL Link**	**Credits**
1	Operating Systems	3-0-2	4	Operating Systems	https://onlinecourses.swayam2.ac.in/cec21_cs20/preview	As recommended by the NPTEL (Dept need to verify the credits and suggest)
2	Data Structures and Algorithms	3-0-2	4	Data Structure and algorithms using Java	https://nptel.ac.in/courses/106105225	
3	Software Engineering	3-0-2	4	Software Engineering	https://onlinecourses.swayam2.ac.in/cec21_cs21/preview	
4	Computer Networks	3-0-2	4	Computer Networks	https://onlinecourses.swayam2.ac.in/cec22_cs05/preview	
5	Database Management Systems	3-0-2	4	Data Base Management System	https://onlinecourses.nptel.ac.in/noc22_cs51/preview	
* If sufficient number of students are not available to offer, can pursue under MOOCS						

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PART B						
S.No	**Subject**	**L-T-P**	**Credits**	**Course available in NPTEL**	**NPTEL Link**	**Credits**
1	Object Oriented Programming through C++	3-0-2	4	Programming in C++ (Two Credits)	https://onlinecourses.nptel.ac.in/noc21_cs02/preview	As recommended by the NPTEL (Dept need to verify the credits and suggest)
2	Data Analytics using Python	3-0-2	4	Data Analytics with Python	https://nptel.ac.in/courses/106107220	
3	Artificial Intelligence	4-0-0	4	Artificial Intelligence: Knowledge Representation And Reasoning	https://nptel.ac.in/courses/106106140	
				OR		
				An Introduction to Artificial Intelligence	https://onlinecourses.nptel.ac.in/noc22_cs56/preview	
4	Unix and Shell Programming	3-0-2	4			
5	Cloud Computing	4-0-0	4	Cloud computing	https://onlinecourses.nptel.ac.in/noc22_cs20/preview	
				OR		
				Cloud Computing and Distributed Systems (TWO Credits)	https://onlinecourses.nptel.ac.in/noc21_cs15/preview	
* If sufficient number of students are not available to offer, can pursue under MOOCS						

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DEPARTMENT OF INFORMATION TECHNOLOGY

I Year - I Semester		L	T	P	C
		3	0	0	3
COMMUNICATIVE ENGLISH					

Introduction

The course is designed to train students in receptive (listening and reading) as well as productive and interactive (speaking and writing) skills by incorporating a comprehensive, coherent and integrated approach that improves the learners' ability to effectively use English language in academic/ workplace contexts. The shift is from learning about the language to using the language. On successful completion of the compulsory English language course/s in B.Tech., learners would be confident of appearing for international language qualification/proficiency tests such as IELTS, TOEFL, or BEC, besides being able to express themselves clearly in speech and competently handle the writing tasks and verbal ability component of campus placement tests. Activity based teaching-learning methods would be adopted to ensure that learners would engage in actual use of language both in the classroom and laboratory sessions.

Course Objectives:

- Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Course Outcomes:

At the end of the module, the learners will be able to

- understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information
- ask and answer general questions on familiar topics and introduce oneself/others
- employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information
- recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs
- form sentences using proper grammatical structures and correct word forms

Unit 1:

Lesson-1: A Drawer full of happiness from "**Infotech English**", Maruthi Publications

Lesson-2: Deliverance by Premchand from "**The Individual Society",**Pearson Publications. (Non-detailed)

Listening: Listening to short audio texts and identifying the topic. Listening to prose, prose and conversation.

Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests. Self introductions and introducing others.

Reading: Skimming text to get the main idea. Scanning to look for specific pieces of information.

Reading for Writing: Paragraph writing (specific topics) using suitable cohesive devices; linkers, sign posts and transition signals; mechanics of writing - punctuation, capital letters.
Vocabulary: Technical vocabulary from across technical branches (20) GRE Vocabulary (20) (Antonyms and Synonyms, Word applications) Verbal reasoning and sequencing of words.
Grammar: Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countables and uncountables; singular and plural basic sentence structures; simple question form - wh-questions; word order in sentences.
Pronunciation: Vowels, Consonants, Plural markers and their realizations

Unit 2:

Lesson-1: Nehru's letter to his daughter Indira on her birthday from "**Infotech English**", Maruthi Publications
Lesson-2: Bosom Friend by Hira Bansode from "**The Individual Society",** Pearson Publications.(Non-detailed)
Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts, both in speaking and writing.
Speaking: Discussion in pairs/ small groups on specific topics followed by short structured talks. Functional English: Greetings and leave takings.
Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.
Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions.
Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary Analogies (20 words) (Antonyms and Synonyms, Word applications)
Grammar: Use of articles and zero article; prepositions.
Pronunciation: Past tense markers, word stress-di-syllabic words

Unit 3:

Lesson-1: Stephen Hawking-Positivity 'Benchmark' from "**Infotech English**", Maruthi Publications
Lesson-2: Shakespeare's Sister by Virginia Woolf from "**The Individual Society",** Pearson Publications.(Non-detailed**)**
Listening: Listening for global comprehension and summarizing what is listened to, both in speaking and writing.
Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed.Functional English:Complaining and Apologizing.
Reading: Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension.Critical reading.
Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. Letter writing-types, format and principles of letter writing.E-mail etiquette, Writing CV's.
Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Association, sequencing of words
Grammar: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.
Pronunciation: word stress-poly-syllabic words.

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Unit 4:

Lesson-1: Liking a Tree, Unbowed: Wangari Maathai-biography from "**Infotech English**", Maruthi Publications

Lesson-2: Telephone Conversation-Wole Soyinka from "**The Individual Society",** Pearson Publications**.**(Non-detailed)

Listening: Making predictions while listening to conversations/ transactional dialogues without video (only audio); listening to audio-visual texts.

Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.Functional English: Permissions, Requesting, Inviting.

Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicative process or display complicated data.

Reading for Writing: Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables.Writing SOP, writing for media.

Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Cloze Encounters.

Grammar: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms

Pronunciation: Contrastive Stress

Unit 5:

Lesson-1: Stay Hungry-Stay foolish from "**Infotech English**", Maruthi Publications

Lesson-2: Still I Rise by Maya Angelou from "**The Individual Society",** Pearson Publications.(Non-detailed)

Listening: Identifying key terms, understanding concepts and interpreting the concepts both in speaking and writing.

Speaking: Formal oral presentations on topics from academic contexts - without the use of PPT slides.Functional English: Suggesting/Opinion giving.

Reading: Reading for comprehension. RAP StrategyIntensive reading and Extensive reading techniques.

Reading for Writing: Writing academic proposals- writing research articles: format and style.

Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Coherence, matching emotions.

Grammar: Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)

Pronunciation: Stress in compound words

Text Books:

1. "Infotech English", Maruthi Publications. (Detailed)
2. "The Individual Society", Pearson Publications.(Non-detailed)

Prescribed text book for Laboratory for Semesters-I & II:

1. "Infotech English", Maruthi Publications. (with Compact Disc)

Reference Books:

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.

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I Year - I Semester		L	T	P	C
		3	0	0	3
MATHEMATICS-I (Calculus And Differential Equations)					

Course Objectives:

- To familiarize a variety of well-known sequences and series, with a developing intuition about the behaviour of new ones.
- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

Course Outcomes: At the end of the course, the student will be able to

- utilize mean value theorems to real life problems (L3)
- solve the differential equations related to various engineering fields (L3)
- familiarize with functions of several variables which is useful in optimization (L3)
- apply double integration techniques in evaluating areas bounded by region (L3)
- learn important tools of calculus in higher dimensions. Students will become familiar with 2-dimensional and 3-dimensional coordinate systems(L5)

UNIT – I: Sequences, Series and Mean value theorems: (10hrs)

Sequences and Series: Convergences and divergence – Ratio test – Comparison tests – Integral test – Cauchy's root test – Alternate series– Leibnitz's rule.

Mean Value Theorems (without proofs): Rolle's Theorem – Lagrange's mean value theorem – Cauchy's mean value theorem – Taylor's and Maclaurin's theorems with remainders, Problems and applications on the above theorem.

UNIT – II: Differential equations of first order and first degree: (10hrs)

Linear differential equations– Bernoulli's equations –Exact equations and equations reducible to exact form.

Applications: Newton's Law of cooling– Law of natural growth and decay– Orthogonal trajectories– Electrical circuits.

UNIT – III: Linear differential equations of higher order: (10hrs)

Homogeneous and Non-homogeneous differential equations of higher order with constant coefficients – with non-homogeneous term of the type e^{ax}, sin ax, cos ax, polynomials in x^n, $e^{ax}V(x)$ and $x^nV(x)$ – Method of Variation of parameters, Cauchy and Legendre's linear equations.

Applications: LCR circuit, Simple Harmonic motion.

UNIT – IV: Partial differentiation: (10hrs) Introduction – Homogeneous function – Euler's theorem– Total derivative– Chain rule– Jacobian – Functional dependence –Taylor's and MacLaurin's series expansion of functions of two variables.

Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method.

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UNIT – V: Multiple integrals: (8 hrs)
Double and Triple integrals – Change of order of integration in double integrals – Change of variables to polar, cylindrical and spherical coordinates.
Applications: Finding Areas and Volumes.

Text Books:
1. B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers.
2. B. V. Ramana,Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:
1. Erwin Kreyszig,Advanced Engineering Mathematics, 10th Edition, Wiley-India.
2. Joel Hass, Christopher Heil and Maurice D. Weir, Thomas calculus, 14thEdition, Pearson.
3. Lawrence Turyn,Advanced Engineering Mathematics, CRC Press, 2013.
4. Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford University Press.

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I Year - I Semester		L	T	P	C
		3	0	0	3
APPLIED PHYSICS					

Course Objectives:

1. Bridging the gap between the physics in school at 10+2 level and UG level engineering courses.
2. To identify the importance of the optical phenomenon i.e. interference, diffraction and polarization related to its Engineering applications
3. Understand the mechanism of emission of light, utilization of lasers as coherent light sources for low and high energy applications, study of propagation of light through optical fibers and their implications in optical communications.
4. Enlightenment of the concepts of Quantum Mechanics and to provide fundamentals of deBroglie matter waves, quantum mechanical wave equation and its application, the importance of free electron theory for metals and band theory for crystalline solids. Metals-Semiconductors-Insulators concepts utilization of transport phenomenon of charge carriers in semiconductors.
5. To explain the significant concepts of dielectric and magnetic materials that leads to potential applications in the emerging micro devices.
6. To Understand the physics of Semiconductors and their working mechanism. To give an impetus on the subtle mechanism of superconductors using the concept of BCS theory and their fascinating applications.

Course Outcomes:

1. Explain the need of coherent sources and the conditions for sustained interference (L2). Identify the applications of interference in engineering (L3). Analyze the differences between interference and diffraction with applications (L4). Illustrate the concept of polarization of light and its applications (L2). Classify ordinary refracted light and extraordinary refracted rays by their states of polarization (L2)
2. Explain various types of emission of radiation (L2). Identify the role of laser in engineering applications (L3). Describe the construction and working principles of various types of lasers (L1). Explain the working principle of optical fibers (L2). Classify optical fibers based on refractive index profile and mode of propagation (L2). Identify the applications of optical fibers in medical, communication and other fields (L2). Apply the fiber optic concepts in various fields (L3).
3. Describe the dual nature of matter (L1). Explain the significance of wave function (L2). Identify the role of Schrodinger's time independent wave equation in studying particle in one-dimensional infinite potential well (L3). Identify the role of classical and quantum free electron theory in the study of electrical conductivity (L3). Classify the energy bands of solids (L2).
4. Explain the concept of dielectric constant and polarization in dielectric materials (L2). Summarize various types of polarization of dielectrics (L2). Interpret Lorentz field and Claussius-Mosotti relation in dielectrics (L2). Classify the magnetic materials based on susceptibility and their temperature dependence (L2). Explain the applications of dielectric and magnetic materials (L2). Apply the concept of magnetism to magnetic devices (L3)
5. Outline the properties of charge carriers in semiconductors (L2). Identify the type of semiconductor using Hall effect (L2). Identify applications of semiconductors in electronic devices (L2). Classify superconductors based on Meissner's effect (L2). Explain Meissner's effect, BCS theory & Josephson effect in superconductors (L2).

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Unit-I: Wave Optics **12hrs**

Interference: Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Colors in thin films- Newton's Rings- Determination of wavelength and refractive index.

Diffraction: Introduction - Fresnel and Fraunhofer diffraction - Fraunhofer diffraction due to single slit, double slit - N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating(Qualitative).

Polarization: Introduction-Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol's Prism -Half wave and Quarter wave plates.

Unit Outcomes:

The students will be able to

- Explain the need of coherent sources and the conditions for sustained interference (L2)
- Identify engineering applications of interference (L3)
- Analyze the differences between interference and diffraction with applications (L4)
- Illustrate the concept of polarization of light and its applications (L2)
- Classify ordinary polarized light and extraordinary polarized light (L2)

Unit-II: Lasers and Fiber optics **8hrs**

Lasers: Introduction – Characteristics of laser – Spontaneous and Stimulated emissions of radiation – Einstein's coefficients – Population inversion – Lasing action - Pumping mechanisms – Ruby laser – He-Ne laser - Applications of lasers.

Fiber optics: Introduction –Principle of optical fiber- Acceptance Angle - Numerical Aperture - Classification of optical fibers based on refractive index profile and modes – Propagation of electromagnetic wave through optical fibers - Applications.

Unit Outcomes:

The students will be able to

- Understand the basic concepts of LASER light Sources (L2)
- Apply the concepts to learn the types of lasers (L3)
- Identifies the Engineering applications of lasers (L2)
- Explain the working principle of optical fibers (L2)
- Classify optical fibers based on refractive index profile and mode of propagation (L2)
- Identify the applications of optical fibers in various fields (L2)

Unit III: Quantum Mechanics, Free Electron Theory and Band theory **10hrs**

Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory– Equation for electrical conductivity based on quantum free electron theory- Fermi-Dirac distribution- Density of states (3D) - Fermi energy.

Band theory of Solids: Bloch's Theorem (Qualitative) - Kronig - Penney model (Qualitative)-
E vs K diagram - v vs K diagram - effective mass of electron – Classification of crystalline solids– concept of hole.

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Unit Outcomes:
The students will be able to
- Explain the concept of dual nature of matter (L2)
- Understand the significance of wave function (L2)
- Interpret the concepts of classical and quantum free electron theories (L2)
- Explain the importance of K-P model
- Classify the materials based on band theory (L2)
- Apply the concept of effective mass of electron (L3)

Unit-IV: Dielectric and Magnetic Materials 8hrs

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility and Dielectric constant - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field- Clausius-Mossotti equation- Piezoelectricity.

Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability - Origin of permanent magnetic moment - Classification of magnetic materials: Dia, para, Ferro, antiferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials- Eddy currents- Engineering applications.

Unit Outcomes: The students will be able to
- Explain the concept of dielectric constant and polarization in dielectric materials (L2)
- Summarize various types of polarization of dielectrics (L2)
- Interpret Lorentz field and Claussius- Mosotti relation in dielectrics(L2)
- Classify the magnetic materials based on susceptibility and their temperature dependence (L2)
- Explain the applications of dielectric and magnetic materials (L2)
- Apply the concept of magnetism to magnetic data storage devices (L3)

Unit – V: Semiconductors and Superconductors 10hrs

Semiconductors: Introduction- Intrinsic semiconductors – Density of charge carriers – Electrical conductivity – Fermi level – extrinsic semiconductors – density of charge carriers – dependence of Fermi energy on carrier concentration and temperature - Drift and diffusion currents – Einstein's equation- Hall effect – Hall coefficient –Applications of Hall effect.

Superconductors: Introduction – Properties of superconductors – Meissner effect – Type I and Type II superconductors – BCS theory (Qualitative) – Josephson effects (AC and DC) – SQUIDs – High T_c superconductors – Applications of superconductors.

Unit Outcomes:
The students will be able to
- Classify the energy bands of semiconductors (L2)
- Interpret the direct and indirect band gap semiconductors (L2)
- Identify the type of semiconductor using Hall effect (L2)
- Identify applications of semiconductors in electronic devices (L2)
- Classify superconductors based on Meissner's effect (L2)
- Explain Meissner's effect, BCS theory & Josephson effect in superconductors (L2)



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Text Books:

1. M. N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy" A Text book of Engineering Physics"- S.Chand Publications, 11th Edition 2019.
2. Engineering Physics" by D.K.Bhattacharya and Poonam Tandon, Oxford press (2015).
3. Applied Physics by P.K.Palanisamy SciTech publications.

Reference Books:

1. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons
2. Engineering Physics by M.R.Srinivasan, New Age international publishers (2009).
3. Shatendra Sharma, Jyotsna Sharma, " Engineering Physics", Pearson Education, 2018
4. Engineering Physics - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press
5. Semiconductor physics and devices- Basic principle – Donald A, Neamen, Mc Graw Hill
6. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning

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I Year - I Semester		L	T	P	C
		3	0	0	3
PROGRAMMING FOR PROBLEM SOLVING USING C					

Course Objectives:
The objectives of Programming for Problem Solving Using C are

- To learn about the computer systems, computing environments, developing of a computer program and Structure of a C Program
- To gain knowledge of the operators, selection, control statements and repetition in C
- To learn about the design concepts of arrays, strings, enumerated structure and union types and their usage.
- To assimilate about pointers, dynamic memory allocation and know the significance of Preprocessor.
- To assimilate about File I/O and significance of functions

Course Outcomes:
Upon the completion of the course the student will learn

- To write algorithms and to draw flowcharts for solving problems
- To convert flowcharts/algorithms to C Programs, compile and debug programs
- To use different operators, data types and write programs that use two-way/ multi-way selection
- To select the best loop construct for a given problem
- To design and implement programs to analyze the different pointer applications
- To decompose a problem into functions and to develop modular reusable code
- To apply File I/O operations

UNIT I
Introduction to Computers: Creating and running Programs, Computer Numbering System, Storing Integers, Storing Real Numbers
Introduction to the C Language: Background, C Programs, Identifiers, Types, Variable, Constants, Input/output, Programming Examples, Scope, Storage Classes and Type Qualifiers.
Structure of a C Program: Expressions Precedence and Associativity, Side Effects, Evaluating Expressions, Type Conversion Statements, Simple Programs, Command Line Arguments.

UNIT II
Bitwise Operators: Exact Size Integer Types, Logical Bitwise Operators, Shift Operators.
Selection & Making Decisions: Logical Data and Operators, Two Way Selection, Multiway Selection, More Standard Functions.
Repetition: Concept of Loop, Pretest and Post-test Loops, Initialization and Updating, Event and Counter Controlled Loops, Loops in C, Other Statements Related to Looping, Looping Applications, Programming Examples.

UNIT III
Arrays: Concepts, Using Array in C, Array Application, Two Dimensional Arrays, Multidimensional Arrays, Programming Example – Calculate Averages
Strings: String Concepts, C String, String Input / Output Functions, Arrays of Strings, String Manipulation Functions String/ Data Conversion, A Programming Example – Morse Code
Enumerated, Structure, and Union: The Type Definition (Type def), Enumerated Types, Structure, Unions, and Programming Application.



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UNIT IV

Pointers: Introduction, Pointers to pointers, Compatibility, L value and R value
Pointer Applications: Arrays, and Pointers, Pointer Arithmetic and Arrays, Memory Allocation Function, Array of Pointers, Programming Application.
Processor Commands: Processor Commands.

UNIT V

Functions: Designing, Structured Programs, Function in C, User Defined Functions, Inter-Function Communication, Standard Functions, Passing Array to Functions, Passing Pointers to Functions, Recursion
Text Input / Output: Files, Streams, Standard Library Input / Output Functions, Formatting Input / Output Functions, Character Input / Output Functions
Binary Input / Output: Text versus Binary Streams, Standard Library, Functions for Files, Converting File Type.

Text Books:

1. Programming for Problem Solving, Behrouz A. Forouzan, Richard F.Gilberg, CENGAGE.
2. The C Programming Language, Brian W.Kernighan, Dennis M. Ritchie, 2e, Pearson.

Reference Books:

1. Computer Fundamentals and Programming, Sumithabha Das, Mc Graw Hill.
2. Programming in C, Ashok N. Kamthane, Amit Kamthane, Pearson.
3. Computer Fundamentals and Programming in C, Pradip Dey, Manas Ghosh, OXFORD.

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DEPARTMENT OF INFORMATION TECHNOLOGY

I Year - I Semester		L	T	P	C
		1	0	4	3
COMPUTER ENGINEERING WORKSHOP					

Course Objectives:
Skills and knowledge provided by this subject are the following:

- **PC Hardware:** Identification of basic peripherals, Assembling a PC, Installation of system software like MS Windows, device drivers, etc. Troubleshooting of PC Hardware and Software issues.
- **Internet & World Wide Web:** Different ways of hooking the PC on to the internet from home and workplace and effectively usage of the internet, web browsers, email, newsgroups and discussion forums. Awareness of cyber hygiene (protecting the personal computer from getting infected with the viruses), worms and other cyber attacks.
- **Productivity Tools:** Understanding and practical approach of professional word documents, excel spread sheets, power point presentations and personal web sites using the Microsoft suite office tools.

Course Outcomes:
By the end of the course student will be able to

- Identify, assemble and update the components of a computer
- Configure, evaluate and select hardware platforms for the implementation and execution of computer applications, services and systems
- Make use of tools for converting pdf to word and vice versa
- Develop presentation, documents and small applications using productivity tools such as word processor, presentation tools, spreadsheets, HTML, LaTex

List of Exercises:

Note: Faculty to consolidate the workshop manuals using the textbook and references

Task 1: Identification of the peripherals of a computer - Prepare a report containing the block diagram of the computer along with the configuration of each component and its functionality. Describe about various I/O Devices and its usage.

Task 2: Practicing disassembling and assembling components of a PC

Task 3: Installation of Device Drivers, MS Windows, Linux Operating systems and Disk Partitioning, dual boating with Windows and Linux

Task 4: Introduction to Memory and Storage Devices, I/O Port, Assemblers, Compilers, Interpreters, Linkers and Loaders.

Task 5: Demonstration of Hardware and Software Troubleshooting

Task 6: Demonstrating Importance of Networking, Transmission Media, Networking Devices-Gateway, Routers, Hub, Bridge, NIC, Bluetooth Technology, Wireless Technology, Modem, DSL, and Dialup Connection.



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Task 7: Surfing the Web using Web Browsers, Awareness of various threats on the Internet and its solutions, Search engines and usage of various search engines, Need of anti-virus, Installation of anti-virus, configuring personal firewall and windows update.
(Students should get connected to their Local Area Network and access the Internet. In the process they should configure the TCP/IP setting and demonstrate how to access the websites and email. Students customize their web browsers using bookmarks, search toolbars and pop up blockers)

Productivity Tools:

Task 8: Basic HTML tags, Introduction to HTML5 and its tags, Introduction to CSS3 and its properties. Preparation of a simple website/ homepage,
Assignment: Develop your home page using HTML Consisting of your photo, name, address and education details as a table and your skill set as a list.
Features to be covered:- Layouts, Inserting text objects, Editing text objects, Inserting Tables, Working with menu objects, Inserting pages, Hyper linking, Renaming, deleting, modifying pages, etc.,

Task 9: Demonstration and Practice of various features of Microsoft Word
Assignment: 1. Create a project certificate.
2. Creating a news letter
Features to be covered:-Formatting Fonts, Paragraphs, Text effects, Spacing, Borders and Colors, Header and Footer, Date and Time option, tables, Images, Bullets and Numbering, Table of Content, Newspaper columns, Drawing toolbar and Word Art and Mail Merge in word etc.,

Task 10: Demonstration and Practice of various features Microsoft Excel
Assignment: 1. Creating a scheduler
2. Calculating GPA
3. Calculating Total, average of marks in various subjects and ranks of students based on marks
Features to be covered:- Format Cells, Summation, auto fill, Formatting Text, Cell Referencing, Formulae in excel, Charts, Renaming and Inserting worksheets, etc.,

Task 11: Demonstration and Practice of various features Microsoft Power Point
Features to be covered:- Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Hyperlinks Tables and Charts, Master Layouts, Types of views, Inserting – Background, textures, Design Templates, etc.,

Task 12: Demonstration and Practice of various features LaTeX – document preparation, presentation
(Features covered in Task 9 and Task 11 need to be explored in LaTex)
Task 13: Tools for converting word to pdf and pdf to word

Task 14: Internet of Things (IoT): IoT fundamentals, applications, protocols, communication models, architecture, IoT devices

Reference Books:

1. Computer Fundamentals, Anita Goel, Pearson India Education, 2017
2. PC Hardware Trouble Shooting Made Easy, TMH
3. Introduction to Information Technology, ITL Education Solutions Limited, 2nd Edition, Perason, 2020
4. Upgrading and Repairing PCs, 18th Edition, Scott Mueller, QUE, Pearson, 2008
5. LaTeX Companion – Leslie Lamport, PHI/Pearson



6. Introducing HTML5, Bruce Lawson, Remy Sharp, 2nd Edition, Pearson, 2012
7. Teach yourself HTML in 24 hours, By Techmedia
8. HTML 5 and CSS 3.0 to the Real World by Alexis Goldstein, Sitepoint publication.
9. Internet of Things, Technologies, Applications, Challenges and Solutions, B K Tripathy, J Anuradha, CRC Press
10. Comdex Information Technology Course Tool Kit, Vikas Gupta, Wiley Dreamtech.
11. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme, CISCO Press, Pearson Education.
12. Essential Computer and IT Fundamentals for Engineering and Science Students, Dr. N. B. Venkateswarlu, S. Chand Publishers

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I Year - I Semester		L	T	P	C
		0	0	3	1.5
ENGLISH COMMUNICATION SKILLS LABORATORY					

UNIT I:
Vowels, Consonants, Pronunciation, Phonetic Transcription, Common Errors in Pronunciation,

UNIT II:
Word stress-di-syllabic words, poly-syllabic words, weak and strong forms, contrastive stress (Homographs)

UNIT III: Stress in compound words, rhythm, intonation, accent neutralization.

UNIT IV: Listening to short audio texts and identifying the context and specific pieces of information to answer a series of questions in speaking.

UNIT V: Newspapers reading; Understanding and identifying key terms and structures useful for writing reports.

Text Book:
1."Infotech English", Maruthi Publications.

Reference Books:
1. Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL.
2. English Pronunciation in use- Mark Hancock, Cambridge University Press.
3. English Phonetics and Phonology-Peter Roach, Cambridge University Press.
4. English Pronunciation in use- Mark Hewings, Cambridge University Press.
5. English Pronunciation Dictionary- Daniel Jones, Cambridge University Press.
6. English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications.

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I Year - I Semester		L	T	P	C
		0	0	3	1.5
APPLIED PHYSICS LAB					

(Any 10 of the following listed experiments)

List of Applied Physics Experiments

1. Determination of thickness of thin object by wedge method.
2. Determination of radius of curvature of a given plano convex lens by Newton's rings.
3. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
4. Determination of dispersive power of the prism.
5. Determination of dielectric constant using charging and discharging method.
6. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
7. Determination of numerical aperture and acceptance angle of an optical fiber.
8. Determination of wavelength of Laser light using diffraction grating.
9. Estimation of Planck's constant using photoelectric effect.
10. Determination of the resistivity of semiconductor by four probe method.
11. To determine the energy gap of a semiconductor using p-n junction diode.
12. Magnetic field along the axis of a current carrying circular coil by Stewart & Gee's Method
13. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall Effect .
14. Measurement of resistance of a semiconductor with varying temperature.
15. Resistivity of a Superconductor using four probe method & Meissner effect.

References:

1. S. Balasubramanian, M.N. Srinivasan "A Text Book of Practical Physics"- S Chand Publishers, 2017.

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DEPARTMENT OF INFORMATION TECHNOLOGY

I Year - I Semester		L	T	P	C
		0	0	3	1.5
PROGRAMMING FOR PROBLEM SOLVING USING C LAB					

Course Objectives:

- Apply the principles of C language in problem solving.
- To design flowcharts, algorithms and knowing how to debug programs.
- To design & develop of C programs using arrays, strings pointers & functions.
- To review the file operations, preprocessor commands.

Course Outcomes:

By the end of the Lab, the student

- Gains Knowledge on various concepts of a C language.
- Able to draw flowcharts and write algorithms.
- Able design and development of C problem solving skills.
- Able to design and develop modular programming skills.
- Able to trace and debug a program

Exercise 1:

1. Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five and four characters.
2. Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5 inches.
3. Write a C program to display multiple variables.

Exercise 2:

1. Write a C program to calculate the distance between the two points.
2. Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".

Exercise 3:

1. Write a C program to convert a string to a long integer.
2. Write a program in C which is a Menu-Driven Program to compute the area of the various geometrical shape.
3. Write a C program to calculate the factorial of a given number.

Exercise 4:

1. Write a program in C to display the n terms of even natural number and their sum.
2. Write a program in C to display the n terms of harmonic series and their sum. 1 + 1/2 + 1/3 + 1/4 + 1/5 ... 1/n terms.
3. Write a C program to check whether a given number is an Armstrong number or not.

Exercise 5:

1. Write a program in C to print all unique elements in an array.
2. Write a program in C to separate odd and even integers in separate arrays.
3. Write a program in C to sort elements of array in ascending order.



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Exercise 6:

1. Write a program in C for multiplication of two square Matrices.
2. Write a program in C to find transpose of a given matrix.

Exercise 7:

1. Write a program in C to search an element in a row wise and column wise sorted matrix.
2. Write a program in C to print individual characters of string in reverse order.

Exercise 8:

1. Write a program in C to compare two strings without using string library functions.
2. Write a program in C to copy one string to another string.

Exercise 9:

1. Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
2. Write a program in C to demonstrate how to handle the pointers in the program.

Exercise 10:

1. Write a program in C to demonstrate the use of & (address of) and *(value at address) operator.
2. Write a program in C to add two numbers using pointers.

Exercise 11:

1. Write a program in C to add numbers using call by reference.
2. Write a program in C to find the largest element using Dynamic Memory Allocation.

Exercise 12:

1. Write a program in C to swap elements using call by reference.
2. Write a program in C to count the number of vowels and consonants in a string using a pointer.

Exercise 13:

1. Write a program in C to show how a function returning pointer.
2. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc( ) function.

Exercise 14:

1. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc( ) function. Understand the difference between the above two programs
2. Write a program in C to convert decimal number to binary number using the function.

Exercise 15:

1. Write a program in C to check whether a number is a prime number or not using the function.
2. Write a program in C to get the largest element of an array using the function.

Exercise 16:

1. Write a program in C to append multiple lines at the end of a text file.
2. Write a program in C to copy a file in another name.
3. Write a program in C to remove a file from the disk.

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DEPARTMENT OF INFORMATION TECHNOLOGY

I Year - II Semester		L	T	P	C
		3	0	0	3
MATHEMATICS-II (Linear Algebra And Numerical Methods)					

Course Objectives:

- To instruct the concept of Matrices in solving linear algebraic equations
- To elucidate the different numerical methods to solve nonlinear algebraic equations
- To disseminate the use of different numerical techniques for carrying out numerical integration.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

Course Outcomes: At the end of the course, the student will be able to

- develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6)
- solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel (L3)
- evaluate the approximate roots of polynomial and transcendental equations by different algorithms (L5)
- apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals (L3)
- apply numerical integral techniques to different Engineering problems (L3)
- apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations (L3)

UNIT – I: Solving systems of linear equations, Eigen values and Eigen vectors: (10hrs)
Rank of a matrix by echelon form and normal form – Solving system of homogeneous and non-homogeneous linear equations – Gauss Elimination method – Eigenvalues and Eigen vectors and properties (article-2.14 in text book-1).

Unit – II: Cayley–Hamilton theorem and Quadratic forms: (10hrs)
Cayley-Hamilton theorem (without proof) – Applications – Finding the inverse and power of a matrix by Cayley-Hamilton theorem – Reduction to Diagonal form – Quadratic forms and nature of the quadratic forms – Reduction of quadratic form to canonical forms by orthogonal transformation. Singular values of a matrix, singular value decomposition (text book-3).

UNIT – III: Iterative methods: (8 hrs)
Introduction– Bisection method–Secant method – Method of false position– Iteration method – Newton-Raphson method (One variable and simultaneous Equations) – Jacobi and Gauss-Seidel methods for solving system of equations numerically.

UNIT – IV: Interpolation: (10 hrs)
Introduction– Errors in polynomial interpolation – Finite differences– Forward differences– Backward differences –Central differences – Relations between operators – Newton's forward and backward formulae for interpolation – Interpolation with unequal intervals – Lagrange's interpolation formula– Newton's divide difference formula.

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UNIT – V: Numerical differentiation and integration, Solution of ordinary differential equations with initial conditions: (10 hrs)

Numerical differentiation using interpolating polynomial – Trapezoidal rule– Simpson's $1/3^{rd}$ and $3/8^{th}$ rule– Solution of initial value problems by Taylor's series– Picard's method of successive approximations– Euler's method –Runge-Kutta method (second and fourth order).

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 44^{th} Edition, Khanna Publishers.
2. B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.
3. David Poole, Linear Algebra- A modern introduction, 4^{th} Edition, Cengage.

Reference Books:

1. Steven C. Chapra, Applied Numerical Methods with MATLAB for Engineering and Science, Tata Mc. Graw Hill Education.
2. M. K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publications.
3. Lawrence Turyn, Advanced Engineering Mathematics, CRC Press.

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DEPARTMENT OF INFORMATION TECHNOLOGY

I Year - II Semester		L	T	P	C
		3	0	0	3
APPLIED CHEMISTRY					

Course Objectives

- Importance of usage of plastics in household appliances and composites (FRP) in aerospace and automotive industries.
- Outline the basics for the construction of electrochemical cells, batteries and fuel cells. Understand the mechanism of corrosion and how it can be prevented.
- Explain the preparation of semiconductors and nanomaterials, engineering applications of nanomaterials, superconductors and liquid crystals.
- Recall the increase in demand for power and hence alternative sources of power are studied due to depleting sources of fossil fuels. Advanced instrumental techniques are introduced.
- Outline the basics of computational chemistry and molecular switches

UNIT I: POLYMER TECHNOLOGY **8 hrs**

Polymerisation:- Introduction, methods of polymerization (emulsion and suspension), mechanical properties.

Plastics: Compounding, fabrication (compression, injection, blown film and extrusion), preparation, properties and applications (PVC, polycarbonates and Bakelite), mention some examples of plastic materials used in electronic gadgets, recycling of e-plastic waste (waste to wealth).

Elastomers:- Introduction, preparation, properties and applications (Buna S, thiokol and polyurethanes).

Composite materials: Fiber reinforced plastics, conducting polymers, biodegradable polymers, biopolymers, biomedical polymers.

Course Outcomes: At the end of this unit, the students will be able to

- Analyze the different types of composite plastic materials and interpret the mechanism of conduction in conducting polymers.

UNIT II: ELECTROCHEMICAL CELLS AND CORROSION **10 hrs**

Single electrode potential, electrochemical series and uses of series, standard hydrogen electrode, calomel electrode, construction of glass electrode, batteries (Dry cell, Li ion battery and zinc air cells), fuel cells (H_2-O_2, CH_3OH-O_2, phosphoric acid and molten carbonate).

Corrosion:-Definition, theories of corrosion (chemical and electrochemical), galvanic corrosion, differential aeration corrosion, stress corrosion, galvanic series, factors influencing rate of corrosion, corrosion control (proper designing and cathodic protection), Protective coatings (surface preparation, cathodic coatings, anodic coatings, electroplating and electroless plating [nickel]), Paints (constituents, functions and special paints).

Course Outcomes: At the end of this unit, the students will be able to

- Utilize the theory of construction of electrodes, batteries and fuel cells in redesigning new engineering products and categorize the reasons for corrosion and study methods to control corrosion.

UNIT III: MATERIAL CHEMISTRY **10 hrs**

Part I : Non-elemental semiconducting materials:- Stoichiometric, controlled valency & chalcogen photo/semiconductors-preparation of semiconductors (distillation, zone refining, Czochralski crystal pulling, epitaxy, diffusion, ion implantation) - Semiconductor devices (p-n junction diode as rectifier, junction transistor).

Insulators & magnetic materials: electrical insulators-ferro and ferri magnetism-Hall effect and its applications.

Part II: Nano materials:- Introduction, sol-gel method, characterization by (Brunauer Emmet Teller [BET]), (scanning electron microscopy [SEM]) and (transmission electron microscopy [TEM]), applications of graphene and fullerenes, carbon nanotubes (types, preparation and applications)
Liquid crystals:- Introduction-types-applications.
Super conductors:-Type –I, Type II-characteristics and applications
Course Outcomes: At the end of this unit, the students will be able to

- Synthesize nanomaterials for modern advances of engineering technology.
- Summarize the preparation of semiconductors; analyze the applications of liquid crystals and superconductors.

UNIT IV: SPECTROSCOPIC TECHNIQUES & NON-CONVENTIONAL ENERGY SOURCES 10 hrs

Part A: **SPECTROSCOPIC TECHNIQUES**

Electromagnetic spectrum-UV (laws of absorption, instrumentation, theory of electronic spectroscopy, Frank-condon principle, chromophores and auxochromes, intensity shifts, applications), FT-IR [instrumentation and differentiation of sp, sp^2, sp^3 and IR stretching of functional groups (alcohols, carbonyls, amines) applications], magnetic resonance imaging and CT scan (procedure & applications).

Part B*:* NON-CONVENTIONAL ENERGY SOURCES

Design, working, schematic diagram, advantages and disadvantages of photovoltaic cell, hydropower, geothermal power, tidal and wave power, ocean thermal energy conversion.
Course Outcomes: At the end of this unit, the students will be able to

- Analyze the principles of different analytical instruments and their applications.
- Design models for energy by different natural sources.

UNIT V: ADVANCED CONCEPTS/TOPICS IN CHEMISTRY 8 hrs

Computational chemistry: Introduction to computational chemistry, molecular modelling and docking studies
Molecular switches: characteristics of molecular motors and machines, Rotaxanes and Catenanes as artificial molecular machines, prototypes – linear motions in rotaxanes, an acid-base controlled molecular shuttle, a molecular elevator, an autonomous light-powered molecular motor
Course Outcomes: At the end of this unit, the students will be able to

- Obtain the knowledge of computational chemistry and molecular machines

Text Books:

1. P.C. Jain and M. Jain "Engineering Chemistry", 15/e, Dhanpat Rai & Sons, Delhi, (Latest edition).
2. Shikha Agarwal, "Engineering Chemistry", Cambridge University Press, New Delhi, (2019).
3. S.S. Dara, "A Textbook of Engineering Chemistry", S.Chand & Co, (2010).
4. Shashi Chawla, "Engineering Chemistry", Dhanpat Rai Publicating Co. (Latest edition).

Reference Books:

1. K. Sesha Maheshwaramma and Mridula Chugh, "Engineering Chemistry", Pearson India Edn.
2. O.G. Palana, "Engineering Chemistry", Tata McGraw Hill Education Private Limited, (2009).
3. CNR Rao and JM Honig (Eds) "Preparation and characterization of materials" Academic press, New York (latest edition)
4. B. S. Murthy, P. Shankar and others, "Textbook of Nanoscience and Nanotechnology", University press (latest edition)

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DEPARTMENT OF INFORMATION TECHNOLOGY

I Year - II Semester		L	T	P	C
		3	0	0	3
COMPUTER ORGANIZATION					

The purpose of the course is to introduce principles of computer organization and the basic architectural concepts. It provides an in depth understanding of basic organization, design, programming of a simple digital computer, computer arithmetic, instruction set design, micro programmed control unit, pipelining and vector processing, memory organization and I/O systems.

Course Outcomes:
By the end of the course the student will be able to

- Demonstrate and understanding of the design of the functional units of a digital computer system.
- Relate Postulates of Boolean algebra and minimize combinational functions
- Recognize and manipulate representations of numbers stored in digital computers
- Build the logic families and realization of logic gates.
- Design and analyze combinational and sequential circuits
- Recall the internal organization of computers,CPU,memory unit and Input/Outputs and the relations between its main components
- Solve elementary problems by assembly language programming

UNITI:
Digital Computers and Data Representation: Introduction ,NumberingSystems,Decimal to Binary Conversion, Binary Coded Decimal Numbers, Weighted Codes,Self-Complementing Codes, Cyclic Codes, Error Detecting Codes, Error Correcting Codes, Hamming Code for Error Correction, Alphanumeric Codes, ASCI Code
Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation.
Boolean Algebra and Logical gates:
Boolean Algebra :Theorems and properties, Boolean functions, canonical and standard forms , minimization of Boolean functions using algebraic identities; Karnaugh map representation and minimization using two and three variable Maps ;Logical gates ,universal gates and Two-level realizations using gates : AND-OR, OR-AND, NAND-NAND and NOR-NOR structures

UNITII:
Digital logic circuits: Combinatorial Circuits: Introduction, Combinatorial Circuit Design Procedure, Implementation using universal gates, Multi-bit adder, Multiplexers, De-multiplexers, Decoders
Sequential Switching Circuits: Latches and Flip-Flops, Ripple counters using T flip-flops; Synchronous counters: Shift Registers; Ring counters

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UNITIII:

Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Booth multiplication algorithm, Division Algorithms, Floating – point Arithmetic operations.

Register Transfer language and microinstructions : Bus memory transfer, arithmetic and logical micro-operations,shift and rotate micro-operations

Basic Computer Organization and Design: Stored program concept,computer Registers, common bus system**,**Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input–Output configuration and program Interrupt.

UNITIV:

Microprogrammed Control: Control memory, Addresssequencing, microprogram example, design of control unit.

Central Processing Unit: General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control:conditional Flags and Branching

UNITV:

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.

Input-Output Organization: Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access.

TextBooks:

1. Digital Logic and Computer Design,Moriss Mano,11thEdition,PearsonEducation.
2. Computer System Architecture,3rded., M.MorrisMano, PHI

Reference Books:

1. Digital Logic and Computer Organization, Rajaraman,Radhakrishnan,PHI,2006
2. Computer Organization, 5thed.,Hamacher, VranesicandZaky,TMH,2002
3. Computer Organization & Architecture :Designing for Performance, 7thed., William Stallings, PHI, 2006



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DEPARTMENT OF INFORMATION TECHNOLOGY

I Year – II Semester		L	T	P	C
		3	0	0	3
PYTHON PROGRAMMING					

Course Objectives:
The Objectives of Python Programming are

- To learn about Python programming language syntax, semantics, and the runtime environment
- To be familiarized with universal computer programming concepts like data types, containers
- To be familiarized with general computer programming concepts like conditional execution, loops & functions
- To be familiarized with general coding techniques and object-oriented programming

Course Outcomes:

- Develop essential programming skills in computer programming concepts like data types, containers
- Apply the basics of programming in the Python language
- Solve coding tasks related conditional execution, loops
- Solve coding tasks related to the fundamental notions and techniques used in object-oriented programming

UNIT I
Introduction: Introduction to Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, Operators. Type conversions, Expressions, More about Data Output.
Data Types, and Expression: Strings Assignment, and Comment, Numeric Data Types and Character Sets, Using functions and Modules.
Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables. Repetition Structures: Introduction, while loop, for loop, Calculating a Running Total, Input Validation Loops, Nested Loops.

UNIT II
Control Statement: Definite iteration for Loop Formatting Text for output, Selection if and if else Statement Conditional Iteration The While Loop
Strings and Text Files: Accessing Character and Substring in Strings, Data Encryption, Strings and Number Systems, String Methods Text Files.

UNIT III
List and Dictionaries: Lists, Defining Simple Functions, Dictionaries
Design with Function**:** Functions as Abstraction Mechanisms, Problem Solving with Top Down Design, Design with Recursive Functions, Case Study Gathering Information from a File System, Managing a Program's Namespace, Higher Order Function.
Modules: Modules, Standard Modules, Packages.

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UNIT IV

File Operations: Reading config files in python, Writing log files in python, Understanding read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines(), Manipulating file pointer using seek, Programming using file operations

Object Oriented Programming**:** Concept of class, object and instances, Constructor, class attributes and destructors, Real time use of class in live projects, Inheritance , overlapping and overloading operators, Adding and retrieving dynamic attributes of classes, Programming using Oops support

Design with Classes: Objects and Classes, Data modeling Examples, Case Study An ATM, Structuring Classes with Inheritance and Polymorphism

UNIT V

Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defined Exceptions, Defining Clean-up Actions, Redefined Clean-up Actions.

Graphical User Interfaces: The Behavior of Terminal Based Programs and GUI -Based, Programs, Coding Simple GUI-Based Programs, Other Useful GUI Resources.

Programming**:** Introduction to Programming Concepts with Scratch.

Text Books

1) Fundamentals of Python First Programs, Kenneth. A. Lambert, Cengage.
2) Python Programming: A Modern Approach, Vamsi Kurama, Pearson.

Reference Books:

1) Introduction to Python Programming, Gowrishankar.S, Veena A, CRC Press.
2) Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

e-Resources:

https://www.tutorialspoint.com/python3/python_tutorial.pdf

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DEPARTMENT OF INFORMATION TECHNOLOGY

I Year – II Semester		L	T	P	C
		3	0	0	3
DATA STRUCTURES					

Course Objectives:
The objective of the course is to
- Introduce the fundamental concept of data structures and abstract data types
- Emphasize the importance of data structures in developing and implementing efficient algorithms
- Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms

Course Outcomes:
After completing this course a student will be able to:
- Summarize the properties, interfaces, and behaviors of basic abstract data types
- Discuss the computational efficiency of the principal algorithms for sorting & searching
- Use arrays, records, linked structures, stacks, queues, trees, and Graphs in writing programs
- Demonstrate different methods for traversing trees

UNIT I
Data Structures - Definition, Classification of Data Structures, Operations on Data Structures, Abstract Data Type (ADT), Preliminaries of algorithms. Time and Space complexity.
Searching - Linear search, Binary search, Fibonacci search.
Sorting- Insertion sort, Selection sort, Exchange (Bubble sort, quick sort), distribution (radix sort), merging (Merge sort) algorithms.

UNIT II
Linked List: Introduction, Single linked list, Representation of Linked list in memory, Operations on Single Linked list-Insertion, Deletion, Search and Traversal ,Reversing Single Linked list, Applications on Single Linked list- Polynomial Expression Representation ,Addition and Multiplication, Sparse Matrix Representation using Linked List, Advantages and Disadvantages of Single Linked list, Double Linked list-Insertion, Deletion, Circular Linked list-Insertion, Deletion.

UNIT III
Queues: Introduction to Queues, Representation of Queues-using Arrays and using Linked list, Implementation of Queues-using Arrays and using Linked list, Application of Queues-Circular Queues, Deques, Priority Queues, Multiple Queues.
Stacks: Introduction to Stacks, Array Representation of Stacks, Operations on Stacks, Linked list Representation of Stacks, Operations on Linked Stack, Applications-Reversing list, Factorial Calculation, Infix to Postfix Conversion, Evaluating Postfix Expressions.

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UNIT IV

Trees: Basic Terminology in Trees, Binary Trees-Properties, Representation of Binary Trees using Arrays and Linked lists. Binary Search Trees- Basic Concepts, BST Operations: Insertion, Deletion, Tree Traversals, Applications-Expression Trees, Heap Sort, Balanced Binary Trees- AVL Trees, Insertion, Deletion and Rotations.

UNIT V

Graphs: Basic Concepts, Representations of Graphs-Adjacency Matrix and using Linked list, Graph Traversals (BFT & DFT), Applications- Minimum Spanning Tree Using Prims & Kruskals Algorithm, Dijkstra's shortest path, Transitive closure, Warshall's Algorithm.

Text Books:

1) Data Structures Using C. 2nd Edition.Reema Thareja, Oxford.
2) Data Structures and algorithm analysis in C, 2nded, Mark Allen Weiss.

Reference Books:

1) Fundamentals of Data Structures in C, 2nd Edition, Horowitz, Sahni, Universities Press.
2) Data Structures: A PseudoCode Approach, 2/e, Richard F.Gilberg, Behrouz A. Forouzon, Cengage.
3) Data Structures with C, Seymour Lipschutz TMH

e-Resources:

1) http://algs4.cs.princeton.edu/home/
2) https://faculty.washington.edu/jstraub/dsa/Master_2_7a.pdf

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DEPARTMENT OF INFORMATION TECHNOLOGY

I Year - II Semester		L	T	P	C
		0	0	3	1.5
APPLIED CHEMISTRY LAB					

Introduction to Chemistry laboratory – Molarity, normality, primary, secondary standard solutions, volumetric titrations, quantitative analysis

1. Determination of HCl using standard Na_2CO_3 solution.
2. Determination of alkalinity of a sample containing Na_2CO_3 and NaOH.
3. Determination of Mn^{+2} using standard oxalic acid solution.
4. Determination of ferrous iron using standard $K_2Cr_2O_7$ solution.
5. Determination of Cu^{+2} using standard hypo solution.
6. Determination of temporary and permanent hardness of water using standard EDTA solution.
7. Determination of Fe^{+3} by a colorimetric method.
8. Determination of the concentration of acetic acid using sodium hydroxide (pH-metry method).
9. Determination of iso-electric point of amino acids using pH-metry method/conductometric method.
10. Determination of the concentration of strong acid vs strong base (by conductometric method).
11. Determination of strong acid vs strong base (by potentiometric method).
12. Determination of Mg^{+2} present in an antacid.
13. Determination of $CaCO_3$ present in an egg shell.
14. Estimation of Vitamin C.
15. Determination of phosphoric content in soft drinks.
16. Adsorption of acetic acid by charcoal.
17. Preparation of nylon-6, 6 and Bakelite (demonstration only).

Of the above experiments at-least 10 assessment experiments should be completed in a semester.

Outcomes: The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

Reference Books

1. A Textbook of Quantitative Analysis, Arthur J. Vogel.

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I Year - II Semester		L	T	P	C
		0	0	3	1.5
PYTHON PROGRAMMING LAB					

Course Objectives:

The Objectives of Python Programming are

- *To learn about Python programming language syntax, semantics, and the runtime environment*
- *To be familiarized with universal computer programming concepts like data types, containers*
- *To be familiarized with general computer programming concepts like conditional execution, loops & functions*
- *To be familiarized with general coding techniques and object-oriented programming*

Course Outcomes:

- Develop essential programming skills in computer programming concepts like data types, containers
- Apply the basics of programming in the Python language
- Solve coding tasks related conditional execution, loops
- Solve coding tasks related to the fundamental notions and techniques used in object-oriented programming

List of Experiments:

1) Write a program that asks the user for a weight in kilograms and converts it to pounds. There are 2.2 pounds in a kilogram.
2) Write a program that asks the user to enter three numbers (use three separate input statements). Create variables called total and average that hold the sum and average of the three numbers and print out the values of total and average.
3) Write a program that uses a *for* loop to print the numbers 8, 11, 14, 17, 20, . . . , 83, 86, 89.
4) Write a program that asks the user for their name and how many times to print it. The program should print out the user's name the specified number of times.
5) Use a *for* loop to print a triangle like the one below. Allow the user to specify how high the triangle should be.

```
*
**
***
****
```

6) Generate a random number between 1 and 10. Ask the user to guess the number and print a message based on whether they get it right or not.
7) Write a program that asks the user for two numbers and prints *Close* if the numbers are within .001 of each other and Not close otherwise.
8) Write a program that asks the user to enter a word and prints out whether that word contains any vowels.
9) Write a program that asks the user to enter two strings of the same length. The program should then check to see if the strings are of the same length. If they are not,

the program should print an appropriate message and exit. If they are of the same length, the program should alternate the characters of the two strings. For example, if the user enters *abcde* and *ABCDE* the program should print out *AaBbCcDdEe*.

10) Write a program that asks the user for a large integer and inserts commas into it according to the standard American convention for commas in large numbers. For instance, if the user enters 1000000, the output should be 1,000,000.
11) In algebraic expressions, the symbol for multiplication is often left out, as in 3x+4y or 3(x+5). Computers prefer those expressions to include the multiplication symbol, like 3*x+4*y or 3*(x+5). Write a program that asks the user for an algebraic expression and then inserts multiplication symbols where appropriate.
12) Write a program that generates a list of 20 random numbers between 1 and 100.
    (a) Print the list.
    (b) Print the average of the elements in the list.
    (c) Print the largest and smallest values in the list.
    (d) Print the second largest and second smallest entries in the list
    (e) Print how many even numbers are in the list.
13) Write a program that asks the user for an integer and creates a list that consists of the factors of that integer.
14) Write a program that generates 100 random integers that are either 0 or 1. Then find the longest run of zeros, the largest number of zeros in a row. For instance, the longest run of zeros in [1,0,1,1,0,0,0,0,1,0,0] is 4.
15) Write a program that removes any repeated items from a list so that each item appears at most once. For instance, the list [1,1,2,3,4,3,0,0] would become [1,2,3,4,0].
16) Write a program that asks the user to enter a length in feet. The program should then give the user the option to convert from feet into inches, yards, miles, millimeters, centimeters, meters, or kilometers. Say if the user enters a 1, then the program converts to inches, if they enter a 2, then the program converts to yards, etc. While this can be done with if statements,it is much shorter with lists and it is also easier to add new conversions if you use lists.
17) Write a function called *sum_digits* that is given an integer num and returns the sum of the digits of num.
18) Write a function called *first_diff* that is given two strings and returns the first location in which the strings differ. If the strings are identical, it should return -1.
19) Write a function called *number_of_factors* that takes an integer and returns how many factors the number has.
20) Write a function called *is_sorted* that is given a list and returns True if the list is sorted and False otherwise.
21) Write a function called root that is given a number x and an integer n and returns $x^{1/n}$. In the function definition, set the default value of n to 2.
22) Write a function called primes that is given a number n and returns a list of the first n primes. Let the default value of n be 100.
23) Write a function called merge that takes two already sorted lists of possibly different lengths, and merges them into a single sorted list.
    (a) Do this using the sort method. (b) Do this without using the sort method.
24) Write a program that asks the user for a word and finds all the smaller words that can be made from the letters of that word. The number of occurrences of a letter in a smaller word can't exceed the number of occurrences of the letter in the user's word.



25) Write a program that reads a file consisting of email addresses, each on its own line. Your program should print out a string consisting of those email addresses separated by semicolons.
26) Write a program that reads a list of temperatures from a file called *temps.txt*, converts those temperatures to Fahrenheit, and writes the results to a file called ftemps.txt.
27) Write a class called Product. The class should have fields called name, amount, and price, holding the product's name, the number of items of that product in stock, and the regular price of the product. There should be a method *get_price* that receives the number of items to be bought and returns a the cost of buying that many items, where the regular price is charged for orders of less than 10 items, a 10% discount is applied for orders of between 10 and 99 items, and a 20% discount is applied for orders of 100 or more items. There should also be a method called *make_purchase* that receives the number of items to be bought and decreases amount by that much.
28) Write a class called Time whose only field is a time in seconds. It should have a method called *convert_to_minutes* that returns a string of minutes and seconds formatted as in the following example: if seconds is 230, the method should return '5:50'. It should also have a method called *convert_to_hours* that returns a string of hours, minutes, and seconds formatted analogously to the previous method.
29) Write a class called Converter. The user will pass a length and a unit when declaring an object from the class—for example, c = Converter(9,'inches'). The possible units are inches, feet, yards, miles, kilometers, meters, centimeters, and millimeters. For each of these units there should be a method that returns the length converted into those units. For example, using the Converter object created above, the user could call c.feet() and should get 0.75 as the result.
30) Write a Python class to implement pow(x, n).
31) Write a Python class to reverse a string word by word.
32) Write a program that opens a file dialog that allows you to select a text file. The program then displays the contents of the file in a textbox.
33) Write a program to demonstrate Try/except/else.
34) Write a program to demonstrate try/finally and with/as.

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I Year – II Semester		L	T	P	C
		0	0	3	1.5
DATA STRUCTURES LAB					

Course Objectives:
The objective of this lab is to demonstrate the different data structures implementation.

Course Outcomes:
By the end of this lab the student is able to

- Use basic data structures such as arrays and linked list.
- Programs to demonstrate fundamental algorithmic problems including Tree Traversals, Graph traversals, and shortest paths.
- Use various searching and sorting algorithms.

List of Experiments:

Exercise -1 (Searching)
a)Write C program that use both recursive and non recursive functions to perform Linear search for a Key value in a given list.
b) Write C program that use both recursive and non recursive functions to perform Binary search for a Key value in a given list.

Exercise -2 (Sorting-I)
a) Write C program that implement Bubble sort, to sort a given list of integers in ascending order
b) Write C program that implement Quick sort, to sort a given list of integers in ascending order
c) Write C program that implement Insertion sort, to sort a given list of integers in ascending order

Exercise -3(Sorting-II)
a) Write C program that implement radix sort, to sort a given list of integers in ascending order
b) Write C program that implement merge sort, to sort a given list of integers in ascending order

Exercise -4(Singly Linked List)
a) Write a C program that uses functions to create a singly linked list
b) Write a C program that uses functions to perform insertion operation on a singly linked list
c) Write a C program that uses functions to perform deletion operation on a singly linked list
d) Write a C program to reverse elements of a single linked list.

Exercise -5(Queue)
a) Write C program that implement Queue (its operations) using arrays.
b) Write C program that implement Queue (its operations) using linked lists



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Exercise -6(Stack)
a) Write C program that implement stack (its operations) using arrays
b) Write C program that implement stack (its operations) using Linked list
c) Write a C program that uses Stack operations to evaluate postfix expression

Exercise -7(Binary Tree)
d) Write a recursive C program for traversing a binary tree in preorder, inorder and postorder.

Exercise -8(Binary Search Tree)
a) Write a C program to Create a BST
b) Write a C program to insert a node into a BST.
c) Write a C program to delete a node from a BST.

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I Year – II Semester		L	T	P	C
		2	0	0	0
ENVIRONMENT SCIENCE					

Course Objectives:
The objectives of the course are to impart:

- Overall understanding of the natural resources.
- Basic understanding of the ecosystem and its diversity.
- Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.
- An understanding of the environmental impact of developmental activities.
- Awareness on the social issues, environmental legislation and global treaties.

UNIT I
Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance – Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects. Role of information technology in environment and human health.
Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem; Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

UNIT II
Natural Resources: Natural resources and associated problems.
Forest resources: Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people.
Water resources: Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems.
Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.
Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.
Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.
Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification; Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.

UNIT III
Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity-classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-sports of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts. - Endangered and endemic species of India – Conservation of biodiversity: conservation of biodiversity.

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UNIT IV

Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his well being.

Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.

UNIT V

Social Issues and the Environment: Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act - Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Public awareness.

Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Green business and Green politics.

The student should Visit an Industry / Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.

Text Books:

1) Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada
2) Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.
3) Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

Reference Books:

1) Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
2) A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi
3) Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi
4) Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2014

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II Year -I Semester		L	T	P	C
		3	0	0	3
MATHEMATICS - III					

Course Objectives:

- To familiarize the techniques in partial differential equations
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.

Course Outcomes:

At the end of the course, the student will be able to

- Interpret the physical meaning of different operators such as gradient, curl and divergence (L5)
- Estimate the work done against a field, circulation and flux using vector calculus (L5)
- Apply the Laplace transform for solving differential equations (L3)
- Find or compute the Fourier series of periodic signals (L3)
- Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms (L3)
- Identify solution methods for partial differential equations that model physical processes (L3)

UNIT I: Vector calculus: (10 hrs)
Vector Differentiation: Gradient – Directional derivative – Divergence – Curl – ScalarPotential. Vector Integration: Line integral – Work done – Area – Surface and volume integrals – Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof).

UNIT II: Laplace Transforms: (10 hrs)
Laplace transforms of standard functions – Shifting theorems – Transforms of derivatives and integrals – Unit step function – Dirac's delta function – Inverse Laplace transforms – Convolution theorem (without proof).
Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.

UNIT III: Fourier series and Fourier Transforms: (10hrs)
Fourier Series: Introduction – Periodic functions – Fourier series of periodic function – Dirichlet's conditions – Even and odd functions – Change of interval – Half-range sine and cosine series.
Fourier Transforms: Fourier integral theorem (without proof) – Fourier sine and cosine integrals – Sine and cosine transforms – Properties – inverse transforms – Finite Fourier transforms.

UNIT IV: PDE of first order: (8 hrs)
Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.

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UNIT V: Second order PDE and Applications: (10hrs)

Second order PDE: Solutions of linear partial differential equations with constant coefficients – RHS term of the type e^{ax+by}, $\sin(ax+by)$, $\cos(ax+by)$, $x^m y^n$.

Applications of PDE: Method of separation of Variables – Solution of One dimensional Wave, Heat and two-dimensional Laplace equation.

Text Books:

1) B. S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2) B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:

1) Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India.
2) Dean. G. Duffy, Advanced Engineering Mathematics with MATLAB, 3rd Edition, CRC Press.
3) Peter O' Neil, Advanced Engineering Mathematics, Cengage.
4) Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford University Press.

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II Year – I Semester		L	T	P	C
		3	0	0	3
OBJECT ORIENTED PROGRAMMING THROUGH C++					

Course Objectives:

- Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects
- Understand dynamic memory management techniques using pointers, constructors, destructors
- Describe the concept of function overloading, operator overloading, virtual functions and polymorphism
- Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming
- Demonstrate the use of various OOPs concepts with the help of programs

Course Outcomes:
By the end of the course, the student

- Classify object oriented programming and procedural programming
- Apply C++ features such as composition of objects, operator overloads, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling
- Build C++ classes using appropriate encapsulation and design principles
- Apply object oriented or non-object oriented techniques to solve bigger computing problems

UNIT I
Introduction to C++: Difference between C and C++, Evolution of C++, The Object Oriented Technology, Disadvantage of Conventional Programming, Key Concepts of Object Oriented Programming, Advantage of OOP, Object Oriented Language.

UNIT II
Classes and Objects &Constructors and Destructor: Classes in C++, Declaring Objects, Access Specifiers and their Scope, Defining Member Function, Overloading Member Function, Nested class, Constructors and Destructors, Introduction, Constructors and Destructor, Characteristics of Constructor and Destructor, Application with Constructor, Constructor with Arguments parameterized Constructor, Destructors, Anonymous Objects.

UNIT III
Operator Overloading and Type Conversion & Inheritance: The Keyword Operator, Overloading Unary Operator, Operator Return Type, Overloading Assignment Operator (=), Rules for Overloading Operators, Inheritance, Reusability, Types of Inheritance, Virtual Base Classes- Object as a Class Member, Abstract Classes, Advantages of Inheritance, Disadvantages of Inheritance.

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UNIT IV

Pointers & Binding Polymorphisms and Virtual Functions: Pointer, Features of Pointers, Pointer Declaration, Pointer to Class, Pointer Object, The this Pointer, Pointer to Derived Classes and Base Class, Binding Polymorphisms and Virtual Functions, Introduction, Binding in C++, Virtual Functions, Rules for Virtual Function, Virtual Destructor.

UNIT V

Generic Programming with Templates & Exception Handling: Definition of class Templates, Normal Function Templates, Over Loading of Template Function, Bubble Sort Using Function Templates, Difference between Templates and Macros, Linked Lists with Templates, Exception Handling, Principles of Exception Handling, The Keywords try throw and catch, Multiple Catch Statements, Specifying Exceptions.

Overview of Standard Template Library, STL Programming Model, Containers, Sequence Containers, Associative Containers, Algorithms, Iterators, Vectors, Lists, Maps.

Text Books:

1) A First Book of C++, Gary Bronson, Cengage Learning.
2) The Complete Reference C++, Herbert Schildt, TMH.

Reference Books:

1) Object Oriented Programming C++, Joyce Farrell, Cengage.
2) C++ Programming: from problem analysis to program design, DS Malik, Cengage Learning
3) Programming in C++, Ashok N Kamthane, Pearson 2nd Edition

e- Resources:

1) https://nptel.ac.in/courses/106/105/106105151/
2) https://github.com/topics/object-oriented-programming

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DEPARTMENT OF INFORMATION TECHNOLOGY

II Year – I Semester		L	T	P	C
		3	0	0	3
OPERATING SYSTEMS					

Course Objectives:
The objectives of this course is to

- Introduce to the internal operation of modern operating systems
- Define, explain, processes and threads, mutual exclusion, CPU scheduling, deadlock, memory management, and file systems
- Understand File Systems in Operating System like UNIX/Linux and Windows
- Understand Input Output Management and use of Device Driver and Secondary Storage (Disk) Mechanism
- Analyze Security and Protection Mechanism in Operating System

Course Outcomes:
After learning, the course the students should be able to:

- Describe various generations of Operating System and functions of Operating System
- Describe the concept of program, process and thread and analyze various CPU Scheduling Algorithms and compare their performance
- Solve Inter Process Communication problems using Mathematical Equations by various methods
- Compare various Memory Management Schemes especially paging and Segmentation in Operating System and apply various Page Replacement Techniques
- Outline File Systems in Operating System like UNIX/Linux and Windows

UNIT I
Operating Systems Overview: Operating system functions, Operating system structure, Operating systems operations, Computing environments, Open-Source Operating Systems.
System Structures: Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs, operating system structure, operating system debugging, System Boot.

UNIT II
Process Concept: Process scheduling, Operations on processes, Inter-process communication, Communication in client server systems.
Multithreaded Programming: Multithreading models, Thread libraries, Threading issues.
Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling, Thread scheduling.

Inter-process Communication: Race conditions, Critical Regions, Mutual exclusion with busy waiting, Sleep and wakeup, Semaphores, Mutexes, Monitors, Message passing, Barriers, Classical IPC Problems - Dining philosophers problem, Readers and writers problem.

UNIT III
Memory-Management Strategies: Introduction, Swapping, Contiguous memory allocation, Paging, Segmentation.
Virtual Memory Management: Introduction, Demand paging, Copy on-write, Page replacement, Frame allocation, Thrashing, Memory-mapped files, Kernel memory allocation.

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UNIT IV

Deadlocks: Resources, Conditions for resource deadlocks, Ostrich algorithm, Deadlock detection and recovery, Deadlock avoidance, Deadlock prevention.
File Systems: Files, Directories, File system implementation, management and optimization.
Secondary-Storage Structure: Overview of disk structure, and attachment, Disk scheduling, RAID structure, Stable storage implementation.

UNIT V

System Protection: Goals of protection, Principles and domain of protection, Access matrix, Access control, Revocation of access rights.
System Security: Introduction, Program threats, System and network threats, Cryptography for security, User authentication, Implementing security defenses, Firewalling to protect systems and networks, Computer security classification.
Case Studies: Linux, Microsoft Windows.

Text Books:

1) Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2013.
2) Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008. (for Interprocess Communication and File systems.)

Reference Books:

1) Dhamdhere D M, Operating Systems A Concept Based Approach, 3rd edition, Tata McGraw-Hill, 2012.
2) Stallings W, Operating Systems -Internals and Design Principles, 6th edition, Pearson Education, 2009
3) Nutt G, Operating Systems, 3rd edition, Pearson Education, 2004.

e-Resources:

1) https://nptel.ac.in/courses/106/105/106105214/

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DEPARTMENT OF INFORMATION TECHNOLOGY

II Year – I Semester		L	T	P	C
		3	0	0	3
DATABASE MANAGEMENT SYSTEMS					

Course Objectives:

- To introduce about database management systems
- To give a good formal foundation on the relational model of data and usage of Relational Algebra
- To introduce the concepts of basic SQL as a universal Database language
- To demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization
- To provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques

Course Outcomes:

By the end of the course, the student will be able to

- Describe a relational database and object-oriented database
- Create, maintain and manipulate a relational database using SQL
- Describe ER model and normalization for database design
- Examine issues in data storage and query processing and can formulate appropriate solutions
- Outline the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage

UNIT I

Introduction: Database system, Characteristics (Database Vs File System), Database Users(Actors on Scene, Workers behind the scene), Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.

UNIT II

Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance BASIC SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update), basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions(Date and Time, Numeric, String conversion).

UNIT III

Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams. SQL: Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non-updatable), relational set operations.

UNIT IV

Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency(1NF, 2NF and 3 NF), concept of surrogate key, Boyce-codd normal form(BCNF), Lossless join and dependency preserving decomposition, Fourth normal form(4NF), Fifth Normal Form (5NF).



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UNIT V

Transaction Concept: Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm.

Indexing Techniques: B+ Trees: Search, Insert, Delete algorithms, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes , Index data Structures, Hash Based Indexing: Tree base Indexing ,Comparison of File Organizations, Indexes and Performance Tuning

Text Books:

1) Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke, TMH
2) Database System Concepts,5/e, Silberschatz, Korth, TMH

Reference Books:

1) Introduction to Database Systems, 8/e C J Date, PEA.
2) Database Management System, 6/e Ramez Elmasri, Shamkant B. Navathe, PEA
3) Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

e-Resources:

1) https://nptel.ac.in/courses/106/105/106105175/
   https://www.geeksforgeeks.org/introduction-to-nosql/

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II Year – I Semester		L	T	P	C
		3	0	0	3
DISCRETE MATHEMATICS AND GRAPH THEORY					

Course Objectives:

- To introduce the students to the topics and techniques of discrete methods and combinatorial reasoning
- To introduce a wide variety of applications. The algorithmic approach to the solution of problems is fundamental in discrete mathematics, and this approach reinforces the close ties between this discipline and the area of computer science

Course Outcomes:

At the end of the course student will be able to

- Demonstrate skills in solving mathematical problems
- Comprehend mathematical principles and logic
- Demonstrate knowledge of mathematical modeling and proficiency in using mathematical software
- Manipulate and analyze data numerically and/or graphically using appropriate Software

UNIT I

Mathematical Logic: Propositional Calculus: Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Normal Forms, Theory of Inference for Statement Calculus, Consistency of Premises, Indirect Method of Proof, Predicate Calculus: Predicates, Predicative Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus.

UNIT II

Set Theory: Sets: Operations on Sets, Principle of Inclusion-Exclusion, Relations: Properties, Operations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering, Hasse Diagrams, Functions: Bijective, Composition, Inverse, Permutation, and Recursive Functions, Lattice and its Properties, Algebraic Structures: Algebraic Systems, Properties, Semi Groups and Monoids, Group, Subgroup and Abelian Group, Homomorphism, Isomorphism.

UNIT III

Combinatorics: Basis of Counting, Permutations, Permutations with Repetitions, Circular and Restricted Permutations, Combinations, Restricted Combinations, Binomial and Multinomial Coefficients and Theorems, Number Theory: Properties of Integers, Division Theorem, Greatest Common Divisor, Euclidean
Algorithm, Least Common Multiple, Testing for Prime Numbers, The Fundamental Theorem of Arithmetic, Modular Arithmetic, Fermat's and Euler's Theorems

UNIT IV

Recurrence Relations: Generating Functions, Function of Sequences, Partial Fractions, Calculating Coefficient of Generating Functions, Recurrence Relations, Formulation as Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations

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UNIT-V

Graph Theory: Basic Concepts, Graph Theory and its Applications, Sub graphs, Graph Representations: Adjacency and Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Bipartite and Planar Graphs, Euler's Theorem, Graph Colouring and Covering, Chromatic Number, Spanning Trees, Prim's and Kruskal's Algorithms, BFS and DFS Spanning Trees

Text Books:

1) Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill.
2) Elements of Discrete Mathematics-A Computer Oriented Approach, C. L. Liu and D. P. Mohapatra, 3rd Edition, Tata McGraw Hill.
3) Theory and Problems of Discrete Mathematics, Schaum's Outline Series, Seymour Lipschutz and Marc Lars Lipson, 3rd Edition, McGraw Hill.

Reference Books:

1) Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel and T. P. Baker, 2nd Edition, Prentice Hall of India.
2) Discrete Mathematical Structures, Bernand Kolman, Robert C. Busby and Sharon Cutler Ross, PHI.
3) Discrete Mathematics, S. K. Chakraborthy and B.K. Sarkar, Oxford, 2011.
4) Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7th Edition, Tata McGraw Hill.

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DEPARTMENT OF INFORMATION TECHNOLOGY

II Year – I Semester		L	T	P	C
		0	0	3	1.5
OBJECT ORIENTED PROGRAMMING THROUGH C++ LAB					

Course Objectives:
The objective of this lab is to

- Demonstrate procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects.
- Understand dynamic memory management techniques using pointers, constructors, destructors, etc
- Demonstrate the concept of function overloading, operator overloading, virtual functions and polymorphism, inheritance.

Course Outcomes:
By the end of this lab the student is able to

- Apply the various OOPs concepts with the help of programs.
-

Exercise -1 (Classes Objects)
Create a Distance class with:

- feet and inches as data members
- member function to input distance
- member function to output distance
- member function to add two distance objects

1. Write a main function to create objects of DISTANCE class. Input two distances and output the sum.
2. Write a C++ Program to illustrate the use of Constructors and Destructors (use the above program.)
3. Write a program for illustrating function overloading in adding the distance between objects (use the above problem)

Exercise – 2 (Access)
Write a program for illustrating Access Specifiers public, private, protected

1. Write a program implementing Friend Function
2. Write a program to illustrate this pointer
3. Write a Program to illustrate pointer to a class

Exercise -3 (Operator Overloading)

1. Write a program to Overload Unary, and Binary Operators as Member Function, and Non Member Function.
    1. Unary operator as member function
    2. Binary operator as non member function
2. Write a c ++ program to implement the overloading assignment = operator



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Exercise -4 (Inheritance)

1. Write C++ Programs and incorporating various forms of Inheritance
    i) Single Inheritance
    ii) Hierarchical Inheritance
    iii) Multiple Inheritances
    iv) Multi-level inheritance
    v) Hybrid inheritance
2. Also illustrate the order of execution of constructors and destructors in inheritance

Exercise -5(Templates, Exception Handling)

1. a)Write a C++ Program to illustrate template class
2. b)Write a Program to illustrate member function templates
3. c) Write a Program for Exception Handling Divide by zero
4. d)Write a Program to rethrow an Exception

Exercise -6

1. Write a C++ program illustrating user defined string processing functions using pointers (string length, string copy, string concatenation)
2. Write a C++ program illustrating Virtual classes & virtual functions.
3. Write C++ program that implement Bubble sort, to sort a given list of integers in ascending order

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II Year – I Semester		L	T	P	C
		0	0	3	1.5
OPERATING SYSTEM LAB					

Course Objectives:

- To understand the design aspects of operating system
- To study the process management concepts & Techniques
- To study the storage management concepts
- To familiarize students with the Linux environment
- To learn the fundamentals of shell scripting/programming

Course Outcomes:

- To use Unix utilities and perform basic shell control of the utilities
- To use the Unix file system and file access control
- To use of an operating system to develop software
- Students will be able to use Linux environment efficiently
- Solve problems using bash for shell scripting

1) a) Study of Unix/Linux general purpose utility command list: man,who,cat, cd, cp, ps, ls, mv, rm, mkdir, rmdir, echo, more, date, time, kill, history, chmod, chown, finger, pwd, cal, logout, shutdown.
   b) Study of vi editor
   c) Study of Bash shell, Bourne shell and C shell in Unix/Linux operating system
   d) Study of Unix/Linux file system (tree structure)
   e) Study of .bashrc, /etc/bashrc and Environment variables.
2) Write a C program that makes a copy of a file using standard I/O, and system calls
3) Write a C program to emulate the UNIX ls –l command.
4) Write a C program that illustrates how to execute two commands concurrently with a command pipe. Ex: - ls –l | sort
5) Simulate the following CPU scheduling algorithms:
   (a) Round Robin (b) SJF (c) FCFS (d) Priority
6) Multiprogramming-Memory management-Implementation of fork (), wait (), exec() and exit (), System calls
7) Simulate the following:
   a) Multiprogramming with a fixed number of tasks (MFT)
   b) Multiprogramming with a variable number of tasks (MVT)
8) Simulate Bankers Algorithm for Dead Lock Avoidance
9) Simulate Bankers Algorithm for Dead Lock Prevention.
10) Simulate the following page replacement algorithms:
    a) FIFO b) LRU c) LFU
11) Simulate the following File allocation strategies
    (a) Sequenced (b) Indexed (c) Linked



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12) Write a C program that illustrates two processes communicating using shared memory

13) Write a C program to simulate producer and consumer problem usingsemaphores

14) Write C program to create a thread using pthreads library and let it run its function.

15) Write a C program to illustrate concurrent execution of threads using pthreads library.

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II Year – I Semester		L	T	P	C
		0	0	3	1.5
DATABASE MANAGEMENT SYSTEMS LAB					

Course Objectives:
This Course will enable students to
- Populate and query a database using SQL DDL/DML Commands
- Declare and enforce integrity constraints on a database
- Writing Queries using advanced concepts of SQL
- Programming PL/SQL including procedures, functions, cursors and triggers

Course Outcomes:
At the end of the course the student will be able to:
- Utilize SQL to execute queries for creating database and performing data manipulation operations
- Examine integrity constraints to build efficient databases
- Apply Queries using Advanced Concepts of SQL
- Build PL/SQL programs including stored procedures, functions, cursors and triggers

List of Exercises:
1. Creation, altering and droping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
2. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example:- Select the roll number and name of the student who secured fourth rank in the class.
3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
4. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date)
5.
   i. Create a simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found)
   ii. Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
6. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.
7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE-APPLICATION ERROR.
8. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.



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9. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.
10. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
11. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers
12. Create a table and perform the search operation on table using indexing and non-indexing techniques.

Text Books/Suggested Reading:

1) Oracle: The Complete Reference by Oracle Press
2) Nilesh Shah, "Database Systems Using Oracle", PHI, 2007
3) Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007

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II Year - I Semester	Skill Oriented Course- I	L	T	P	C
		0	0	4	2
ANIMATIONS- 2D ANIMATION					

Course Objectives:
This Course will enable students to learn various aspects of animation using a variety of 2-D software
and to implement advance principles of traditional animation in Adobe animate to create high quality
animation for production

Course Outcomes:
At the end of the course the student will be able to:

- learn various tools of digital 2-D animation.
- understand production pipeline to create 2-D animation.
- analyze special effects in animation to bring interest and awe in the scenes and backgrounds.
- apply the tools to create 2D animation for films and videos.

Perform Experiments related to the following concepts:

2D GRAPHIC DESIGN

Adobe Photoshop:
1. Create your visiting card
2. Create Title for any forthcoming film
3. Digital Matte Paint
4. Convert Black and White to Color
5. Convert Day mode to Night mode
6. Design Image manipulation
7. Smooth skin and remove blemishes & scars
8. Create a 3D pop-out effect
9. Create Textures
10. Timeline Animation

Adobe Illustrator:
1. Advertisement
2. Digital Illustrations
3. Brochure
4. Packet Design(Toothpaste packet, Soap cover, any Food product)
5. Danglers for display
6. Menu cards
7. Calendar Design
8. Tracing image
9. Vehicle Design
10. Festival



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Adobe Indesign:
1. Magazine A4 Size
2. Newspaper layout design & advertisements – Fine arts
3. Special Supplement
4. Different categories of Books
5. Info-graphics
6. Caricatures

Corel DRAW:
1. Create a paper ad for advertising of any commercial agency
2. Package Design
3. Corporate ID
4. Exhibition Layout
5. Oblers

2D ANIMATION

1. Creating Web Banners in Adobe Flash
2. Creating a Logo Animation in Adobe Flash
3. Creating Frame by Frame animation
4. Draw Cartoon Animation using reference.
5. Create Lip Sink to Characters
6. Using filters & Special effects
7. Create a scene by using Mask layers animation

E-Learning Lab:
8. Student Application form
9. Video Controlling
10. Audio Controlling
11. Start Drag and Stop Drag Actions
12. Interactive Keyboard Controls using Flash Action Script.
13. Interactive Flash Game.
14. Creating Character Animation in After Effects

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II Year - I Semester	Skill Oriented Course- I	L	T	P	C
		0	0	4	2
DISTRIBUTED TECHNOLOGIES-SQLITE					

Course Objectives:
This Course will enable students to learn about SQLite Database and applying CRUD operations

Course Outcomes:
At the end of the course the student will be able to:

- learn about SQLite which is a relational database that is present in android and helps the users by storing important information.
- Perform various operations on server less database SQLite
- implement a small, fast, self-contained, high-reliability, full-featured using SQL database engine.

Perform Experiments related to the following concepts:

1. SQLite Installation
2. DOT(.) Commands
3. Attach, Detach Databases
4. Data types
5. Constraint
6. Create, Alter, Drop Index
7. SELECT statement
8. Operators
9. Aggregate functions
10. Core Functions
11. JOINS
12. Triggers

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II Year - I Semester		L	T	P	C
		2	0	0	0
CONSTITUTION OF INDIA					

Course Objectives:

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
- To understand the central and state relation financial and administrative

Course Outcomes:

At the end of the course, the student will be able to have a clear knowledge on the following:

- Understand historical background of the constitution making and its importance for building a democratic India.
- Understand the functioning of three wings of the government ie., executive, legislative and judiciary.
- Understand the value of the fundamental rights and duties for becoming good citizen of India.
- Analyze the decentralization of power between central, state and local self-government.
- Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.
    1. Know the sources, features and principles of Indian Constitution.
    2. Learn about Union Government, State government and its administration.
    3. Get acquainted with Local administration and Pachayati Raj.
    4. Be aware of basic concepts and developments of Human Rights.
    5. Gain knowledge on roles and functioning of Election Commission

UNIT I

Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

Learning outcomes:After completion of this unit student will

- Understand the concept of Indian constitution
- Apply the knowledge on directive principle of state policy
- Analyze the History, features of Indian constitution
- Evaluate Preamble Fundamental Rights and Duties

UNIT II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre-State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, LokSabha, RajyaSabha, The Supreme Court and High Court: Powers and Functions;

Learning outcomes: After completion of this unit student will

- Understand the structure of Indian government
- Differentiate between the state and central government
- Explain the role of President and Prime Minister
- Know the Structure of supreme court and High court

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UNIT III

State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

Learning outcomes: After completion of this unit student will

- Understand the structure of state government
- Analyze the role Governor and Chief Minister
- Explain the role of state Secretariat
- Differentiate between structure and functions of state secretariat

UNIT IV

A.Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation PachayatiRaj: Functions PRI: ZilaPanchayat, Elected officials and their roles, CEO ZilaPanchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy

Learning outcomes:-After completion of this unit student will

- Understand the local Administration
- Compare and contrast district administration role and importance
- Analyze the role of Myer and elected representatives of Municipalities
- Evaluate Zillapanchayat block level organisation

UNIT V

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women

Learning outcomes: After completion of this unit student will

- Know the role of Election Commission apply knowledge
- Contrast and compare the role of Chief Election commissioner and Commissiononerate
- Analyze role of state election commission
- Evaluate various commissions of viz SC/ST/OBC and women

References:

1) Durga Das Basu, Introduction to the Constitution of India, Prentice Hall of India Pvt. Ltd.
2) SubashKashyap, Indian Constitution, National Book Trust
3) J.A. Siwach, Dynamics of Indian Government & Politics
4) D.C. Gupta, Indian Government and Politics
5) H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6) J.C. Johari, Indian Government andPolitics Hans
7) J. Raj IndianGovernment and Politics
8) M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi
9) Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

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e-Resources:

1) nptel.ac.in/courses/109104074/8
2) nptel.ac.in/courses/109104045/
3) nptel.ac.in/courses/101104065/
4) www.hss.iitb.ac.in/en/lecture-details
5) www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

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II Year – II Semester		L	T	P	C
		2	0	2	3
STATISTICS WITH R					

COURSE OBJECTIVES:
After taking the course, students will be able to
• Use R for statistical programming, computation, graphics, and modeling,
• Write functions and use R in an efficient way,
• Fit some basic types of statistical models
• Use R in their own research,
• Be able to expand their knowledge of R on their own.

COURSE OUTCOMES:
At the end of this course, students will be able to:
• List motivation for learning a programming language
• Access online resources for R and import new function packages into the R workspace
• Import, review, manipulate and summarize data-sets in R
• Explore data-sets to create testable hypotheses and identify appropriate statistical tests
• Perform appropriate statistical tests using R , Create and edit visualizations with R

UNIT-I:
Introduction, How to run R, R Sessions and Functions, Basic Math, Variables, Data Types, Vectors, Conclusion, Advanced Data Structures, Data Frames, Lists, Matrices, Arrays, Classes**.**

UNIT-II:
R Programming Structures, Control Statements, Loops, - Looping Over Nonvector Sets,- If-Else,
Arithmetic and Boolean Operators and values, Default Values for Argument, Return Values, Deciding Whether to explicitly call return- Returning Complex Objects, Functions are Objective,
No Pointers in R, Recursion, A Quicksort Implementation-Extended Extended Example: A Binary Search Tree.

UNIT-III:
Doing Math and Simulation in R, Math Function, Extended Example Calculating Probability-Cumulative Sums and Products-Minima and Maxima- Calculus, Functions Fir Statistical Distribution, Sorting, Linear Algebra Operation on Vectors and Matrices, Extended Example: Vector cross Product- Extended Example: Finding Stationary Distribution of Markov Chains, Set
Operation, Input /output, Accessing the Keyboard and Monitor, Reading and writer Files,

UNIT-IV:
Graphics, Creating Graphs, The Workhorse of R Base Graphics, the plot() Function – Customizing Graphs, Saving Graphs to Files.
Probability Distributions, Normal Distribution- Binomial Distribution- Poisson Distributions Other Distribution, Basic Statistics, Correlation and Covariance, T-Tests,-ANOVA.

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UNIT-V:
Linear Models, Simple Linear Regression, -Multiple Regression Generalized Linear Models, Logistic Regression, - Poisson Regression- other Generalized Linear Models-Survival Analysis,
Nonlinear Models, Splines- Decision- Random Forests,

TEXT BOOKS:
1) The Art of R Programming, Norman Matloff, Cengage Learning
2) R for Everyone, Lander, Pearson

REFERENCE BOOKS:
1) R Cookbook, PaulTeetor, Oreilly.
2) R in Action,Rob Kabacoff, Manning

EXPERIMENTS:

1) Write a R program to take input from the user (name and age) and display the values. Also print the version of R installation.
2) Write a R program to create a sequence of numbers from 20 to 50 and find the mean of numbers from 20 to 60 and sum of numbers from 51 to 91.
3) Write a R program to create three vectors a,b,c with 3 integers. Combine the three vectors to become a 3×3 matrix where each column represents a vector. Print the content of the matrix.
4) Write a R program to find row and column index of maximum and minimum value in a given matrix.
5) Write a R program to combine three arrays so that the first row of the first array is followed by the first row of the second array and then first row of the third array.
6) Write a R program to create an array using four given columns, three given rows, and two given tables and display the content of the array.
7) Write a R program to create a data frame from four given vectors.
8) Write a R program to find Sum, Mean and Product of a Vector, ignore element like NA or NaN.
9) Write a R program to create a list containing a vector, a matrix and a list and remove the second element.
10) Write a R program to merge two given lists into one list.
11) Write a R program to create an ordered factor from data consisting of the names of months.
12) Plot the density and distribution functions for Normal approximation to the Binomial distribution.
13) Take any dataset, Visualize Tables, charts and plots. Compute visualising Measures of Central Tendency, Variation, and Shape. Box plots, Pareto diagrams. Aslo, find the mean median standard deviation and quantiles of a set of observations.
14) Take any dataset. Calculate the correlation between two variables. Draw the scatter plots. Use the scatter plot to investigate the relationship between two variables.



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15) The sales of a company for each year are shown in the table below.

x (year)	2015	2016	2017	2018	2019
y (sales in lakhs)	12	19	29	37	45

a) Find the least square regression line $y = a\,x + b$.

b) Use the least squares regression line as a model to estimate the sales of the company in 2021.

16) Find the least square regression line for the following set of data {(-1 , 0),(0 , 2),(1 , 4),(2 , 5) Plot the given points and the regression line in the same rectangular system of axes

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II Year – II Semester		L	T	P	C
		3	0	0	3
PRINCIPLES OF SOFTWARE ENGINEERING					

Course Objectives:
This course is designed to:

- Give exposure to phases of Software Development, common process models including Waterfall, and the Unified Process, and hands-on experience with elements of the agile process
- Give exposure to a variety of Software Engineering practices such as requirements analysis and specification, code analysis, code debugging, testing, traceability, and version control
- Give exposure to Software Design techniques

Course Outcomes:
Students taking this subject will gain software engineering skills in the following areas:

- Transform an Object-Oriented Design into high quality, executable code
- Skills to design, implement, and execute test cases at the Unit and Integration level
- Compare conventional and agile software methods

UNIT I
The Nature of Software, The Unique Nature of WebApps, Software Engineering, The Software Process, Software Engineering Practice, Software Myths, How It All Starts. A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Technology.

UNIT II
Agility, Agility and the Cost of Change, Agile Process, Extreme Programming (XP), Other Agile Process Models, A Tool Set for the Agile Process, Software Engineering Knowledge , Core Principles, Principles That Guide Each Framework Activity, Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Requirements Model, Negotiating Requirements, Validating Requirements.

UNIT III
Requirements Analysis, Scenario-Based Modeling, UML Models That Supplement the Use Case, Data Modeling Concepts, Class-Based Modeling, Requirements Modeling Strategies, Flow-Oriented Modeling, Creating a Behavioral Model, Patterns for Requirements Modelling, Requirements Modeling for WebApps.

UNIT IV
Design within the Context of Software Engineering, The Design Process, Design Concepts, The Design Model, Software Architecture, Architectural Genres, Architectural Styles, Assessing Alternative Architectural Designs, Architectural Mapping Using Data Flow, What Is a Component?, Designing Class-Based Components, Conducting Component-Level Design, Component-Level Design for WebApps, Designing Traditional Components, Component-Based Development.

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UNIT V

The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, WebApp Interface Design, Design Evaluation, Elements of Software Qualtiy Assurance, SQA Tasks, Goals & Metrics, Statistical SQA, Software Reliability, A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object-Oriented Software, Test Strategies for WebApps, Validation Testing, System Testing, The Art of Debugging, Software Testing Fundamentals, Internal and External Views of Testing, White-Box Testing, Basis Path Testing

Text Books:

1) Software Engineering a practitioner's approach, Roger S. Pressman, Seventh Edition, McGraw Hill Higher Education.
2) Software Engineering, Ian Sommerville, Ninth Edition, Pearson.

Reference Books:

1) Software Engineering, A Precise Approach, PankajJalote, Wiley India, 2010.
2) Software Engineering, Ugrasen Suman, Cengage.

e-Resources:

1) https://nptel.ac.in/courses/106/105/106105182/

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II Year – II Semester		L	T	P	C
		3	0	0	3
AUTOMATA THEORY AND COMPILER DESIGN					

Course Objectives:

- To learn fundamentals of Regular and Context Free Grammars and Languages
- To understand the relation between Contexts free Languages, PDA and TM
- To study the various phases in the design of a compiler
- To understand the design of top-down and bottom-up parsers
- To understand syntax directed translation schemes
- To learn to develop algorithms to generate code for a target machine

Course Outcomes:

At the end of the course, the students will be able to:

- Ability to design, develop, and implement a compiler for any language
- Able to use LEX and YACC tools for developing a scanner and a parser
- Able to design and implement LL and LR parsers
- Able to design algorithms to perform code optimization in order to improve the performance of a program in terms of space and time complexity
- Ability to design algorithms to generate machine code

UNIT-I

Formal Language and Regular Expressions : Languages, Definition Languages regular expressions, Finite Automata – DFA, NFA. Conversion of regular expression to NFA, NFA to DFA. Applications of Finite Automata to lexical analysis, lex tools.

UNIT-II

Context Free grammars and parsing : Context free grammars, derivation, parse trees, ambiguity LL(K) grammars and LL(1) parsing

Bottom up parsing handle pruning LR Grammar Parsing, LALR parsing, parsing ambiguous grammars, YACC programming specification.

UNIT-III

Semantics: Syntax directed translation, S-attributed and L-attributed grammars, Intermediate code – abstract syntax tree, translation of simple statements and control flow statements.

Context Sensitive features – Chomsky hierarchy of languages and recognizers. Type checking, type conversions, equivalence of type expressions, overloading of functions and operations.

UNIT-IV

Run time storage : Storage organization, storage allocation strategies scope access to now local names, parameters, language facilities for dynamics storage allocation.

Code optimization : Principal sources of optimization, optimization of basic blocks, peephole optimization, flow graphs, Data flow analysis of flow graphs.

UNIT-V

Code generation : Machine dependent code generation, object code forms, generic code generation algorithm, Register allocation and assignment. Using DAG representation of Block.

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TEXT BOOKS:

1) Introduction to Automata Theory, Languages and Computation, J. E. Hopcroft, R. Motwani and J. D. Ullman, 3rd Edition, Pearson, 2008.
2) Compilers Principles, Techniques and Tools Aho, Ullman, Ravisethi, Pearson Education.

REFERENCES:

1) Louden: "Compiler Construction, Principles & Practice", 1st Edition, Thomson Press, 2006.
2) Tremblay J P, Sorenson G P: "The Theory & Practice of Compiler writing", 1st Edition, BSP publication, 2010.
3) Theory of Computation, V. Kulkarni, Oxford University Press, 2013

e-Resources:

1) https://nptel.ac.in/courses/106/104/106104028/
2) https://nptel.ac.in/courses/106/104/106104123/

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II Year – II Semester		L	T	P	C
		3	0	0	3
JAVA PROGRAMMING					

Course Objectives:
The learning objectives of this course are:

- To identify Java language components and how they work together in applications
- To learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
- To learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications
- To understand how to design applications with threads in Java
- To understand how to use Java APIs for program development

Course Outcomes:
By the end of the course, the student will be

- Able to realize the concept of Object Oriented Programming & Java Programming Constructs
- Able to describe the basic concepts of Java such as operators, classes, objects, inheritance, packages, Enumeration and various keywords
- Apply the concept of exception handling and Input/ Output operations
- Able to design the applications of Java & Java applet
- Able to Analyze & Design the concept of Event Handling and Abstract Window Toolkit

UNIT I
Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.

Data Types, Variables, and Operators :Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final, Introduction to Operators, Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.

Control Statements: Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator?:, Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.



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UNIT II

Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by

Reference, Keyword this.
Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.

UNIT III

Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.

Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.
Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.

UNIT IV

Packages and Java Library: Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java.lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto-unboxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java.time.Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.

Exception Handling: Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions, try-with-resources, Catching Subclass Exception, Custom Exceptions, Nested try and catch Blocks, Rethrowing Exception, Throws Clause.

UNIT V

String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Methods for Comparison of Strings, Methods for Modifying Strings, Methods for Searching Strings, Data Conversion and Miscellaneous Methods, Class String Buffer, Class String Builder.

Multithreaded Programming: Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread- Creation of New

Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter-thread Communication - Suspending, Resuming, and Stopping of Threads.

Java Database Connectivity: Introduction, JDBC Architecture, Installing MySQL and MySQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, ResultSet Interface, Creating JDBC Application, JDBC Batch Processing, JDBC Transaction Management

Text Books:

1) JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
2) The complete Reference Java, 8th edition, Herbert Schildt, TMH.

References Books:

1) Introduction to java programming, 7th edition by Y Daniel Liang, Pearson
2) Murach's Java Programming, Joel Murach

e-Resources:

1) https://nptel.ac.in/courses/106/105/106105191/
2) https://www.w3schools.com/java/java_data_types.asp

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II Year – II Semester		L	T	P	C
		3	0	0	3
MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTANCY					

Course Objectives:

- The Learning objectives of this paper are to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting
- To familiarize about the Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles
- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation
- Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals

Course Outcomes:

- The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product
- The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs
- The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units
- The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis
- The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making

UNIT I

Introduction to Managerial Economics and demand Analysis: Definition of Managerial Economics – Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.

UNIT II

Theories of Production and Cost Analyses: Theories of Production function- Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs-Fixed costs, Variable Costs and Total costs –Cost –Volume-Profit analysis-Determination of Breakeven point(problems)-Managerial significance and limitations of Breakeven point.

UNIT III

Introduction to Markets, Theories of the Firm & Pricing Policies: Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson's models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing, Business Cycles : Meaning and Features – Phases of a Business Cycle. Features and Evaluation of Sole Trader, Partnership, Joint Stock

Company – State/Public Enterprises and their forms.

UNIT IV

Introduction to Accounting & Financing Analysis: Introduction to Double Entry System, Journal, Ledger, Trail Balance and Preparation of Final Accounts with adjustments – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow and cash flow analysis (Problems)

UNIT V

Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods(pay back period, accounting rate of return) and modern methods(Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)

Text Books:

1) A R Aryasri, Managerial Economics and Financial Analysis, The McGraw – Hill companies.

Reference Books:

1) Varshney R.L, K.L Maheswari, Managerial Economics, S. Chand & Company Ltd.
2) JL Pappas and EF Brigham, Managerial Economics, Holt, R & W; New edition edition
3) N.P Srinivasn and M. SakthivelMurugan, Accounting for Management, S. Chand & Company Ltd.
4) MaheswariS.N,AnIntroduction to Accountancy, Vikas Publishing House Pvt Ltd
5) I.M Pandey, Financial Management , Vikas Publishing House Pvt Ltd
6) V. Maheswari, Managerial Economics, S. Chand & Company Ltd.

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II Year –I I Semester		L	T	P	C
		0	1	2	2
UNIFIED MODELING LANGUAGE (UML) LAB					

Course Objectives:

- To know the practical issues of the different object oriented analysis and design concepts
- Inculcate the art of object oriented software analysis and design
- Apply forward and reverse engineering of a software system
- Carry out the analysis and design of a system in an object oriented way

Course Outcomes:

At the end of the course, student will be able to

- Know the syntax of different UML diagrams
- Create use case documents that capture requirements for a software system
- Create class diagrams that model both the domain model and design model of a software system
- Create interaction diagrams that model the dynamic aspects of a software system
- Write code that builds a software system
- Develop simple applications

Note: For performing the experiments consider any case study (ATM/ Banking/ Library/Hospital management systems)

Experiment 1:

Familiarization with Rational Rose or Umbrella environment

Experiment 2:

a) Identify and analyze events
b) Identify Use cases
c) Develop event table

Experiment 3:

a) Identify & analyze domain classes
b) Represent use cases and a domain class diagram using Rational Rose
c) Develop CRUD matrix to represent relationships between use cases and problem domain classes

Experiment 4:

a) Develop Use case diagrams
b) Develop elaborate Use case descriptions & scenarios
c) Develop prototypes (without functionality)

Experiment 5:

a) Develop system sequence diagrams and high-level sequence diagrams for each use case
b) Identify MVC classes / objects for each use case
c) Develop Detailed Sequence Diagrams / Communication diagrams for each use case showing interactions among all the three-layer objects



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Experiment 6:

a) Develop detailed design class model (use GRASP patterns for responsibility assignment)
b) Develop three-layer package diagrams for each case study

Experiment 7:

a) Develop Use case Packages
b) Develop component diagrams
c) Identify relationships between use cases and represent them
d) Refine domain class model by showing all the associations among classes

Experiment 8:

Develop sample diagrams for other UML diagrams - state chart diagrams, activity diagrams and deployment diagrams

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II Year –I I Semester		**L**	**T**	**P**	**C**
		0	**0**	**2**	**1**
FOSS LAB					

Course Objectives:
This Course will enable students to

- provide introduction to UNIX operating system and its File System.
- develop the ability to formulate Regular Expressions and use them for Pattern Matching.
- gain an understanding of important aspects related to the Shell and the Process.
- provide a comprehensive introduction to Shell Programming, Services and Utilities.

Course Outcomes:
At the end of the course the student will be able to:

- Demonstrate UNIX commands for file handling and process control
- Construct regular expressions for pattern matching and apply them to various filters for a specific task.
- Analyze a given problem and apply requisite facets of shell programming in order to devise a shell script to solve the problem

Programs:
1. Session-1
   a) Log into the system
   b) Use vi editor to create a file called myfile.txt which contains some text.
   c) correct typing errors during creation.
   d) Save the file
   e) logout of the system

Session-2
   a) Log into the system
   b) open the file created in session 1
   c) Add some text
   d) Change some text
   e) Delete some text
   f) Save the Changes
   g) Logout of the system

2.a) Log into the system
b) Use the cat command to create a file containing the following data. Call it mytable use tabs to separate the fields.

1425	Ravi	15.65
4320	Ramu	26.27
6830	Sita	36.15
1450	Raju	21.86

c) Use the cat command to display the file, mytable

d) Use the vi command to correct any errors in the file, mytable.

e)Use the sort command to sort the file my table according to the first field. Call the sorted file my table (same name)
f)Print the file my table
g)Use the cut and paste commands to swap fields 2 and 3 of my table. Call it my table (same name)
h)Print the new file, mytable
i)Logout of the system.

3.A)
a) Login to the system
b) Use the appropriate command to determine your login shell
c) Use the /etc/passwd file to verify the result of step b.
d) Use the who command and redirect the result to a file called myfile1. Use the more command to see the contents of myfile1.
e) Use the date and who commands in sequence (in one line) such that the output of date will display on the screen and the output of who will be redirected to a file called myfile2. Use the more command to check the contents of myfile2.

B)Write a sed command that deletes the first character in each line in a file.
b)Write a sed command that deletes the character before the last character in each line in a file.
c)Write a sed command that swaps the first and second words in each line in a file.

4. a)Pipe your /etc/passwd file to awk, and print out the home directory of each user.
b)Develop an interactive grep script that asks for a word and a file name and then tells how many lines contain that word.
c)Repeat
d)Part using awk

5. a)Write a shell script that takes a command –line argument and reports on whether it is directory, a file, or something else

b)Write a shell script that accepts one or more file name as arguments and converts all of them to uppercase, provided they exist in the current directory.
c)Write a shell script that determines the period for which a specified user is working on the system.

6. a)Write a shell script that accepts a file name starting and ending line numbers as arguments and displays all the lines between the given line numbers.
b)Write a shell script that deletes all lines containing a specified word in one or more files supplied as arguments to it.

7. a)Write a shell script that computes the gross salary of a employee according to the following rules:
i)If basic salary is < 1500 then HRA =10% of the basic and DA =90% of the basic.
ii)If basic salary is >=1500 then HRA =Rs500 and DA=98% of the basic

The basic salary is entered interactively through the key board.
b)Write a shell script that accepts two integers as its arguments and computers the value of first number raised to the power of the second number.

8. a)Write an interactive file-handling shell program. Let it offer the user the choice of copying, removing, renaming, or linking files. Once the user has made a choice, have the program ask the user for the necessary information, such as the file name, new name and so on.
b) Write shell script that takes a login name as command – line argument and reports when that person logs in
c) Write a shell script which receives two file names as arguments. It should check whether the two file contents are same or not. If they are same then second file should be deleted.

9. a)Write a shell script that displays a list of all the files in the current directory to which the user has read, write and execute permissions.
b) Develop an interactive script that ask for a word and a file name and then tells how many times that word occurred in the file.
c) Write a shell script to perform the following string operations:
i)To extract a sub-string from a given string.

ii)To find the length of a given string.

10 .Write a C program that takes one or more file or directory names as command line input and reports the following information on the file:
i)File type ii)Number of links iii)Read, write and execute permissions
iv)Time of last access
(Note : Use stat/fstat system calls)

11. Write C programs that simulate the following unix commands:
a)mv b)cp (Use system calls)

12. Write a C program that simulates ls Command (Use system calls / directory API)

13. Write a shell script to accept the name of the file from standard input and perform the following tests on it a) File executable b) File readable c) File writable d) Both readable & writable

14. Write an awk program to print sum, avg of students marks list
15. Write an awk program which will find maximum word and its length in the given input File

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II Year – II Semester		L	T	P	C
		0	0	3	1.5
JAVA PROGRAMMING LAB					

Course Objectives:
The aim of this lab is to
- Practice programming in the Java
- Gain knowledge of object-oriented paradigm in the Java programming language
- Learn use of Java in a variety of technologies and on different platforms

Course Outcomes:
By the end of the course student will be able to write java program for
- Evaluate default value of all primitive data type, Operations, Expressions, Control-flow, Strings
- Determine Class, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
- Illustrating simple inheritance, multi-level inheritance, Exception handling mechanism
- Construct Threads, Event Handling, implement packages, developing applets

Exercise - 1 (Basics)
a) Write a JAVA program to display default value of all primitive data type of JAVA
b) Write a java program that display the roots of a quadratic equation $ax^2+bx=0$. Calculate the discriminate D and basing on value of D, describe the nature of root.
c) Five Bikers Compete in a race such that they drive at a constant speed which may or may not be the same as the other. To qualify the race, the speed of a racer must be more than the average speed of all 5 racers. Take as input the speed of each racer and print back the speed of qualifying racers.
Exercise - 2 (Operations, Expressions, Control-flow, Strings)
a) Write a JAVA program to search for an element in a given list of elements using binary search mechanism.
b) Write a JAVA program to sort for an element in a given list of elements using bubble sort
c) Write a JAVA program to sort for an element in a given list of elements using merge sort.
d) Write a JAVA program using StringBuffer to delete, remove character.
Exercise - 3 (Class, Objects)
a) Write a JAVA program to implement class mechanism. Create a class, methods and invoke them inside main method.
b) Write a JAVA program to implement constructor.
Exercise - 4 (Methods)
a) Write a JAVA program to implement constructor overloading.
b) Write a JAVA program implement method overloading.
Exercise - 5 (Inheritance)
a) Write a JAVA program to implement Single Inheritance
b) Write a JAVA program to implement multi level Inheritance
c) Write a java program for abstract class to find areas of different shapes
Exercise - 6 (Inheritance - Continued)
a) Write a JAVA program give example for "super" keyword.
b) Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?



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Exercise - 7 (Exception)
a) Write a JAVA program that describes exception handling mechanism
b) Write a JAVA program Illustrating Multiple catch clauses
Exercise – 8 (Runtime Polymorphism)
a) Write a JAVA program that implements Runtime polymorphism
b) Write a Case study on run time polymorphism, inheritance that implements in above problem
Exercise – 9 (User defined Exception)
a) Write a JAVA program for creation of Illustrating throw
b) Write a JAVA program for creation of Illustrating finally
c) Write a JAVA program for creation of Java Built-in Exceptions
d) d)Write a JAVA program for creation of User Defined Exception
Exercise – 10 (Threads)
a) Write a JAVA program that creates threads by extending Thread class .First thread display "Good Morning "every 1 sec, the second thread displays "Hello "every 2 seconds and the third display "Welcome" every 3 seconds ,(Repeat the same by implementing Runnable)
b) Write a program illustrating **isAlive** and **join ()**
c) Write a Program illustrating Daemon Threads.
Exercise - 11 (Threads continuity)
a) Write a JAVA program Producer Consumer Problem
b) Write a case study on thread Synchronization after solving the above producer consumer problem
Exercise – 12 (Packages)
a) Write a JAVA program illustrate class path
b) Write a case study on including in class path in your os environment of your package.
c) Write a JAVA program that import and use the defined your package in the previous Problem
Exercise - 13 (Applet)
a) Write a JAVA program to paint like paint brush in applet.
b) Write a JAVA program to display analog clock using Applet.
c) Write a JAVA program to create different shapes and fill colors using Applet.
Exercise - 14 (Event Handling)
a) Write a JAVA program that display the x and y position of the cursor movement using Mouse.
b) Write a JAVA program that identifies key-up key-down event user entering text in a Applet.

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II Year - II Semester	Skill Oriented Course- II	L	T	P	C
		0	0	4	2
ANIMATIONS- INTRODUCTION TO 3D					

Course Objectives:
This Course will enable students to

- To know about 3D software interface.
- To know about different type of 3d modeling like polygon, nerves modeling, curve based
  modeling, Patch modeling,
- To understand the basic blocking of 3D Inorganic and organic modeling, high poly modeling, unwrapping texturing.

Course Outcomes:
At the end of the course the student will be able to:

- To understand different styles and treatment of content in 3d model creation
- To analyze the importance of cognitive 3d designing.
- To apply tools to create effective 3D modelling texturing and lighting

1. Create any Model some objects such as chairs, tables, fruits, utensils
2. Create any Model instruments, tools
3. Create any Model of Cars or Bike,
4. Create any model of the male or female character.
5. Create any Model of any animal.
6. Create any Model of any birds, fishes, and worms.
7. Apply basic material and shader types & Procedurals textures.
8. Unwrap the models of objects and characters using various projection maps.
9. Apply texture on various objects and characters.
10. Create a natural outdoor or indoor scene.
11. Create Opacity, Smoothness, Secularity, and color maps, Transparency, Reflection
12. Bump & Displacement Maps
13. Render a frame and video of indoor and outdoor scenes.
14. Render a video of indoor scenes.
15. Render a photorealistic output of an interior scene.
16. Advance lighting using mental ray render.
17. Animate day and night scene of a street with the help of lighting.

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II Year - II Semester	Skill Oriented Course- II	L	T	P	C
		0	0	4	2
DISTRIBUTED TECHNOLOGIES-MONGODB					

Course Objectives:
This Course will enable students to

- master the leading document-oriented NoSQL database, MongoDB Architecture, CRUD, Schema
- Design, Data Modelling and Indexing using real-life case studies
- Learn how to design Schema using Advanced Queries

Course Outcomes:
At the end of the course the student will be able to:

- Install, configure and setup the drivers to use MongoDB with your programming language of choice
- Gain an in-depth understanding of main features of MongoDB and their use cases
- Retrieve data in the database using advanced querying
- to build new types of applications for mobile, cloud, e-commerce and and social technologies

Perform Experiments related to the following concepts:

1. MongoDB on Windows
2. MongoShell
3. Databases, Documents
4. Collections
5. MongoDB Connections
6. Query and Projection
7. Operators
8. Agrregation Pipeline Operators
9. Database Commands
10. Shell Methods

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DEPARTMENT OF INFORMATION TECHNOLOGY

III Year – I Semester		L	T	P	C
		3	0	0	3
COMPUTER NETWORKS					

Course Objectives:
- To provide insight about networks, topologies, and the key concepts.
- To gain comprehensive knowledge about the layered communication architectures (OSI and TCP/IP) and its functionalities.
- To understand the principles, key protocols, design issues, and significance of each layers in ISO and TCP/IP.
- To know the basic concepts of network services and various network applications.

Course Outcomes:
By the end of the course, the student will be able to
- Demonstrate different network models for networking links OSI, TCP/IP, B-ISDN, N-BISDN and get knowledge about various communication techniques, methods and protocol standards.
- Discuss different transmission media and different switching networks.
- Analyze data link layer services, functions and protocols like HDLC and PPP.
- Compare and Classify medium access control protocols like ALOHA, CSMA, CSMA/CD, CSMA/CA, Polling, Token passing, FDMA, TDMA, CDMA protocols
- Determine application layer services and client server protocols working with the client server paradigms like WWW, HTTP, FTP, e-mail and SNMP etc.

UNIT I:
Introduction: Network Types, LAN, MAN, WAN, Network Topologies Reference models- The OSI Reference Model- the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models, OSI Vs TCP/IP, Lack of OSI models success, Internet History.
Physical Layer –Introduction to Guided Media- Twisted-pair cable, Coaxial cable and Fiber optic cable and unguided media: Wireless-Radio waves, microwaves, infrared.

UNIT II:
Data link layer: Design issues, **Framing**: fixed size framing, variable size framing, flow control, error control, error detection and correction codes, CRC, Checksum: idea, one's complement internet checksum, services provided to Network Layer, **Elementary Data Link Layer protocols**: simplex protocol, Simplex stop and wait, Simplex protocol for Noisy Channel.
Sliding window protocol: One bit, Go back N, Selective repeat-Stop and wait protocol, Data link layer in HDLC: configuration and transfer modes, frames, control field, point to point protocol (PPP): framing transition phase, multiplexing, multi link PPP.

UNIT III:
Media Access Control: Random Access: ALOHA, Carrier sense multiple access (CSMA), CSMA with Collision Detection, CSMA with Collision Avoidance, **Controlled Access:** Reservation, Polling, Token Passing, **Channelization:** frequency division multiple Access(FDMA), time division multiple access(TDMA), code division multiple access(CDMA).
Wired LANs: Ethernet, Ethernet Protocol, Standard Ethernet, Fast Ethernet(100 Mbps), Gigabit Ethernet, 10 Gigabit Ethernet.

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UNIT IV:

The Network Layer Design Issues – Store and Forward Packet Switching-Services Provided to the Transport layer- Implementation of Connectionless Service-Implementation of Connection Oriented Service- Comparison of Virtual Circuit and Datagram Networks, Routing Algorithms-The Optimality principle-Shortest path, Flooding, Distance vector, Link state, Hierarchical, Congestion Control algorithms-General principles of congestion control, Congestion prevention polices, Approaches to Congestion Control-Traffic Aware Routing- Admission Control-Traffic Throttling-Load Shedding. Traffic Control Algorithm-Leaky bucket & Token bucket.

Internet Working: How networks differ- How networks can be connected- Tunnelling, internetwork routing-, Fragmentation, network layer in the internet – IP protocols-IP Version 4 protocol-IPV4 Header Format, IP addresses, Class full Addressing, CIDR, NAT-, Subnets-IP Version 6-The main IPV6 header, Transition from IPV4 to IPV6, Comparision of IPV4 & IPV6- Internet control protocols- ICMP-ARP-DHCP

UNIT V:

The Transport Layer: Transport layer protocols: Introduction-services- port number-User data gram protocol-User datagram-UDP services-UDP applications-Transmission control protocol: TCP services-TCP features- Segment- A TCP connection- windows in TCP- flow control-Error control, Congestion control in TCP.

Application Layer –- World Wide Web: HTTP, Electronic mail-Architecture- web based mail- email security- TELENET-local versus remote Logging-Domain Name System: Name Space, DNS in Internet ,-Resolution-Caching- Resource Records- DNS messages- Registrars-security of DNS Name Servers, SNMP.

Text Books:

1. Computer Networks — Andrew S Tanenbaum, Fifth Edition. Pearson Education/PHI
2. Data Communications and Networks – Behrouz A. Forouzan, Fifth Edition TMH.

References Books:

1. Data Communications and Networks- Achut S Godbole, AtulKahate
2. Computer Networks, Mayank Dave, CENGAGE

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DEPARTMENT OF INFORMATION TECHNOLOGY

III Year – I Semester		L	T	P	C
		3	0	0	3
DESIGN AND ANALYSIS OF ALGORITHMS					

Course Objectives:

Upon completion of this course, students will be able to do the following:

- Ability to understand, analyze and denote time complexities of algorithms
- To introduce the different algorithmic approaches for problem solving through numerous example problems
- Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms, and analyze them.
- To provide some theoretical grounding in terms of finding the lower bounds of algorithms and the NP-completeness

Course Outcomes: After the completion of the course, student will be able to

- Analyze the performance of a given algorithm, denote its time complexity using the asymptotic notation for recursive and non-recursive algorithms
- List and describe various algorithmic approaches and Solve problems using divide and conquer &greedy Method
- Synthesize efficient algorithms dynamic programming approaches to solve in common engineering design situations.
- Organize important algorithmic design paradigms and methods of analysis: backtracking, branch and bound algorithmic approaches
- Demonstrate NP- Completeness theory ,lower bound theory and String Matching

UNIT I:

Introduction: Algorithm Definition, Algorithm Specification, performance Analysis, Performance measurement, asymptotic notation, Randomized Algorithms.

UNIT II:

Divide and Conquer: General Method, Defective chessboard, Binary Search, finding the maximum and minimum, Merge sort, Quick sort.

The Greedy Method: The general Method, knapsack problem, minimum-cost spanning Trees, Optimal Merge Patterns, Single Source Shortest Paths.

UNIT III:

Dynamic Programming: The general method, multistage graphs, All pairs-shortest paths, optimal Binary search trees, 0/1 knapsack, The traveling salesperson problem.

UNIT IV:

Backtracking: The General Method, The 8-Queens problem, sum of subsets, Graph coloring, Hamiltonian cycles, knapsack problem.

UNIT V:

NP-Hard and NP-Complete problems: Basic concepts, non-deterministic algorithms, NP - Hard and NP-Complete classes, Cook’s theorem.

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Text Books:

1. Ellis Horowitz, SartajSahni, Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", 2nd Edition, Universities Press.
2. Introduction to Algorithms Thomas H. Cormen, PHI Learning
3. Harsh Bhasin, "Algorithms Design & Analysis", Oxford University Press.

Reference Books:

1. Horowitz E. Sahani S: "Fundamentals of Computer Algorithms", 2nd Edition, Galgotia Publications,2008.
2. S. Sridhar, "Design and Analysis of Algorithms", Oxford University Press.

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III Year – I Semester		L	T	P	C
		3	0	0	3
DATA MINING TECHNIQUES					

Course Objectives:
The main objective of the course is to

- Introduce basic concepts and techniques of data warehousing and data mining
- Examine the types of the data to be mined and apply pre-processing methods on raw data
- Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms.

Course Outcomes:
By the end of the course student will be able to

- Illustrate the importance of Data Warehousing, Data Mining and its functionalities and Design schema for real time data warehousing applications.
- Demonstrate on various Data Preprocessing Techniques viz. data cleaning, data integration, data transformation and data reduction and Process raw data to make it suitable for various data mining algorithms.
- Choose appropriate classification technique to perform classification, model building and evaluation.
- Make use of association rule mining techniques viz. Apriori and FP Growth algorithms and analyze on frequent itemsets generation.
- Identify and apply various clustering algorithm (with open source tools), interpret, evaluate and report the result.

UNIT I:
Data Warehousing and Online Analytical Processing: Data Warehouse: Basic concepts, Data Warehouse Modelling: Data Cube and OLAP, Data Warehouse Design and Usage, Data Warehouse Implementation, Introduction: Why and What is data mining, What kinds of data need to be mined and patterns can be mined, Which technologies are used, Which kinds of applications are targeted.

UNIT II:
Data Pre-processing: An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization.

UNIT III:
Classification: Basic Concepts, General Approach to solving a classification problem, Decision Tree Induction: Attribute Selection Measures, Tree Pruning, Scalability and Decision Tree Induction, Visual Mining for Decision Tree Induction.

UNIT IV:
Association Analysis: Problem Definition, Frequent Item set Generation, Rule Generation: Confident Based Pruning, Rule Generation in Apriori Algorithm, Compact Representation of frequent item sets, FP-Growth Algorithm.

UNIT V:
Cluster Analysis: Overview, Basics and Importance of Cluster Analysis, Clustering techniques, Different Types of Clusters; K-means: The Basic K-means Algorithm, K-means Additional Issues, Bi-secting K Means,

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Text Books:

1. Data Mining concepts and Techniques, 3/e, Jiawei Han, Michel Kamber, Elsevier,2011.
2. Introduction to Data Mining: Pang-Ning Tan & Michael Steinbach, Vipin Kumar, Pearson,2012.

Reference Books:

1. Data Mining Techniques and Applications: An Introduction, Hongbo Du, Cengage Learning.
2. Data Mining: VikramPudi and P. Radha Krishna, Oxford Publisher.
3. Data Mining and Analysis - Fundamental Concepts and Algorithms; Mohammed J. Zaki, Wagner Meira, Jr, Oxford
4. Data Warehousing Data Mining & OLAP, Alex Berson, Stephen Smith, TMH.
   http://onlinecourses.nptel.ac.in/noc18_cs14/preview
5. (NPTEL course by Prof.PabitraMitra)
   http://onlinecourses.nptel.ac.in/noc17_mg24/preview
6. (NPTEL course by Dr. NandanSudarshanam& Dr. BalaramanRavindran)
   http://www.saedsayad.com/data_mining_map.htm

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DEPARTMENT OF INFORMATION TECHNOLOGY

III Year – I Semester		L	T	P	C
		3	0	0	3
DevOps (Job Oriented Course)					

Course Objectives:

- Introduces the basic concepts of Information System.
- To understand The Management Control Framework and The Application Control Framework.

Course Outcomes: At the end of the course, student will be able to

- Enumerate the principles of continuous development and deployment, automation of configuration management, inter-team collaboration, and IT service agility.
- Describe DevOps & DevSecOps methodologies and their key concepts
- Illustrate the types of version control systems, continuous integration tools, continuous monitoring tools, and cloud models
- Set up complete private infrastructure using version control systems and CI/CD tools
- Acquire the knowledge of maturity model, Maturity Assessment

UNIT I: Phases of Software Development Life Cycle, Values and principles of agile software development.

UNIT II: Fundamentals of DevOps: Architecture, Deployments, Orchestration, Need, Instance of applications, DevOps delivery pipeline, DevOps eco system.

UNIT III: DevOps adoption in projects: Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes

UNIT IV: CI/CD: Introduction to Continuous Integration, Continuous Delivery and Deployment, Benefits of CI/CD, Metrics to track CICD practices

UNIT V: Devops Maturity Model: Key factors of DevOps maturity model, stages of Devops maturity model, DevOps maturity Assessment

Text Books:

1. The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, Gene Kim , John Willis , Patrick Debois , Jez Humb,1st Edition, O'Reilly publications, 2016.
2. What is Devops? Infrastructure as code, 1st Edition, Mike Loukides ,O'Reilly publications, 2012.

Reference Books:

1. Building a DevOps Culture, 1st Edition, Mandi Walls, O'Reilly publications, 2013.

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DEPARTMENT OF INFORMATION TECHNOLOGY

III Year – I Semester		L	T	P	C
		3	0	0	3
ARTIFICIAL INTELLIGENCE (Professional Elective –I)					

Course Objectives: The student will be able to

- Know the methodology of Problem solving
- Implement basic AI algorithms
- Design and carry out an empirical evolution of different algorithms on a problem formalization

Course Outcomes (COs): At the end of the course, student will be able to

- Understand the fundamental concepts in Artificial Intelligence
- Analyze the applications of search strategies and problem reductions
- Apply the mathematical logic concepts.
- Develop the Knowledge representations in Artificial Intelligence.
- Explain the Fuzzy logic systems.

UNIT I:
Introduction to artificial intelligence: Introduction ,history, intelligent systems, foundations of AI, applications, tic-tac-tie game playing, development of AI languages, current trends in AI.

UNIT II:
Problem solving: state-space search and control strategies: Introduction, general problem solving, characteristics of problem
Search Strategies: exhaustive searches, heuristic search techniques, iterative-deepening A*, constraint satisfaction

UNIT III:
Logic concepts: Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, predicate logic

UNIT IV:
Knowledge representation: Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR
Advanced knowledge representation techniques: Introduction, conceptual dependency theory, script structure.

UNIT V:
Expert system and applications: Introduction phases in building expert systems, expert system versus traditional systems, rule-based expert systems blackboard systems truth maintenance systems, application of expert systems, list of shells and tools.

Text Books:

1. Artificial Intelligence, Saroj Kaushik, CENGAGE Learning,
2. Artificial intelligence, A modern Approach , 2nd ed, Stuart Russel, Peter Norvig, PEA
3. Artificial Intelligence, Rich, Kevin Knight, Shiv Shankar B Nair, 3rd ed, TMH
4. Introduction to Artificial Intelligence, Patterson, PHI

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Reference Books:

1. Artificial intelligence, structures and Strategies for Complex problem solving, -George F Lugar, 5th ed, PEA
2. Introduction to Artificial Intelligence, Ertel, Wolf Gang, Springer
3. Artificial Intelligence, A new Synthesis, Nils J Nilsson, Elsevier

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III Year – I Semester		L	T	P	C
		3	0	0	3
AGILE SOFTWARE PROCESS (Professional Elective –I)					

Course Objectives:
Students shall be able to

- Comprehend an iterative, incremental development process leads to faster delivery of more useful software.
- Apply the principles and practices of extreme programming.
- Analyze the essence of agile development methods.
- Develop prototyping in the software process.

Course Outcomes:
After going through this course the student will be able to:

- Comprehend the common characteristics of an agile development process.
- Identify and contrast state of the practice agile methodologies.
- Analyze and contrast agile software development process models and plan driven process models.
- Determine software project characteristics that would be suitable for an agile process

UNIT I:
The Agile Movement - A Five Minute Primer, What is Agile Development, The Agile Methodologies Agile Values, Agile Practices, Agile Principles Agile Characteristics-The Characteristics of an Agile Project, The Development Team Project Management, The Customer, Processes and Tools The Contract, What Projects Can Benefit from Agile Development.

UNIT II:
The Agile Methodologies: Common Themes, Methodology Descriptions, Extreme Programming, Scrum, Feature Driven Development, The Crystal Methodologies, Adaptive Software Development, Dynamic Systems Development Method, Lean Software Development, Starting Monday: Investigate Further Selecting an Approach that Fits: Choosing between an Agile or Traditional Approach, Selecting the Right Agile Approach

UNIT III:
Going Agile: Is the Team Ready? Announcing the Team's Intention to Go Agile, Encountering, Addressing and Overcoming Resistance, Start with the Bare Minimum, Altering the Project Environment, Iteration Zero, Discontinue a Process Once its Served its Purpose, False Agile, Practitioners and Projects, Starting Monday: Measuring The Team's Progress.

UNIT IV:
Agile Practices: Getting Started, Agile Practices Explained, Selecting the Next Practice, Rejecting a Practice, Adopt Practices before Tools Learn Programming Practices in Pairs, Agile Practices in this Book Agile Practices Explained, Why these Practices were Chosen

UNIT V:
Testing :An Agile Approach to Testing, The Good Enough Approach Testing as the Best Defense, Sharing a Code Base with another Project Team, Sharing Common Components with another Project Team, Depending upon Code or Components Produced by Another Project Team

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Text Books:

1. Agile Software Development with Scrum, Ken Schawber, Mike Beedle, Pearson, 2015. ISBN-13: 9780132074896.
2. Integrating Agile Development In The Real World (Charles River Media Programming), Peter Schuh, , 2004, Cengage Learning, ISBN-13: 9781584503644

Reference Books:

1. Agile Testing: A Practical Guide for Testers and Agile Teams, Lisa Crispin, Janet Gregory, Publisher: Addison Wesley
2. Agile Software Development, Principles, Patterns and Practices, Alistair Cockburn, Pearson Education, 2015. ISBN-13: 9780321482754
3. Agile Software Development: The Cooperative Game, By Alistair Cockburn Publisher: Addison Wesley

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III Year – I Semester		L	T	P	C
		3	0	0	3
DISTRIBUTED SYSTEMS (Professional Elective –I)					

Course Objectives:

- To understand the foundations of distributed systems.
- To learn issues related to clock Synchronization and the need for global state in distributedsystems
- To learn distributed mutual exclusion and deadlock detection algorithms
- To understand the significance of agreement, fault tolerance and recovery protocols in Distributed Systems
- To learn the characteristics of peer-to-peer and distributed shared memory systems

Course Outcomes:

At the end of the course, the students will be able to:

- Elucidate the foundations and issues of distributed systems
- Illustrate the various synchronization issues and global state for distributed systems
- Illustrate the Mutual Exclusion and Deadlock detection algorithms in distributed systems
- Describe the agreement protocols and fault tolerance mechanisms in distributed systems
- Describe the features of peer-to-peer and distributed shared memory systems

UNIT I:

Distributed Systems: Definition, Relation to computer system components, Motivation, Relation to parallel systems, Message-passing systems versus shared memory systems, Primitives for distributed communication, Synchronous versus asynchronous executions, Design issues andchallenges.

A model of distributed computations: A distributed program, A model of distributed executions, Models of communication networks, Global state, Cuts, Past and future cones of an event, Models of process communications.

Logical Time: A framework for a system of logical clocks, Scalar time, Vector time, Physical clock synchronization: NTP.

UNIT II:

Message Ordering & Snapshots: Message ordering and group communication: Message ordering paradigms, Asynchronous execution with synchronous communication, Synchronous program order on an asynchronous system, Group communication, Causal order (CO), Total order. Global state and snapshot recording algorithms: Introduction, System model and definitions, Snapshot algorithms for FIFO channels.

UNIT III:

Distributed Mutex & Deadlock: Distributed mutual exclusion algorithms: Introduction, Preliminaries, Lamport‘s algorithm, Ricart-Agrawala algorithm, Maekawa‘s algorithm, Suzuki–Kasami‘s broadcast algorithm. Deadlock detection in distributed systems: Introduction, System model, Preliminaries, Models of deadlocks, Knapp‘s classification, Algorithms forthe single resource model, the AND model and the OR model.

UNIT IV:

Recovery & Consensus: Check pointing and rollback recovery: Introduction, Background and definitions, Issues in failure recovery, Checkpoint-based recovery, Log-based rollback recovery, Coordinated check pointing algorithm, Algorithm for asynchronous check pointing and recovery. Consensus and agreement algorithms: Problem definition, Overview of results, Agreement in a failure, free system, Agreement in synchronous systems with failures.

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UNIT V:

Peer-to-peer computing and overlay graphs: Introduction, Data indexing and overlays, Chord –Content addressable networks, Tapestry.
Distributed shared memory: Abstraction and advantages, Memory consistency models, Sharedmemory Mutual Exclusion.

Text Books:

1. Distributed Systems Concepts and Design, George Coulouris, Jean Dollimore and TimKindberg, Fifth Edition, Pearson Education, 2012.
2. Distributed computing: Principles, algorithms, and systems, Ajay Kshemkalyani and Mukesh Singhal, Cambridge University Press, 2011.

Reference Books:

1. Distributed Operating Systems: Concepts and Design, Pradeep K Sinha, Prentice Hall ofIndia, 2007.
2. Advanced concepts in operating systems. Mukesh Singhal and Niranjan G. Shivaratri,McGraw-Hill, 1994.
3. Distributed Systems: Principles and Paradigms, Tanenbaum A.S., Van Steen M.,PearsonEducation, 2007.

e-Resources:

1) https://nptel.ac.in/courses/106/106/106106168/

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DEPARTMENT OF INFORMATION TECHNOLOGY

III Year – I Semester		L	T	P	C
		3	0	0	3
ADVANCED UNIX PROGRAMMING (Professional Elective –I)					

Course Objectives:
Understating the shell commands, shell programming, system calls of files and processes, signals, inter-process communication concepts and programming, TCP and UDP.

Course Outcomes: After finishing this course student will be able to:

- Gain good knowledge on Unix commands and awareness of shell programming
- Know about different system calls for files and directories
- Ability to know the working of processes and signals
- Application of client server program for IPC
- Knowledge about socket programming

UNIT I:
Introduction, Architecture of unix, Responsibilities of shell, unix file system, vi editor. **Unix commands**: Some Basic Commands, file utilities, process utilities, text processing utilities, network utilities, disk utilities, backup utilities , Security by file permissions.

UNIT II:
Shell Programming: shell variables, The Export command, The Profile File a Script Run During starting, The First Shell Script, The read command, Positional Parameters, The $? Variable , Knowing the exit Status- More about the Set Command, The Exit command, Branching Control Structures, Loop Control Structures, The Continue and Break Statement- The Expr Command, Performing Integer Arithmetic- Real Arithmetic in Shell Programs- The here Document(<<), The Sleep Command, Debugging Scripts, The Script command, The Eval command, The Exec Command, Sample programs. **Files** - Introduction, file descriptors, open, creat, read, write, close, lseek, dup2, file status information-stat family, file and record locking- fcntl function, file permissions - chmod, fchmod, file ownership-chown, lchown, links-soft and hard links-symlink, link, unlink.

UNIT III:
Directories-Creating, removing and changing Directories-mkdir, rmdir, chdir, obtaining current working directory-getcwd, Directory contents, Scanning Directories-opendir, readdir, closedir, rewinddir functions. **Process Control**: process identifiers, fork function, vfork function, exit function, wait and waitpid functions, exec functions, user identification. **Signals**: signal handling using signal function, kill and raise, alarm, pause, abort and sleep functions.

UNIT IV:
IPC: introduction, pipes, FIFO's, client –server examples for pipes and FIFO's **message queues:** message queue structure in kernel, system calls of message queue, client-server example for message queue. **Semaphores:** definition, system calls of semaphores, semaphores structure in kernel, file locking using semaphores

UNIT V:
Shared memory-system calls of shared memory, semaphore structure in kernel, client server example. **Sockets:** Introduction, overview, elementary socket system calls, TCP Echo program, UDP Echo program

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Text Books:

1. Unix the ultimate guide, 3rd edition, Sumitabha Das, TMH.
2. Advanced programming in the Unix environment by W. Richard Stevens.
3. Unix network programming by W. Richard Stevens.

Reference Books:

1. Introduction to Unix and shell programming, Venkateshmurhty
2. Unix and shell programming by B.M. Harwani, OXFORD university press.

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DEPARTMENT OF INFORMATION TECHNOLOGY

III Year – I Semester		L	T	P	C
		0	0	3	1.5
DATA MINING TECHNIQUES WITH R LAB					

Course Objectives:

- To understand the mathematical basics quickly and covers each and every condition of data mining in order to prepare for real-world problems.
- The various classes of algorithms will be covered to give a foundation to further apply knowledge to dive deeper into the different flavors of algorithms.
- Students should aware of packages and libraries of R and also familiar with functions used in R for visualization.
- To enable students to use R to conduct analytics on large real life datasets.
- To familiarize students with how various statistics like mean median etc. can be collected for data exploration in R.

Course Outcomes(COs): At the end of the course, student will be able to

- Extend the functionality of R by using add-on packages
- Extract data from files and other sources and perform various data manipulation tasks on them.
- Code statistical functions in R
- Use R Graphics and Tables to visualize results of various statistical operations on data
- Apply the knowledge of R gained to data Analytics for real life applications

List of Experiments:

1. Implement all basic R commands.
2. Interact data through .csv files (Import from and export to .csv files).
3. Get and Clean data using swirl excercises.(Use 'swirl' package, library and install that topic from swirl).
4. Visualize all Statistical measures (Mean,Mode, Median, Range, Inter Quartile Range etc., using Histograms, Boxplots and Scatter Plots).
5. Create a data frame with the following structure.

EMP ID	EMP NAME	SALARY	START DATE
1	Satish	5000	01-11-2013
2	Vani	7500	05-06-2011
3	Ramesh	10000	21-09-1999
4	Praveen	9500	13-09-2005
5	Pallavi	4500	23-10-2000

   a. Extract two column names using column name.
   b. Extract the first two rows and then all columns.
   c. Extract 3rd and 5th row with 2nd and 4th column.
6. Write R Program using 'apply' group of functions to create and apply normalization function on each of the numeric variables/columns of iris dataset to transform them into
   i. 0 to 1 range with min-max normalization.
   ii. a value around 0 with z-score normalization.
7. Create a data frame with 10 observations and 3 variables and add new rows and columns to it using 'rbind' and 'cbind' function.
8. Write R program to implement linear and multiple regression on 'mtcars' dataset to estimate the value of 'mpg' variable, with best R^2 and plot the original values in 'green' and predicted values in 'red'.

9. Write R Programs to implement k-means clustering.
10. Write R Programs to implement k-medoids clustering.
11. Write R Programs to implement density based clustering on iris dataset.
12. Write a R Program to implement decision trees using 'readingSkills' dataset.
13. Implement decision trees using 'iris' dataset using package party and 'rpart'.
14. Use a Corpus() function to create a data corpus then Build a term Matrix and Reveal word frequencies.

Reference Books:

1. www.tutorialspoint.com/r
2. www.r-tutor.com
3. R and Data Mining: Examples and Case Studies, 1st ed, Yanchang Zhao, Sprnger, 2012.
4. https://towardsdatascience.com/

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III Year – I Semester		L	T	P	C
		0	0	3	1.5
COMPUTER NETWORKS LAB					

Course Objectives:
Learn basic concepts of computer networking and acquire practical notions of protocols with the emphasis on TCP/IP. A lab provides a practical approach to Ethernet/Internet networking: networks are assembled, and experiments are made to understand the layered architecture and how do some important protocols work

Course Outcomes:
By the end of the course student will be able to

- Know how reliable data communication is achieved through data link layer.
- Suggest appropriate routing algorithm for the network.
- Provide internet connection to the system and its installation.
- Work on various network management tools

List of Experiments:

1. Study of Network devices in detail and connect the computers in Local Area Network.
2. Write a Program to implement the data link layer farming methods such as
   i) Character stuffing ii) bit stuffing.
3. Write a Program to implement data link layer farming method checksum.
4. Write a program for Hamming Code generation for error detection and correction.
5. Write a Program to implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC CCIP.
6. Write a Program to implement Sliding window protocol for Goback N.
7. Write a Program to implement Sliding window protocol for Selective repeat.
8. Write a Program to implement Stop and Wait Protocol.
9. Write a program for congestion control using leaky bucket algorithm
10. Write a Program to implement Dijkstra‘s algorithm to compute the Shortest path through a graph.
11. Write a Program to implement Distance vector routing algorithm by obtaining routing table at each node (Take an example subnet graph with weights indicating delay between nodes).
12. Write a Program to implement Broadcast tree by taking subnet of hosts.
13. Wireshark
    i. Packet Capture Using Wire shark
    ii. Starting Wire shark
    iii. Viewing Captured Traffic
    iv. Analysis and Statistics & Filters.
14. How to run Nmap scan
15. Operating System Detection using Nmap
16. Do the following using NS2 Simulator
    i. NS2 Simulator-Introduction
    ii. Simulate to Find the Number of Packets Dropped
    iii. Simulate to Find the Number of Packets Dropped by TCP/UDP
    iv. Simulate to Find the Number of Packets Dropped due to Congestion
    v. Simulate to Compare Data Rate& Throughput.

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III Year – I Semester		L	T	P	C
		0	0	4	2
ANIMATION COURSE: ANIMATION DESIGN (Skill Oriented Course)					

Course Objectives:
The main objective of this course is to understand 2-D and 3-D animation using Adobe package

Course Outcomes:
At the end of the Course, Student will be able to:

- learn various tools of digital 2-D animation
- understand production pipeline to create 2-D animation.
- apply the tools to create 2D animation for films and videos
- understand different styles and treatment of content in 3D model creation
- apply tools to create effective 3D modelling texturing and lighting

List of Experiments:

1. Adobe Photoshop:
   a. Create your visiting card
   b. Create Title for any forthcoming film
2. Draw Cartoon Animation using reference
3. Creating Frame by Frame animation
4. Create a scene by using Mask layers animation
5. Adobe Illustrator:
   Packet Design(Toothpaste packet, Soap cover, any Food product)
6. Create any model of the male or female character
7. Create any Model of Cars or Bike
8. Create any Model of any animal.
9. Create any Model of any birds, fishes, and worms.
10. Create and Convert 2D objects into 3D objects
11. Create an animated 3D titling with sound
12. Create any Model some objects such as chairs, tables, fruits, utensils

List of Augmented Experiments: (Weeks 13 – Week 16)
(Any two of the following experiments can be performed)

1. Animate day and night scene of a street with the help of lighting
2. Create a human character using Character studio and animate the same
3. Create a natural outdoor or indoor scene.
4. Apply texture on various objects and characters

Reference Books:
1. Flash MX 2004, Thyagharajan Anbumani, TMH.
2. Brian Underdahl, The Complete Reference – Macromedia Flash Mx2004, 2nd edition – TMH.

Web Links:
1. https://onlinecourses.swayam2.ac.in/cec21_cs07/preview
2. https://onlinecourses.swayam2.ac.in/ugc19_cs09/preview
3. https://onlinecourses.swayam2.ac.in/ntr20_ed15/preview
4. https://youtube.com/playlist?list=PLfFk8y2fd3FjeE_CrFASNvDLBp3yF1Hwi

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III Year – I Semester		L	T	P	C
		0	0	4	2
CONTINUOUS INTEGRATION AND CONTINUOUS DELIVERY USING DevOps (Skill Oriented Course)					

Course Outcomes:
At the end of the Course, Student will be able to:

- Understand the why, what and how of DevOps adoption
- Attain literacy on Devops
- Align capabilities required in the team
- Create an automated CICD pipeline using a stack of tools

List of Exercises:

Note: There are online courses indicated in the reference links section. Learners need to go through the contents in order to perform the given exercises

Exercise 1:

Reference course name :Software engineering and Agile software development
Get an understanding of the stages in software development lifecycle, the process models, values and principles of agility and the need for agile software development. This will enable you to work in projects following an agile approach to software development.
Solve the questions given in the reference course name to gauge your understanding of the topic

Exercise 2:

Reference course name: Development & Testing with Agile: Extreme Programming
Get a working knowledge of using extreme automation through XP programming practices of test first development, refactoring and automating test case writing.
Solve the questions in the "Take test" module given in the reference course name to gauge your understanding of the topic

Exercise 3:

Module name : DevOps adoption in projects
It is important to comprehend the need to automate the software development lifecycle stages through DevOps. Gain an understanding of the capabilities required to implement DevOps, continuous integration and continuous delivery practices.
Solve the questions given in Quiz1, Quiz2, Quiz 3

Exercise 4:

Module name :Implementation of CICD with Java and open source stack
Configure the web application and Version control using Git using Git commands and version control operations.

Exercise 5:

Module Name: Implementation of CICD with Java and open source stack
Configure a static code analyzer which will perform static analysis of the web application code and identify the coding practices that are not appropriate. Configure the profiles and dashboard of the static code analysis tool.

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Exercise 6:

Module Name: Implementation of CICD with Java and open source stack
Write a build script to build the application using a build automation tool like Maven. Create a folder structure that will run the build script and invoke the various software development build stages. This script should invoke the static analysis tool and unit test cases and deploy the application to a web application server like Tomcat.

Exercise 7:

Module Name: Implementation of CICD with Java and open source stack
Configure the Jenkins tool with the required paths, path variables, users and pipeline views.

Exercise 8:

Module name: Implementation of CICD with Java and open source stack
Configure the Jenkins pipeline to call the build script jobs and configure to run it whenever there is a change made to an application in the version control system. Make a change to the background color of the landing page of the web application and check if the configured pipeline runs.

Exercise 9:

Module name: Implementation of CICD with Java and open source stack
Create a pipeline view of the Jenkins pipeline used in Exercise 8. Configure it with user defined messages.

Exercise 10 :

Module name: Implementation of CICD with Java and open source stack
In the configured Jenkins pipeline created in Exercise 8 and 9, implement quality gates for static analysis of code.

Exercise 11:

Module name :Implementation of CICD with Java and open source stack
In the configured Jenkins pipeline created in Exercise 8 and 9, implement quality gates for static unit testing.

Exercise 12:

Module name :Course end assessment
In the configured Jenkins pipeline created in Exercise 8 and 9, implement quality gates for code coverage.

Reference Books:

1. Learning Continuous Integration with Jenkins: A beginner's guide to implementing Continuous Integration and Continuous Delivery using Jenkins - Nikhil Pathania ,Packt publication [https://www.amazon.in/Learning-Continuous-Integration-Jenkins-Pathania/dp/1785284835]
2. Jenkins 2 – Up and Running: Evolve Your Deployment Pipeline for Next Generation Automation - Brent Laster, O'Reilly publication [https://www.amazon.in/Jenkins-2-Running-Brent-Laster/dp/1491979593]

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Hardware and software configuration:

1. Git [GitHub or Gitlab]
2. Sonarqube
3. Jenkins
4. JUnit
5. Eclipse
6. Tomcat server
7. Maven
8. Cobertura or JaCoCo
9. Java SDK
10. All necessary drivers and jar files for connecting the software
11. Windows machine with 16GB RAM

Web Links: (Courses mapped to Infosys Springboard platform)

1. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_01338269041100390473 5_shared/overview [Software Engineering and Agile software development]

2. https://infyspringboard.onwingspan.com/en/viewer/html/lex_auth_013501578194976768 10467 [Development & Testing with Agile: Extreme Programming]

3. https://infyspringboard.onwingspan.com/en/viewer/html/lex_auth_01353898917192499226_shared [DevOps CICD]

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III Year – I Semester		L	T	P	C
		2	0	0	0
EMPLOYABILITY SKILLS-I					

Course Objectives:
The main objective of this course is to assist students in developing employability skills and personal qualities related to gaining and sustaining employment.

Course Outcomes: The end of the course student will be able to
- Understand the corporate etiquette.
- Make presentations effectively with appropriate body language
- Be composed with positive attitude
- Understand the core competencies to succeed in professional and personal life

UNIT I:
Analytical Thinking & Listening Skills: Self-Introduction, Shaping Young Minds - A Talk by Azim Premji (Listening Activity), Self – Analysis, Developing Positive Attitude, Perception.
Communication Skills: Verbal Communication; Non Verbal Communication (Body Language)

UNIT II:
Self-Management Skills: Anger Management, Stress Management, Time Management, Six Thinking Hats, Team Building, Leadership Qualities
Etiquette: Social Etiquette, Business Etiquette, Telephone Etiquette, Dining Etiquette

UNIT III:
Standard Operation Methods: Note Making, Note Taking, Minutes Preparation, Email & Letter Writing
Verbal Ability: Synonyms, Antonyms, One Word Substitutes-Correction of Sentences-Analogies, Spotting Errors, Sentence Completion, Course of Action -Sentences Assumptions, Sentence Arguments, Reading Comprehension, Practice work

UNIT IV:
Job-Oriented Skills –I: Group Discussion, Mock Group Discussions

UNIT V:
Job-Oriented Skills –II: Resume Preparation, Interview Skills, Mock Interviews

Text Books and Reference Books:
1. Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011.
2. S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010.
3. R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand & Company Ltd., 2018.
4. Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.

e-resources:
1. www. Indiabix.com
2. www.freshersworld.com

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III Year – I Semester	Minor Course	L	T	P	C
		3	0	2	4
COMPUTER NETWORKS					

Course Objectives:
Learn basic concepts of computer networking and acquire practical notions of protocols with the emphasis on TCP/IP. A lab provides a practical approach to Ethernet/Internet networking: networks are assembled, and experiments are made to understand the layered architecture and how do some important protocols work

Course Outcomes:
By the end of the course, the student will be able to
- Demonstrate different network models for networking links OSI, TCP/IP, B-ISDN, N-BISDN and get knowledge about various communication techniques, methods and protocol standards.
- Discuss different transmission media and different switching networks.
- Analyze data link layer services, functions and protocols like HDLC and PPP.
- Compare and Classify medium access control protocols like ALOHA, CSMA, CSMA/CD, CSMA/CA, Polling, Token passing, FDMA, TDMA, CDMA protocols
- Suggest appropriate routing algorithm for the network.
- Determine application layer services and client server protocols working with the client server paradigms like WWW, HTTP, FTP, e-mail and SNMP etc.

UNIT I:
Introduction: Network Types, LAN, MAN, WAN, Network Topologies Reference models- The OSI Reference Model- the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models, OSI Vs TCP/IP, Lack of OSI models success, Internet History.
Physical Layer –Introduction to Guided Media- Twisted-pair cable, Coaxial cable and Fiber optic cable and unguided media: Wireless-Radio waves, microwaves, infrared.

UNIT II:
Data link layer: Design issues, **Framing**: fixed size framing, variable size framing, flow control, error control, error detection and correction codes, CRC, Checksum: idea, one's complement internet checksum, services provided to Network Layer, **Elementary Data Link Layer protocols**: simplex protocol, Simplex stop and wait, Simplex protocol for Noisy Channel.
Sliding window protocol: One bit, Go back N, Selective repeat-Stop and wait protocol, Data link layer in HDLC: configuration and transfer modes, frames, control field, point to point protocol (PPP): framing transition phase, multiplexing, multi link PPP.

UNIT III:
Media Access Control: Random Access: ALOHA, Carrier sense multiple access (CSMA), CSMA with Collision Detection, CSMA with Collision Avoidance, **Controlled Access:** Reservation, Polling, Token Passing, **Channelization:** frequency division multiple Access(FDMA), time division multiple access(TDMA), code division multiple access(CDMA).

UNIT IV:
The Network Layer Design Issues – Store and Forward Packet Switching-Services Provided to the Transport layer- Implementation of Connectionless Service-Implementation of Connection Oriented Service- Comparison of Virtual Circuit and Datagram Networks, Routing Algorithms-The Optimality principle-Shortest path, Flooding, Distance vector, Link state, Hierarchical, Congestion Control algorithms-

General principles of congestion control, Congestion prevention polices, Approaches to Congestion Control-Traffic Aware Routing- Admission Control-Traffic Throttling-Load Shedding. Traffic Control Algorithm-Leaky bucket & Token bucket.

UNIT V:

The Transport Layer: Transport layer protocols: Introduction-services- port number-User data gram protocol-User datagram-UDP services-UDP applications-Transmission control protocol: TCP services-TCP features- Segment- A TCP connection- windows in TCP- flow control-Error control, Congestion control in TCP.

List of Experiments:

1. Study of Network devices in detail and connect the computers in Local Area Network.
2. Write a Program to implement the data link layer farming methods such as
   i) Character stuffing ii) bit stuffing.
3. Write a Program to implement data link layer farming method checksum.
4. Write a program for Hamming Code generation for error detection and correction.
5. Write a Program to implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC CCIP.
6. Write a Program to implement Sliding window protocol for Goback N.
7. Write a Program to implement Sliding window protocol for Selective repeat.
8. Write a Program to implement Stop and Wait Protocol.
9. Write a program for congestion control using leaky bucket algorithm
10. Write a Program to implement Dijkstra‘s algorithm to compute the Shortest path through a graph.

Text Books:

1. Computer Networks — Andrew S Tanenbaum, Fifth Edition. Pearson Education/PHI
2. Data Communications and Networks – Behrouz A. Forouzan, Fifth Edition TMH.

References Books:

1. Data Communications and Networks- Achut S Godbole, AtulKahate
2. Computer Networks, Mayank Dave, CENGAGE

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III Year – II Semester		L	T	P	C
		3	0	0	3
MACHINE LEARNING					

Course Objectives:

- Identify problems that are amenable to solution by ANN methods, and which ML methods may be suited to solving a given problem.
- Formalize a given problem in the language/framework of different ANN methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, as a Markov decision process, etc).

Course Outcomes: After the completion of the course, student will be able to

- Explain the fundamental usage of the concept Machine Learning system
- Demonstrate on various regression Technique
- Analyze the Ensemble Learning Methods
- Illustrate the Clustering Techniques and Dimensionality Reduction Models in Machine Learning.
- Discuss the Neural Network Models and Fundamentals concepts of Deep Learning

Unit I:

Introduction- Artificial Intelligence, Machine Learning, Deep learning, Types of Machine Learning Systems, Main Challenges of Machine Learning.

Statistical Learning: Introduction, Supervised and Unsupervised Learning, Training and Test Loss, Tradeoffs in Statistical Learning, Estimating Risk Statistics, Sampling distribution of an estimator, Empirical Risk Minimization.

Unit II:

Supervised Learning(Regression/Classification):Basic Methods: Distance based Methods, Nearest Neighbours, Decision Trees, Naive Bayes, **Linear Models:** Linear Regression, Logistic Regression, Generalized Linear Models, Support Vector Machines, **Binary Classification:** Multiclass/Structured outputs, MNIST, Ranking.

Unit III:

Ensemble Learning and Random Forests: Introduction, Voting Classifiers, Bagging and Pasting, Random Forests, Boosting, Stacking.

Support Vector Machine: Linear SVM Classification, Nonlinear SVM Classification SVM Regression, Naïve Bayes Classifiers.

Unit IV:

Unsupervised Learning Techniques: Clustering, K-Means, Limits of K-Means, Using Clustering for Image Segmentation, Using Clustering for Preprocessing, Using Clustering for Semi-Supervised Learning, DBSCAN, Gaussian Mixtures.

Dimensionality Reduction: The Curse of Dimensionality, Main Approaches for Dimensionality Reduction, PCA, Using Scikit-Learn, Randomized PCA, Kernel PCA.

Unit V:

Neural Networks and Deep Learning: Introduction to Artificial Neural Networks with Keras, Implementing MLPs with Keras, Installing TensorFlow 2, Loading and Preprocessing Data with TensorFlow.

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Text Books:

1. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 2nd Edition, O'Reilly Publications, 2019
2. Data Science and Machine Learning Mathematical and Statistical Methods,Dirk P. Kroese, Zdravko I. Botev, Thomas Taimre, Radislav Vaisman,25th November 2020

Reference Books:

1. Machine Learning Probabilistic Approach, Kevin P. Murphy, MIT Press, 2012.

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III Year – II Semester		L	T	P	C
		3	0	0	3
BIG DATA ANALYTICS					

Course Objectives:
- To optimize business decisions and create competitive advantage with Big Data analytics
- To learn to analyze the big data using intelligent techniques
- To introduce programming tools PIG & HIVE in Hadoop echo system

Course Outcomes:
At the end of the course, the students will be able to
- Illustrate big data challenges in different domains including social media, transportation, finance and medicine
- Use various techniques for mining data stream
- Design and develop Hadoop
- Identify the characteristics of datasets and compare the trivial data and big data for various applications
- Explore the various search methods and visualization techniques

UNIT I:
Introduction: Introduction to big data: Introduction to Big Data Platform, Challenges of Conventional Systems, Intelligent data analysis, Nature of Data, Analytic Processes and Tools, Analysis vs Reporting.

UNIT II:
Stream Processing: Mining data streams: Introduction to Streams Concepts, Stream Data Model and Architecture, Stream Computing, Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream, Estimating Moments, Counting Oneness in a Window, Decaying Window, Real time Analytics Platform (RTAP) Applications, Case Studies - Real Time Sentiment Analysis - Stock Market Predictions.

UNIT III:
Introduction to Hadoop: Hadoop: History of Hadoop, the Hadoop Distributed File System, Components of Hadoop Analysing the Data with Hadoop, Scaling Out, Hadoop Streaming, Design of HDFS, Java interfaces to HDFS Basics, Developing a Map Reduce Application, How Map Reduce Works, Anatomy of a Map Reduce Job run, Failures, Job Scheduling, Shuffle and Sort, Task execution, Map Reduce Types and Formats, Map Reduce Features Hadoop environment.

UNIT IV:
Frameworks and Applications: Frameworks: Applications on Big Data Using Pig and Hive, Data processing operators in Pig, Hive services, HiveQL, Querying Data in Hive, fundamentals of HBase and ZooKeeper.

UNIT V:
Predictive Analytics and Visualizations: Predictive Analytics, Simple linear regression, Multiple linear regression, Interpretation of regression coefficients, Visualizations, Visual data analysis techniques, interaction techniques, Systems and application

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Text Books:

1. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'reilly Media, Fourth Edition, 2015.
2. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGrawHill Publishing, 2012.
3. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", CUP, 2012

Reference Books:

1. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley& sons, 2012.
2. Paul Zikopoulos, DirkdeRoos, Krishnan Parasuraman, Thomas Deutsch, James Giles, David Corrigan, "Harness the Power of Big Data:The IBM Big Data Platform", Tata McGraw Hill Publications, 2012.
3. Arshdeep Bahga and Vijay Madisetti, "Big Data Science & Analytics: A Hands On Approach ", VPT, 2016.
4. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications (WILEY Big Data Series)", John Wiley & Sons, 2014.

Software Links:

1. Hadoop:http://hadoop.apache.org/
2. Hive: https://cwiki.apache.org/confluence/display/Hive/Home
3. Piglatin: http://pig.apache.org/docs/r0.7.0/tutorial.html

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III Year – II Semester		L	T	P	C
		3	0	0	3
CRYPTOGRAPHY AND NETWORK SECURITY					

Course Objectives:
The main objectives of this course are to explore the working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, public key algorithms, design issues and working principles of various authentication protocols and various secure communication standards including Kerberos, IPsec, and SSL/TLS.

Course Outcomes : At the end of the course, student will be able to
- Explain different security threats and countermeasures and foundation course of cryptography mathematics.
- Classify the basic principles of symmetric key algorithms and operations of some symmetric key algorithms and asymmetric key cryptography
- Revise the basic principles of Public key algorithms and Working operations of some Asymmetric key algorithms such as RSA, ECC and some more
- Design applications of hash algorithms, digital signatures and key management techniques
- Determine the knowledge of Application layer, Transport layer and Network layer security Protocols such as PGP, S/MIME, SSL,TSL, and IPsec .

UNIT I:
Basic Principles : Security Goals, Cryptographic Attacks, Services and Mechanisms, Mathematics of Cryptography.

UNIT II:
Symmetric Encryption: Mathematics of Symmetric Key Cryptography, Introduction to Modern Symmetric Key Ciphers, Data Encryption Standard, Advanced Encryption Standard.

UNIT III:
Asymmetric Encryption: Mathematics of Asymmetric Key Cryptography, Asymmetric Key Cryptography

UNIT IV:
Data Integrity, Digital Signature Schemes & Key Management : Message Integrity and Message Authentication, Cryptographic Hash Functions, Digital Signature, Key Management.

UNIT V:
Network Security-I: Security at application layer: PGP and S/MIME, Security at the Transport Layer: SSL and TLS, **Network Security-II :** Security at the Network Layer: IPSec, System Security

Text Books:
1. Cryptography and Network Security, 3rd Edition Behrouz A Forouzan, Deb deep Mukhopadhyay, McGraw Hill,2015
2. Cryptography and Network Security,4th Edition, William Stallings, (6e) Pearson,2006
3. Everyday Cryptography, 1st Edition, Keith M.Martin, Oxford,2016

Reference Books:
1. Network Security and Cryptography, 1st Edition, Bernard Meneges, Cengage Learning,2018

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III Year – II Semester		L	T	P	C
		3	0	0	3
MOBILE COMPUTING (Professional Elective-II)					

Course Objectives:

- To understand the fundamentals of mobile communication
- To understand the architecture of various Wireless Communication Networks
- To understand the significance of different layers in mobile system Course Contents

Course Outcomes: Upon completion of the course, the students will be able to:

- Develop a strong grounding in the fundamentals of mobile Networks
- Apply knowledge in MAC, Network, and Transport Layer protocols of Wireless Network
- Comprehend, design, and develop a lightweight network stack
- Analyze the Mobile Network Layer system working
- Explain about the WAP Model

UNIT I:

Introduction to Wireless Networks: Applications, History, Simplified Reference Model, Wireless transmission, Frequencies, Signals, Antennas, Signal propagation, Multiplexing, Modulation, Spread spectrum, Cellular Systems: Frequency Management and Channel Assignment, types of hand-off and their characteristics.

UNIT II:

MAC – Motivation, SDMA, FDMA, TDMA, CDMA, Telecommunication Systems, GSM: Architecture Location tracking and call setup, Mobility management, Handover, Security, GSM, SMS, International roaming for GSM, call recording functions, subscriber and service data management, DECT, TETRA, UMTS, IMT-2000.

UNIT III:

Wireless LAN: Infrared vs. Radio transmission, Infrastructure, Adhoc Network, IEEE 802.11WLAN Standards, Architecture, Services, HIPERLAN, Bluetooth Architecture & protocols.

UNIT IV:

Mobile Network Layer: Mobile IP, Dynamic Host Configuration Protocol, Mobile Transport Layer, Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/Fast recovery, Transmission/Time-out freezing, Selective retransmission, Transaction Oriented TCP.

UNIT V:

Support for Mobility: Wireless Application Protocol: Architecture, Wireless Datagram Protocol, Wireless Transport Layer Security, Wireless Transaction Protocol, Wireless Session Protocol, Wireless Application Environment, Wireless Markup Language, WML Scripts, Wireless Telephone Application.

Text Books:

1. Jochen Schiller, “Mobile Communication”, Second Edition, Pearson Education, 2008.

Reference Books:

1. William Stallings, “Wireless Communications and Networks”, Second Edition, Pearson Education, 2004.
2. C. Siva Ram Murthy, B. S. Manoj, “Adhoc Wireless Networks: Architectures and Protocols”, Second Edition, Pearson Education, 2008.

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III Year – II Semester		L	T	P	C
		3	0	0	3
MEAN STACK DEVELOPMENT (Professional Elective II)					

Course Outcomes:
At the end of the Course, Student will be able to:

- Build static web pages using HTML 5 elements.
- Apply JavaScript to embed programming interface for web pages and also to perform Client side validations.
- Build a basic web server using Node.js, work with Node Package Manager (NPM) and recognize the need for Express.js.
- Develop JavaScript applications using typescript and work with document database using MongoDB.
- Utilize Angular JS to design dynamic and responsive web pages.

UNIT-I:
HTML 5: Introduction to Web, Overview of Web Technologies, HTML - Introduction, HTML - Need, Case-insensitivity, Platform-independency, DOCTYPE Declaration, Types of Elements, HTML Elements - Attributes, Metadata Element, Sectioning Elements, Paragraph Element, Division and Span Elements, List Element, Link Element, Character Entities, HTML5 Global Attributes, Creating Table Elements, Table Elements : Colspan/ Rowspan Attributes, border, cellspacing and cellpadding attributes, Creating Form Elements, Input Elements - Attributes, Color and Date Pickers, Select and Datalist Elements, Editing Elements, Media, Iframe, Why HTML Security, HTML Injection, Clickjacking, HTML5 Attributes & Events Vulnerabilities, Local Storage Vulnerabilities, HTML5 - Cross-browser support, Best Practices For HTML Web Pages.

UNIT-II:
JavaScript: Why we need JavaScript, What is JavaScript, Environment Setup, Working with Identifiers, Type of Identifiers, Primitive and Non Primitive Data Types, Operators and Types of Operators, Types of Statements, Non - Conditional Statements, Types of Conditional Statements, If and Switch Statements, Types of Loops, Types of Functions, Declaring and Invoking Function, Arrow Function, Function Parameters, Nested Function, Built-in Functions, Variable Scope in Functions, Working With Classes, Creating and Inheriting Classes, In-built Events and Handlers, Working with Objects, Types of Objects, Creating Objects, Combining and cloning Objects using Spread operator, Destructuring Objects, Browser and Document Object Model, Creating Arrays, Destructuring Arrays, Accessing Arrays, Array Methods, Introduction to Asynchronous Programming, Callbacks, Promises, Async and Await, Executing Network Requests using Fetch API, Creating and consuming Modules.

UNIT-III:
Node.js: Why and What Node.js, How to use Node.js, Create a web server in Node.js, Node Package Manager, Modular programming in Node.js, Restarting Node Application, File Operations.
Express.js: Express Development Environment, Defining a route, Handling Routes, Route and Query Parameters, How Middleware works, Chaining of Middlewares, Types of Middlewares, Connecting to MongoDB with Mongoose, Validation Types and Defaults, Models, CRUD Operations, API Development, Why Session management, Cookies, Sessions, Why and What Security, Helmet Middleware, Using a Template Engine Middleware, Stylus CSS Preprocessor.

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UNIT-IV:

Typescript: Installing TypeScript, Basics of TypeScript, Function, Parameter Types and Return Types, Arrow Function, Function Types, Optional and Default Parameters, Rest Parameter, Creating an Interface, Duck Typing, Function Types, Extending Interfaces, Classes, Constructor, Access Modifiers, Properties and Methods, Creating and using Namespaces, Creating and using Modules, Module Formats and Loaders, Module Vs Namespace, What is Generics, What are Type Parameters, Generic Functions, Generic Constraints.

MongoDB: Introduction Module Overview, Document Database Overview, Understanding JSON, MongoDB Structure and Architecture, MongoDB Remote Management, Installing MongoDB on the local computer (Mac or Windows), Introduction to MongoDB Cloud, Create MongoDB Atlas Cluster, GUI tools Overview, Install and Configure MongoDB Compass, Introduction to the MongoDB Shell, MongoDB Shell JavaScript Engine, MongoDB Shell JavaScript Syntax, Introduction to the MongoDB Data Types, Introduction to the CRUD Operations on documents, Create and Delete Databases and Collections, Introduction to MongoDB Queries.

UNIT-V:

What is Angular, Features of Angular, Angular Application Setup, Components and Modules, Executing Angular Application, Elements of Template, Change Detection, Structural Directives - ngIf, ngFor, ngSwitch, Custom Structural Directive, Attribute Directives - ngStyle, ngClass, Custom Attribute Directive, Property Binding, Attribute Binding, Style and Event Binding, Built in Pipes, Passing Parameters to Pipes, Nested Components Basics, Passing data from Container Component to Child Component, Passing data from Child Component to ContainerComponent, Shadow DOM, Component Life Cycle, Template Driven Forms, Model Driven Forms or Reactive Forms, Custom Validators in Reactive Forms, Custom Validators in Template Driven forms, Dependency Injection, Services Basics, RxJS Observables, Server Communication using HttpClient, Communicating with different backend services using Angular HttpClient, Routing Basics, Router Links, Route Guards, Asynchronous Routing, Nested Routes.

Text Books:

1. Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson.
2. Pro Mean Stack Development, 1st Edition, ELadElrom, Apress O'Reilly.
3. Full Stack JavaScript Development with MEAN, Colin J Ihrig, Adam Bretz, 1st edition, SitePoint, SitePoint Pty. Ltd., O'Reilly Media.
4. MongoDB – The Definitive Guide, 2nd Edition, Kristina Chodorow,O'Reilly.

Reference Books:

1. Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book,1st Edition, Dream Tech.
2. An Introduction to Web Design, Programming, 1st Edition, Paul S Wang, Sanda SKatila, Cengage Learning.

Web Links:

1. https://infyspringboard.onwingspan.com/en/app/toc/lex_17739732834840810000_shared/overview (HTML5)

2. https://infyspringboard.onwingspan.com/en/app/toc/lex_18109698366332810000_shared/overview (Javascript)

3. https://infyspringboard.onwingspan.com/en/app/toc/lex_32407835671946760000_shared/overview (Node.js & Express.js)

4. https://infyspringboard.onwingspan.com/en/app/toc/lex_9436233116512678000_shared/overview (Typescript)

5. https://infyspringboard.onwingspan.com/en/app/toc/lex_20858515543254600000_shared/overview (Angular JS)

6. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_013177169294712832113_shared/overview (MongoDB)

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III Year – II Semester		L	T	P	C
		3	0	0	3
DESIGN PATTERNS (Professional Elective II)					

Course Objectives:

- Demonstration of patterns related to object oriented design.
- Describe the design patterns that are common in software applications
- Analyze a software development problem and express it
- Design a module structure to solve a problem, and evaluate alternatives
- Implement a module so that it executes efficiently and correctly

Course Outcomes:

- Construct a design consisting of a collection of modules
- Examine well-known design patterns (such as Iterator, Observer, Factory and Visitor)
- Distinguish between different categories of design patterns
- Ability to understand and apply common design patterns to incremental /iterative development
- Identify appropriate patterns for design of given problem
- Design the software using Pattern Oriented Architectures

UNIT I:
Introduction: Design Pattern, Design Patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns Solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern.
A Case Study: Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation.

UNIT II:
Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.

UNIT III:
Structural Pattern: Adapter, Bridge, Composite, Decorator, açade, Flyweight, Proxy.

UNIT IV:
Behavioral Patterns: Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Memento, Observer.

UNIT V:
Behavioral Patterns: State, Strategy, Template Method, Visitor, Discussion of Behavioral Patterns.
What to Expect from Design Patterns, a Brief History, the Pattern Community an Invitation, a Parting Thought.

Text Books:

1. "Design Patterns", Erich Gamma, Pearson Education.



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Reference Books:

1. "Head First Design patterns", Eric Freeman & Elisabeth Freeman, O'REILLY, 2007.
2. "Design Patterns in Java", Steven John Metsker & William C. Wake, Pearson education, 2006
3. "J2EE Patterns", Deepak Alur, John Crupi & Dan Malks, Pearson education, 2003.
4. "Design Patterns in C#", Steven John metsker, Pearson education, 2004.
5. "Pattern Oriented Software Architecture", F.Buschmann & others, John Wiley & Sons.

e-Resources:

1. https://www.javatpoint.com/design-patterns-in-java
2. https://www.tutorialspoint.com/design_pattern/design_pattern_overview.htm

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III Year – II Semester		L	T	P	C
		3	0	0	3
SCRIPTING LANGUAGES (Professional Elective II)					

Course Objectives:
From the course the student will
- Understand the concepts of scripting languages for developing web based projects
- Illustrates object oriented concepts like PHP, PYTHON, PERL
- Create database connections using PHP and build the website for the world
- Demonstrate IP address for connecting the web servers
- Analyze the internet ware application, security issues and frame works for application

Course Outcomes:
After the completion of the course, student will be able to do the following
- Ability to understand the differences between scripting languages
- Create PHP authentication Methodology for security issues
- Identify PHP encryption functions and Mcrypt Package
- Explain syntax and variables in TCL
- Able to gain some fluency programming in Ruby, JavaScript, Perl, Python, and related languages
- Master an understanding of python especially the object oriented concepts

UNIT I:
Introduction to PERL and Scripting: Scripts and Programs, Origin of Scripting , Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

UNIT II:
Advanced PERL: Finer points of looping, pack and unpack, file system, eval, data structures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Issues.
PHP Basics: PHP Basics- Features, Embedding PHP Code in your Web pages, Outputting the data to the browser, Data types, Variables, Constants, expressions, string interpolation, control structures, Function, Creating a Function, Function Libraries, Arrays, strings and Regular Expressions.

UNIT III:
Advanced PHP Programming: PHP and Web Forms, Files, PHP Authentication and Methodologies-Hard Coded, File Based, Database Based, IP Based, Login Administration, Uploading Files with PHP, Sending Email using PHP, PHP Encryption Functions, the Mcrypt package, Building Web sites for the World.

UNIT IV:
TCL: TCL Structure, syntax, Variables and Data in TCL, Control Flow, Data Structures,input/output, procedures , strings , patterns, files, Advance TCL- eval, source, exec and uplevel commands, Name spaces, trapping errors, event driven programs, making applications internet aware, Nuts and Bolts Internet Programming, Security Issues, C Interface. Tk-Visual Tool Kits, Fundamental Concepts of Tk, Tk by example, Events and Binding , Perl-Tk.

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UNIT V:
Python: Introduction to Python language, python-syntax, statements, functions, Built-in-functionsand Methods, Modules in python, Exception Handling. Integrated Web Applications in Python – Building Small, Efficient Python Web Systems, Web Application Framework.

Text Books:
1. The World of Scripting Languages, David Barron, Wiley Publications.
2. Python Web Programming, Steve Holden and David Beazley, New Riders Publications.
3. Beginning PHP and MySQL, 3rd Edition, Jason Gilmore, Apress Publications (Dream tech).

References Books:
1. Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP, J.Leeand B.Ware (Addison Wesley) Pearson Education. Programming Python,M.Lutz,SPD.
2. PHP 6 Fast and Easy Web Development, Julie Meloni and Matt Telles, Cengage Learning Publications.
3. Tcl and the Tk Tool kit, Ousterhout, Pearson Education.
4. PHP and MySQL by Example, E.Quigley, Prentice Hall (Pearson).
5. Perl Power, J.P.Flynt, Cengage Learning.

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III Year – II Semester		L	T	P	C
		0	0	3	1.5
BIG DATA ANALYTICS LAB					

Software Requirements :

1. **Hadoop** : https://hadoop.apache.org/release/2.7.6.html
2. **Java** : https://www.oracle.com/java/technologies/javase/javase8u211-later-archive-downloads.html
3. **Eclipse** : https://www.eclipse.org/downloads/

List of Experiments:

Experiment 1: Week 1, 2:

1. Implement the following Data structures in Java
   a) Linked Lists b) Stacks c) Queues d) Set e) Map

Experiment 2: Week 3:

2. (i)Perform setting up and Installing Hadoop in its three operating modes: Standalone, Pseudo distributed, Fully distributed
   (ii)Use web based tools to monitor your Hadoop setup.

Experiment 3: Week 4:

3.Implement the following file management tasks in Hadoop:

- Adding files and directories
- Retrieving files
- Deleting files

Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities.

Experiment 4: Week 5:

4. Run a basic Word Count MapReduce program to understand MapReduce Paradigm**.**

Experiment 5: Week 6:

5. Write a map reduce program that mines weather data.
   Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with Map Reduce, since it is semi structured and record-oriented.

Experiment 6: Week 7:

6.Use MapReduce to find the shortest path between two people in a social graph.
Hint: Use an adjacency list to model a graph, and for each node store the distance from the original node, as well as a back pointer to the original node. Use the mappers to propagate the distance to the original node, and the reducer to restore the state of the graph. Iterate until the target node has been reached.

Experiment 7: Week 8:

7. Implement Friends-of-friends algorithm in MapReduce.
Hint: Two MapReduce jobs are required to calculate the FoFs for each user in a social network .The first job calculates the common friends for each user, and the second job sorts the common friends by the number of connections to your friends.



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Experiment 8: Week 9:

8. Implement an iterative PageRank graph algorithm in MapReduce.

Hint: PageRank can be implemented by iterating a MapReduce job until the graph has converged. The mappers are responsible for propagating node PageRank values to their adjacent nodes, and the reducers are responsible for calculating new PageRank values for each node, and for re-creating the original graph with the updated PageRank values.

Experiment 9: Week 10:

9. Perform an efficient semi-join in MapReduce.

Hint: Perform a semi-join by having the mappers load a Bloom filter from the Distributed Cache, and then filter results from the actual MapReduce data source by performing membership queries against the Bloom filter to determine which data source records should be emitted to the reducers.

Experiment 10: Week 11:

10. Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data.

Experiment 12: Week 12:

11. Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, functions, and indexes

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III Year – II Semester		L	T	P	C
		0	0	3	1.5
MACHINE LEARNING USING PYTHON LAB					

Course Objectives:
This course will enable students to learn and understand different Data sets in implementing the machine learning algorithms.

Course Outcomes (Cos): At the end of the course, student will be able to
- Implement procedures for the machine learning algorithms
- Design and Develop Python programs for various Learning algorithms
- Apply appropriate data sets to the Machine Learning algorithms
- Develop Machine Learning algorithms to solve real world problems

Requirements: Develop the following program using Anaconda/ Jupiter/ Spider and evaluate ML models.

Experiment-1:
Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.

Experiment-2:
For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.

Experiment-3:
Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

Experiment-4:
Exercises to solve the real-world problems using the following machine learning methods: a) Linear Regression b) Logistic Regression c) Binary Classifier

Experiment-5: Develop a program for Bias, Variance, Remove duplicates , Cross Validation
Experiment-6: Write a program to implement Categorical Encoding, One-hot Encoding

Experiment-7:
Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.

Experiment-8:
Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions.

Experiment-9: Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

Experiment-10:
Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and

recall for your data set.

Experiment-11: Apply EM algorithm to cluster a Heart Disease Data Set. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.

Experiment-12: Exploratory Data Analysis for Classification using Pandas or Matplotlib.

Experiment-13:
Write a Python program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set

Experiment-14:
Write a program to Implement Support Vector Machines and Principle Component Analysis

Experiment-15:
Write a program to Implement Principle Component Analysis

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III Year – II Semester		L	T	P	C
		0	0	3	1.5
CRYPTOGRAPHY AND NETWORK SECURITY LAB					

Course Objectives:

- To learn basic understanding of cryptography, how it has evolved, and some key encryption techniques used today.
- To understand and implement encryption and decryption using Ceaser Cipher, Substitution Cipher, Hill Cipher.

Course Outcomes: At the end of the course, student will be able to

- Apply the knowledge of symmetric cryptography to implement encryption and decryption using Ceaser Cipher, Substitution Cipher, Hill Cipher
- Demonstrate the different algorithms like DES, BlowFish, and Rijndael, encrypt the text "Hello world" using Blowfish Algorithm.
- Analyze and implement public key algorithms like RSA, Diffie-Hellman Key Exchange mechanism, the message digest of a text using the SHA-1 algorithm

List of Experiments:

1. Write a C program that contains a string (char pointer) with a value \Hello World'. The program should XOR each character in this string with 0 and displays the result.
2. Write a C program that contains a string (char pointer) with a value \Hello World'. The program should AND or and XOR each character in this string with 127 and display the result
3. Write a Java program to perform encryption and decryption using the following algorithms:
   a) Ceaser Cipher
   b) Substitution Cipher
   c) Hill Cipher
4. Write a Java program to implement the DES algorithm logic
5. Write a C/JAVA program to implement the BlowFish algorithm logic
6. Write a C/JAVA program to implement the Rijndael algorithm logic.
7. Using Java Cryptography, encrypt the text "Hello world" using BlowFish. Create your own key using Java key tool.
8. Write a Java program to implement RSA Algorithm
9. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript. Consider the end user as one of the parties (Alice) and the JavaScript application as other party (bob).
10. Calculate the message digest of a text using the SHA-1 algorithm in JAVA.

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III Year – II Semester		L	T	P	C
		0	0	4	2
DATA SCIENCE: NATURAL LANGUAGE PROCESSING (Skill Oriented Course)					

Course Outcomes:

Upon successful completion of the course, the student will be able to:

- Explore natural language processing (NLP) libraries in Python
- Learn various techniques for implementing NLP including parsing & text processing
- Understand how to use NLP for text feature engineering

Python Libraries: nltk, re,word2vec

List of Experiments :

1. Demonstrate Noise Removal for any textual data and remove regular expression pattern such as hash tag from textual data.
2. Perform lemmatization and stemming using python library nltk.
3. Demonstrate object standardization such as replace social media slangs from a text.
4. Perform part of speech tagging on any textual data.
5. Implement topic modeling using Latent Dirichlet Allocation (LDA) in python.
6. Demonstrate Term Frequency – Inverse Document Frequency (TF – IDF) using python
7. Demonstrate word embeddings using word2vec.
8. Implement Text classification using naïve bayes classifier and text blob library.
9. Apply support vector machine for text classification.
10. Convert text to vectors (using term frequency) and apply cosine similarity to provide closeness among two text.
11. Case study 1: Identify the sentiment of tweets

    In this problem, you are provided with tweet data to predict sentiment on electronic products of netizens.
12. Case study 2: Detect hate speech in tweets.

    The objective of this task is to detect hate speech in tweets. For the sake of simplicity, we say a tweet contains hate speech if it has a racist or sexist sentiment associated with it. So, the task is to classify racist or sexist tweets from other tweets.

Web References:

1. https://www.analyticsvidhya.com/blog/2017/01/ultimate-guide-to-understand-implement-natural-language-processing-codes-in-python/
2. https://datahack.analyticsvidhya.com/contest/linguipedia-codefest-natural-language-processing-1/?utm_source=ultimate-guide-to-understand-implement-natural-language-processing-codes-in-python&utm_medium=blog
3. https://www.analyticsvidhya.com/blog/2018/07/hands-on-sentiment-analysis-dataset-python/

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III Year – II Semester		L	T	P	C
		0	0	4	2
VIDEO ANALYTICS (Skill Oriented Course)					

Course Outcomes:
At the end of the Course, Student will be able to:

- Illustrate the principles and techniques of digital image
- Demonstrate the image recognition and motion recognition
- Discuss the fundamentals of digital video processing
- Illustrate the motion estimation, segmentation and modeling
- Analyze video processing in applications

List of Experiments:
Note: Implement the following applications using MATLAB/Open CV/Python

1. Image enhancement application
2. Object/image recognition applications based on digital image transforms.
3. Image analysis systems for object recognition.
4. Content Based Image Retrieval
5. Image compression, Image Fusion
6. Image Steganography, Watermarking
7. Video Enhancement and Noise Reduction
8. Motion Estimation and Segmentation,
9. Motion Tracking
10. Multi-target/Multi-camera tracking
11. Action Recognition

List of Augmented Experiments: (Weeks 13 – Week 16)
(Any two of the following experiments can be performed)

1. Implement Optical character recognition,
2. Implement Image Captioning and Visual Question Answering.
3. Implement Gesture Recognition.
4. Implement Smart Surveillance and Tracking

Reference Books:

1. ”Practical Image and Video Processing Using MATLAB”, Oge Marques,Wiley-IEEE Press,2011.
2. “Image Engineering: Processing, Analysis and Understanding”, Yu Jin Zhang, Tsinghua University Press, 2009.
3. “Object Detection and Recognition in Digital Images: Theory and Practice”, Boguslaw Cyganek ,Wiley 2013.

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III Year – II Semester		L	T	P	C
		2	0	0	0
EMPLOYABILITY SKILLS-II					

Course Objectives:
The main objective of this course is to assist students in developing employability skills and personal qualities related to gaining and sustaining employment.

Course Outcomes: After completion of this course
- Solve various Basic Mathematics problems by following different methods
- Follow strategies in minimizing time consumption in problem solving Apply shortcut methods to solve problems
- Confidently solve any mathematical problems and utilize these mathematical skills both in their professional as well as personal life.
- Analyze, summarize and present information in quantitative forms including table, graphs and formulas

UNIT I:
Numerical ability l: Number system, HCF & LCM, Average, Simplification, Problems on numbers
Numerical ability II: Ratio & Proportion, Partnership, Percentages, Profit & Loss

UNIT II:
Arithmetical ability l: Problems on ages, Time & Work, Pipes & Cistern, Chain Rule.
Arithmetical ability ll: Time & Distance, Problems on boats &Steams, Problems on Trains

UNIT III:
Arithmetical ability lll: Allegation, Simple interest and compound interest, Races & Games of skills, Calendar and Clock,
Logical ability: Permutations and Combination and Probability.

UNIT IV:
Mensuration: Geometry, Areas, Volumes

UNIT V:
Data interpretation: Tabulation, Bar graphs, Pie charts, line graphs

Text Books And Reference Books:
1. R. S. Aggarwal “Quantitative Aptitude”, Revised ed., S Chand publication, 2017 ISBN:8121924987

E- resources:
1. https://blog.feedspot.com/aptitude_youtube_channels/
2. https://www.tutorialspoint.com/quantitative_aptitude/
3. https://www.careerbless.com/aptitude/qa/home.php

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III Year – II Semester	Minor Course	L	T	P	C
		3	0	2	4
DATA STRUCTURES AND ALGORITHMS					

Course Objectives:

The objective of the course is to

- Introduce the fundamental concept of data structures and abstract data types
- Emphasize the importance of data structures in developing and implementing efficient algorithms
- Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms
- Demonstrate the different data structures implementation

Course Outcomes:

After completing this course a student will be able to:

- Use basic data structures such as arrays and linked list.
- Programs to demonstrate fundamental algorithmic problems including Tree Traversals, Graph traversals, and shortest paths.
- Use various searching and sorting algorithms.

UNIT I:

Data Structures - Definition, Classification of Data Structures, Operations on Data Structures, Abstract Data Type (ADT), Preliminaries of algorithms. Time and Space complexity.
Searching - Linear search, Binary search, Fibonacci search.
Sorting- Insertion sort, Selection sort, Exchange (Bubble sort, quick sort), distribution (radix sort), merging (Merge sort) algorithms.

UNIT II:

Linked List: Introduction, Single linked list, Representation of Linked list in memory, Operations on Single Linked list-Insertion, Deletion, Search and Traversal ,Reversing Single Linked list, Applications on Single Linked list- Polynomial Expression Representation, Addition and Multiplication, Sparse Matrix Representation using Linked List, Advantages and Disadvantages of Single Linked list, Double Linked list-Insertion, Deletion, Circular Linked list-Insertion, Deletion.

UNIT III:

Queues: Introduction to Queues, Representation of Queues-using Arrays and using Linked list, Implementation of Queues-using Arrays and using Linked list, Application of Queues- Circular Queues, Deques, Priority Queues, Multiple Queues.
Stacks: Introduction to Stacks, Array Representation of Stacks, Operations on Stacks, Linked list Representation of Stacks, Operations on Linked Stack, Applications-Reversing list, Factorial Calculation, Infix to Postfix Conversion, Evaluating Postfix Expressions.

UNIT IV:

Trees: Basic Terminology in Trees, Binary Trees-Properties, Representation of Binary Trees using Arrays and Linked lists. Binary Search Trees- Basic Concepts, BST Operations: Insertion, Deletion, Tree Traversals,



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UNIT V:

Graphs: Basic Concepts, Representations of Graphs-Adjacency Matrix and using Linked list, Graph Traversals (BFT & DFT), Applications- Minimum Spanning Tree Using Prims & Kruskals Algorithm, Dijkstra's shortest path

Exercise -1 (Searching)

a)Write C program that use both recursive and non recursive functions to perform Linear search for a Key value in a given list.

b) Write C program that use both recursive and non recursive functions to perform Binary search for a Key value in a given list.

Exercise -2 (Sorting-I)

a) Write C program that implement Bubble sort, to sort a given list of integers in ascending order

b) Write C program that implement Quick sort, to sort a given list of integers in ascending order

c) Write C program that implement Insertion sort, to sort a given list of integers in ascending order

Exercise -3(Sorting-II)

a) Write C program that implement radix sort, to sort a given list of integers in ascending order

b) Write C program that implement merge sort, to sort a given list of integers in ascending order

Exercise -4(Singly Linked List)

a) Write a C program that uses functions to create a singly linked list

b) Write a C program that uses functions to perform insertion, deletion operations on a singly linked list

c) Write a C program to reverse elements of a single linked list.

Exercise -5(Queue)

a) Write C program that implement Queue (its operations) using arrays.

b) Write C program that implement Queue (its operations) using linked lists

Exercise -6(Stack)

a) Write C program that implement stack (its operations) using arrays

b) Write C program that implement stack (its operations) using Linked list

c) Write a C program that uses Stack operations to evaluate postfix expression

Exercise -7(Binary Tree)

Write a recursive C program for traversing a binary tree in preorder, inorder and postorder.

Exercise -8(Binary Search Tree)

a) Write a C program to Create a BST

b) Write a C program to insert a node into and delete a node from a BST.

Text Books:

1) Data Structures Using C. 2nd Edition.Reema Thareja, Oxford.
2) Data Structures and algorithm analysis in C, 2nded, Mark Allen Weiss.

Reference Books:

1) Fundamentals of Data Structures in C, 2nd Edition, Horowitz, Sahni, Universities Press.
2) Data Structures: A PseudoCode Approach, 2/e, Richard F.Gilberg, Behrouz A. Forouzon, Cengage.
3) Data Structures with C, Seymour Lipschutz TMH

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e-Resources:

1) http://algs4.cs.princeton.edu/home/
2) https://faculty.washington.edu/jstraub/dsa/Master_2_7a.pdf

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IV Year – I Semester		L	T	P	C
		3	0	0	3
CLOUD COMPUTING (Professional Elective-III)					

Course Objectives:

- To explain the evolving computer model caned cloud computing.
- To introduce the various levels of services that can be achieved by cloud.
- To describe the security aspects in cloud.
- To motivate students to do programming and experiment with the various cloud computing environments.

Course Outcomes: At the end of the course, student will be able to

- Illustrate the key dimensions of the challenge of Cloud Computing
- Classify the Levels of Virtualization and mechanism of tools.
- Analyze Cloud infrastructure including Google Cloud and Amazon Cloud.
- Create Combinatorial Auctions for cloud resource and design scheduling algorithms for computing cloud
- Assess control storage systems and cloud security, the risks involved its impact and develop cloud application

UNIT I:

Systems Modeling, Clustering and Virtualization: Scalable Computing over the Internet-The Age of Internet Computing, Scalable computing over the internet, Technologies for Network Based Systems, System models for Distributed and Cloud Computing, , Performance, Security and Energy Efficiency

UNIT II:

Virtual Machines and Virtualization of Clusters and Data Centers: Implementation Levels of Virtualization, Virtualization Structures/ Tools and Mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data-Center Automation.

UNIT III:

Cloud Platform Architecture: Cloud Computing and Service Models, Public Cloud Platforms, Service Oriented Architecture, Programming on Amazon AWS and Microsoft Azure

UNIT IV:

Cloud Resource Management and Scheduling: Policies and Mechanisms for Resource Management, Applications of Control Theory to Task Scheduling on a Cloud, Stability of a Two Level Resource Allocation Architecture, Feedback Control Based on Dynamic Thresholds. Coordination of Specialized Autonomic Performance Managers, Resource Bundling, Scheduling Algorithms for Computing Clouds-Fair Queuing, Start Time Fair Queuing.

UNIT V:

Storage Systems: Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system.

Text Books:

1. Distributed and Cloud Computing, Kai Hwang, Geoffry C. Fox, Jack J. Dongarra MK Elsevier.
2. Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier.

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Reference Books:

1. Cloud Computing, A Hands on approach, ArshadeepBahga, Vijay Madisetti, University Press
2. Cloud Computing, A Practical Approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH
3. Mastering Cloud Computing, Foundations and Application Programming, Raj Kumar Buyya, Christen vecctiola, S Tammaraiselvi, TMH

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IV Year – I Semester		L	T	P	C
		3	0	0	3
ARTIFICIAL NEURAL NETWORKS (Professional Elective-III)					

Course Objectives: The main objective of the course is to
- Introduce the foundations of Artificial Neural Networks.
- Acquire the knowledge on Soft Computing Concepts.
- learn various types of Genetic algorithms and its applications.
- gain knowledge to apply optimization strategies.

Course Outcomes: At the end of the course, student will be able to
- Understand the concepts of Artificial intelligence and soft computing techniques
- Analyze the concepts of Neural Networks and select the Learning Networks in modeling real world systems.
- Implement the concepts of Fuzzy reasoning and concepts of Genetic algorithm and its applications to soft computing.
- Classify Biologically inspired algorithm such as neural networks, genetic algorithms, ant colony optimization, and bee colony optimization.
- Design hybrid system incorporating neural network, genetic algorithms, fuzzy systems.

UNIT I:
Soft Computing and Artificial Intelligence: Introduction of Soft Computing, Soft Computing vs. Hard Computing, Various Types of Soft Computing Techniques, Applications of Soft Computing, AI Search Algorithm, Predicate Calculus, Rules of Interference, Semantic Networks, Frames, Objects, Hybrid Models.

UNIT II:
Artificial Neural Networks and Paradigms: Introduction to Neuron Model, Neural Network Architecture, Learning Rules, Perceptrons, Single Layer Perceptrons, Multilayer Perceptrons, Back propagation Networks, Kohnen's self organizing networks, Hopfield network, Applications of NN.

UNIT III:
Fuzzy Logic: Introduction, Fuzzy sets and Fuzzy reasoning, Basic functions on fuzzy sets, relations, rule based models and linguistic variables, fuzzy controls, Fuzzy decision making, applications of fuzzy logic.

UNIT IV:
Genetic Algorithms and Swarm Optimizations: Introduction, Genetic Algorithm, Fitness Computations, Cross Over, Mutation, Evolutionary Programming, Classifier Systems, Genetic Programming Parse Trees, Variants of GA, Applications, Ant Colony Optimization, Particle Swarm Optimization, Artificial Bee Colony Optimization.

UNIT V:
Hybrid Systems: Neuro fuzzy hybrid systems, Adaptive neuro fuzzy inference systems, Fuzzy backpropagation network, Genetic neuro hybrid system, Genetic algorithm based backpropagation network, Genetic-fuzzy hybrid systems.

Text Books:
1. Simon S. Haykin, Neural Networks, Prentice Hall, 2nd edition.
2. S. Rajasekaran & G. A. Vijayalakshmi Pai "Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications", PHI,2003.

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DEPARTMENT OF INFORMATION TECHNOLOGY

Reference Books:

1. S. N. Sivanandam & S. N. Deepa ”Principles of Soft Computing” Wiley – India, 2nd Edition, 2007.
2. Jang J.S.R., Sun C.T. and Mizutani E, "Neuro-Fuzzy and Soft computing", Prentice Hall, 1998.
3. Jacek M. Zurada, Introduction to Artificial Neural Systems, Jaico Publishing House,1994
4. Zimmermann, “Fuzzy Set Theory and its Application”, 3rd Edition.
5. D.E. Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y, 1989.
6. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill, 3rd edition 2009.

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DEPARTMENT OF INFORMATION TECHNOLOGY

IV Year – I Semester		L	T	P	C
		3	0	0	3
INTERNET OF THINGS (IoT) **(Professional Elective-III)**					

Course Objectives:
From the course the student will learn
- the application areas of IOT
- the revolution of Internet in Mobile Devices, Cloud & Sensor Networks
- building blocks of Internet of Things and characteristics

Course Outcomes:
By the end of the course, student will be able to
- Review Internet of Things (IoT).
- Demonstrate various business models relevant to IoT.
- Construct designs for web connectivity
- Organize sources of data acquisition related to IoT, integrate to enterprise systems.
- Describe IoT with Cloud technologies.

UNIT I:
The Internet of Things- An Overview of Internet of things, Internet of Things Technology, behind IoTs Sources of the IoTs, Examples OF IoTs, Design Principles For Connected Devices, Internet connectivity, **Application Layer Protocols-** HTTP, HTTPS, FTP

UNIT II:
Business Models for Business Processes in the Internet of Things, IoT/M2M systems LAYERS AND designs standardizations, Modified OSI Stack for the IoT/M2M Systems ,ETSI M2M domains and High-level capabilities, Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability.

UNIT III:
Design Principles for the Web Connectivity for connected-Devices, Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected-Devices.

UNIT IV:
Data Acquiring, Organizing and Analytics in IoT/M2M, Applications/Services/Business Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in the Internet Of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.

UNIT V:
Data Collection, Storage and Computing Using a Cloud Platform for IoT/M2M Applications/Services, Data Collection, Storage and Computing Using cloud platform Everything as a service and Cloud Service Models, IOT cloud-based services using the Xively (Pachube/COSM), Nimbits and other platforms Sensor, Participatory Sensing, Actuator, Radio Frequency Identification, and Wireless, Sensor Network Technology, Sensors Technology, Sensing the World.

Text Books:
1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education
2. Internet of Things, A.Bahgya and V.Madisetti, Univesity Press, 2015

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Reference Books:

1. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley
2. Getting Started with the Internet of Things, CunoPfister , Oreilly

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IV Year – I Semester		L	T	P	C
		3	0	0	3
CYBER SECURITY & FORENSICS (Professional Elective-III)					

Course Objectives:

The aim of the course is to

- identify security risks and take preventive steps
- understand the forensics fundamentals
- understand the evidence capturing process
- understand the preservation of digital evidence

Course Outcomes: At the end of the course, student will be able to

- Explain the Cybercrime Fundamentals
- Describe the types of attacks on networks
- Analyze various tools available for Cybercrime Investigation
- Explain the Computer Forensics and Investigation Fundamentals and tools
- Analyze the legal perspectives of Cybercrime

UNIT I:

Introduction to Cybercrime: Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Cybercriminals, Classifications of Cybercrime, Cyberstalking, Cybercafe and Cybercrimes, Botnets. Attack Vector, Proliferation of Mobile and Wireless Devices, Security Challenges Posed by Mobile Devices, Attacks on Mobile/Cell Phones, Network and Computer Attacks.

UNIT II:

Tools and Methods : Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, Sniffers, Spoofing, Session Hijacking Buffer over flow, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks, Identity Theft (ID Theft), Foot Printing and Social Engineering, Port Scanning, Enumeration.

UNIT III:

Cyber Crime Investigation: Introduction, Investigation Tools, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Hands on Case Studies. Encryption and Decryption Methods, Search and Seizure of Computers, Recovering Deleted Evidences, Password Cracking.

UNIT IV:

Computer Forensics and Investigations: Understanding Computer Forensics, Preparing for Computer Investigations. Current Computer Forensics Tools: Evaluating Computer Forensics Tools, Computer Forensics Software Tools, Computer Forensics Hardware Tools, Validating andTesting Forensics Software, Face, Iris and Fingerprint Recognition, Audio Video Analysis, Windows System Forensics, Linux System Forensics, Graphics and Network Forensics, E-mail Investigations, Cell Phone and Mobile Device Forensics.

UNIT V:

Cyber Crime Legal Perspectives: Introduction, Cybercrime and the Legal Landscape around the World, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime and Punishment, Cyberlaw, Technology and Students: Indian Scenario.

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Text Books:

1. Sunit Belapure Nina Godbole "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", WILEY, 2011.
2. Nelson Phillips and Enfinger Steuart, "Computer Forensics and Investigations", Cengage Learning, New Delhi, 2009.

Reference Books:

1. Michael T. Simpson, Kent Backman and James E. Corley, "Hands on Ethical Hacking and Network Defence", Cengage, 2019.
2. Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media, New Delhi.
3. Alfred Basta, Nadine Basta,Mary Brown and Ravinder Kumar "Cyber Security and Cyber Laws" , Cengage,2018.

E-Resources:

1. CERT-In Guidelines- http://www.cert-in.org.in/
2. https://www.coursera.org/learn/introduction-cybersecurity-cyber-attacks [Online Course]
3. https://computersecurity.stanford.edu/free-online-videos [Free Online Videos]
4. Nickolai Zeldovich. 6.858 Computer Systems Security. Fall 2014. Massachusetts Institute of Technology: MIT OpenCourseWare, https://ocw.mit.edu License: Creative Commons BY-NC-SA.

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DEPARTMENT OF INFORMATION TECHNOLOGY

IV Year – I Semester		L	T	P	C
		3	0	0	3
DEEP LEARNING TECHNIQUES (Professional Elective-IV)					

Course Objectives: At the end of the course, the students will be expected to:

- Learn deep learning methods for working with sequential data,
- Learn deep recurrent and memory networks,
- Learn deep Turing machines,
- Apply such deep learning mechanisms to various learning problems.
- Know the open issues in deep learning, and have a grasp of the current research directions.

Course Outcomes: After the completion of the course, student will be able to

- Demonstrate the fundamental concepts learning techniques of Artificial Intelligence, Machine Learning and Deep Learning.
- Discuss the Neural Network training, various random models**.**
- Explain the Techniques of Keras, TensorFlow, Theano and CNTK
- Classify the Concepts of CNN and RNN
- Implement Interactive Applications of Deep Learning.

UNIT I:

Fundamentals of Deep Learning: Artificial Intelligence, History of Machine learning: Probabilistic Modeling, Early Neural Networks, Kernel Methods, Decision Trees, Random forests and Gradient Boosting Machines, **Fundamentals of Machine Learning:** Four Branches of Machine Learning, Evaluating Machine learning Models, Overfitting and Underfitting. **[Text Book 2]**

UNIT II: Introducing Deep Learning: Biological and Machine Vision, Human and Machine Language, Artificial Neural Networks, Training Deep Networks, Improving Deep Networks. **[Text Book3]**

UNIT III: Neural Networks: Anatomy of Neural Network, Introduction to Keras: Keras, TensorFlow, Theano and CNTK, Setting up Deep Learning Workstation, Classifying Movie Reviews: Binary Classification, Classifying newswires: Multiclass Classification. **[Text Book 2]**

UNIT IV:

Convolutional Neural Networks: Nerual Network and Representation Learing, Convolutional Layers, Multichannel Convolution Operation, **Recurrent Neural Networks:** Introduction to RNN, RNN Code, PyTorch Tensors: Deep Learning with PyTorch, CNN in PyTorch. **[Text Book 3]**

UNIT V:

Interactive Applications of Deep Learning: Machine Vision, Natural Language processing, Generative Adversial Networks, Deep Reinforcement Learning. **[Text Book 1]**

Deep Learning Research: Autoencoders**,** Deep Generative Models: Boltzmann Machines Restricted Boltzmann Machines, Deep Belief Networks. **[Text Book 1]**

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Text Books:

1. Deep Learning- Ian Goodfellow, Yoshua Bengio and Aaron Courvile, MIT Press, 2016
2. Deep Learning with Python - Francois Chollet, Released December 2017, Publisher(s): Manning Publications, ISBN: 9781617294433
3. Deep Learning Illustrated: A Visual, Interactive Guide to Artificial Intelligence - Jon Krohn, Grant Beyleveld, Aglaé Bassens, Released September 2019, Publisher(s): Addison-Wesley Professional, ISBN: 9780135116821
4. Deep Learning from Scratch - Seth Weidman, Released September 2019, Publisher(s): O'Reilly Media, Inc., ISBN: 9781492041412

Reference Books:

1. Artificial Neural Networks, Yegnanarayana, B., PHI Learning Pvt. Ltd, 2009.
2. Matrix Computations, Golub, G.,H., and Van Loan,C.,F, JHU Press,2013.
3. Neural Networks: A Classroom Approach, Satish Kumar, Tata McGraw-Hill Education, 2004.

Web Link:

1. Swayam NPTEL: Deep Learning: https://onlinecourses.nptel.ac.in/noc22_cs22/preview

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DEPARTMENT OF INFORMATION TECHNOLOGY

IV Year – I Semester		L	T	P	C
		3	0	0	3
SOCIAL NETWORK ANALYSIS (Professional Elective-IV)					

Course Objectives:

- Formalize different types of entities and relationships as nodes and edges and represent thisinformation as relational data
- Plan and execute network analytical computations
- Use advanced network analysis software to generate visualizations and perform empirical investigations of network data
- Interpret and synthesize the meaning of the results with respect to a question, goal, or task
- Collect network data in different ways and from different sources while adhering to legal standards and ethics standards

Course Outcomes:

After completing the course student should:

- Know basic notation and terminology used in network science
- Be able to visualize, summarize and compare networks
- Illustrate basic principles behind network analysis algorithms
- Develop practical skills of network analysis in R programming language
- Be capable of analyzing real work networks

UNIT I:

Social Network Analysis: Preliminaries and definitions, Erdos Number Project, Centrality measures, Balance and Homophily.

UNIT II:

Random graph models**:** Random graphs and alternative models, Models of network growth, Navigation in social Networks, Cohesive subgroups, Multidimensional Scaling, Structural equivalence, roles and positions.

UNIT III:

Network topology and diffusion, Contagion in Networks, Complex contagion, Percolation and information, Navigation in Networks Revisited.

UNIT IV:

Small world experiments, small world models, origins of small world, Heavy tails, Small Diameter, Clustering of connectivity, The Erdos Renyi Model, Clustering Models.

UNIT V:

Network structure -Important vertices and page rank algorithm, towards rational dynamics in networks, basics of game theory, Coloring and consensus, biased voting, network formation games, network structure and equilibrium, behavioral experiments, Spatial and agent-based models.

Text Books:

1. S. Wasserman and K. Faust. “Social Network Analysis: Methods and Applications”, Cambridge University Press.
2. D. Easley and J. Kleinberg, “Networks, Crowds and Markets: Reasoning about a highly connected world” , Cambridge University Press, 1st edition,2010

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Reference Books:

1. Maarten van Steen. "Graph Theory and Complex Networks. An Introduction", 2010.
2. Reza Zafarani, Mohammed Ali Abbasi, Huan Liu. "Social Media Mining: An Introduction". Cambridge University Press 2014.
3. Maksim Tsvetovat and Alexander Kouznetsov. "Social Network Analysis for Startups". O'Reilly Media, 2011.

e-Resources:

1) https://www.classcentral.com/course/edx-social-network-analysis-sna-9134
2) https://www.coursera.org/learn/social-network-analysis

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DEPARTMENT OF INFORMATION TECHNOLOGY

IV Year – I Semester		L	T	P	C
		3	0	0	3
ADVANCED DATABASES (Professional Elective-IV)					

Course Objectives:

- This Subject deals with dealing data in the real world, maintaining data without any redundancy, several techniques involved in DBMS to recover the problems caused due to redundancy, storing data for quick insertion, manipulation and deletion operations in order to retrieve data from the database.
- This subject provides an introduction to multidisciplinary field of data mining, the general data features, techniques for data preprocessing, general implementation of data warehouses and OLAP, the relationship between data warehousing and other generalization methods
- The concepts of data clustering includes a different methods of clustering such as k-means, k-mediods, db scan algorithm, role of data mining in web mining.

Course Outcomes:

After the completion of the course, student will be able to

- Analyze on normalization techniques.
- Elaborate on concurrency control techniques and query optimization.
- Summarize the concepts of data mining, data warehousing and data preprocessing strategies.
- Apply data mining algorithms.
- Assess various classification & cluster techniques.

UNIT I:

Introduction: Concepts and Definitions, Relational models, Data Modeling and Query Languages, Database Objects. **Normalization Techniques:** Functional Dependency, 1NF, 2NF, 3NF, BCNF; Multi valued Dependency; Loss-less Join and Dependency Preservation.

UNIT II:

Transaction Processing: Consistency, Atomicity, Isolation and Durability, Serializable Schedule, Recoverable Schedule, Concurrency Control, Time-stamp based protocols, Isolation Levels, Online Analytical Processing, **Database performance Tuning and Query optimization:** Query Tree, Cost of Query, Join, Selection and Projection Implementation Algorithms and Optimization Database Security: Access Control, MAC, RBAC, Authorization, SQL Injection Attacks.

UNIT III:

Data Mining: stages and techniques, knowledge representation methods, data mining approaches (OLAP, DBMS, Statistics and ML). **Data warehousing:** data warehouse and DBMS, multidimensional data model, OLAP operations. **Data processing:** cleaning, transformation, reduction, filters and discretization with weka.

UNIT IV:

Knowledge representation: background knowledge, representing input data and output knowledge, visualization techniques and experiments with weka. **Data mining algorithms:** association rules, mining weather data, generating item sets and rules efficiently, correlation analysis.

UNIT V:

Classification & Clustering: 1R algorithm, decision trees, covering rules, task prediction, statistical classification, Bayesian network, instance based methods, linear models, Cluster/2, Cobweb, k-means, Hierarchical methods. **Mining real data:** preprocessing data from a real medical domain, data mining

techniques to create a comprehensive and accurate model of data. **Advanced topics:** text mining, text classification, web mining, data mining software.

Text Books:

1. Fundamentals of Database Systems, RamezElmasri, Shamkant B. Navathe, Addison-Wesley,6th edition-
2. Data Mining: Concepts and Techniques, J. Han and M. Kamber, Morgan Kaufmann C.J. Date, Database Systems, Pearson, 3rd edition-

Reference Books:

1. Principles of Distributed Database Systems, Prentice Hall, P. Valduriez, M. TamerOzsu 3rd edition-2000
2. Database systems: Design, implementation and Management, C.M. Coronel, S. Morris, P. Rob, Boston: Cengage Learning,9th edition-2011

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DEPARTMENT OF INFORMATION TECHNOLOGY

IV Year – I Semester		L	T	P	C
		3	0	0	3
BLOCK-CHAIN TECHNOLOGIES (Professional Elective-V)					

Course Objectives:
To understand block chain technology and Cryptocurrency works

Course Outcomes:
After the completion of the course, student will be able to

- Demonstrate the block chain basics, Crypto currency
- To compare and contrast the use of different private vs. public block chain and use cases
- Design an innovative Bit coin Block chain and scripts, Block chain Science on varies coins
- Classify Permission Block chain and use cases – Hyper ledger, Corda
- Make Use of Block-chain in E-Governance, Land Registration, Medical Information Systems and others

UNIT I:
Introduction: Introduction, basic ideas behind block chain, how it is changing the landscape of digitalization, introduction to cryptographic concepts required, Block chain or distributed trust, Currency, Cryptocurrency, How a Cryptocurrency works, Financial services, Bitcoin prediction markets.

UNIT II:
Hashing, public key cryptosystems, private vs public block chain and use cases, Hash Puzzles, Extensibility of Block chain concepts, Digital Identity verification, Block chain Neutrality, Digital art, Block chain Environment

UNIT III:
Introduction to Bitcoin : Bitcoin Block chain and scripts, Use cases of Bitcoin Blockchain scripting language in micropayment, escrow etc Downside of Bit coin mining, Block chain Science: Grid coin, Folding coin, Block chain Genomics, Bit coin MOOCs.

UNIT IV:
Ethereum continued, IOTA, The real need for mining, consensus, Byzantine Generals Problem, and Consensus as a distributed coordination problem, Coming to private or permissioned block chains, Introduction to Hyper ledger, Currency, Token, Campus coin, Coin drop as a strategy for Public adoption, Currency Multiplicity, Demurrage currency

UNIT V:
Technical challenges, Business model challenges, Scandals and Public perception, Government Regulations, Uses of Block chain in E-Governance, Land Registration, Medical Information Systems.

Text Books:
1. Blockchain Blue print for Economy by Melanie Swan

Reference Books:
1. Blockchain Basics: A Non-Technical Introduction in 25 Steps 1st Edition, by Daniel Drescher

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IV Year – I Semester		L	T	P	C
		3	0	0	3
M-COMMERCE (Professional Elective-V)					

Course Objectives:
The objective of the course is to provide the students with the Mobile Commerce concepts, environment and customer value and Business applications of Mobile Commerce.

Course Outcomes:
After the completion of the course, student will be able to

- Define mobile commerce and its framework, growth benefits and limitations
- Determine the information distribution for mobile networks in multimedia content
- Describe the method how to publish mobile networks and mobile payment models in multimedia
- get acquaintance with wireless communications technology with reference to WWAN, Cellular systems 2G, 2.5G, 3G, 4G, 5G and WLAN, and WMAN technology
- learn M-COMMERCE applications in various areas like advertising, payment, ticketing, product location, entertainment and shopping

UNIT I:
Electronic Commerce: Traditional commerce and E-commerce, Internet and WWW, Role of WWW, Value Chains, Strategic Business and Industry Value Chains, Role of E-commerce. Packet Switched Networks, TCP/IP Protocol Script, Internet Utility Programmes – SGML, HTML and XML, Web Client and Servers, Web Client/Server Architecture, Intranet and Extranets, Web Based Tools for E-commerce, Security.

UNIT II:
Mobile Commerce: Introduction, Infrastructure of M–Commerce, Types Of Mobile Commerce Services, Technologies of Wireless Business, Benefits and Limitations, Support, Mobile Marketing & Advertisement, Non– Internet Applications in M–Commerce, Wireless/Wired Commerce Comparisons.

UNIT III:
Mobile Commerce Technology : A Framework For The Study Of Mobile Commerce, NTT Docomo's I-Mode, Wireless Devices For Mobile Commerce, Towards a Classification Framework for Mobile Location Based Services, Wireless Personal and Local Area Networks, The Impact of Technology Advances on Strategy Formulation in Mobile Communications Networks.

UNIT IV:
Mobile Commerce Theory and Applications : The Ecology of Mobile Commerce, The Wireless Application Protocol, Mobile Business Services, Mobile Portal, Factors Influencing the Adoption of Mobile Gaming Services, Mobile Data Technologies and Small Business Adoption and Diffusion, E–commerce in The Automotive Industry, Location– Based Services: Criteria For Adoption and Solution Deployment, The Role of Mobile Advertising in Building a Brand, M–commerce Business Models

UNIT V:
Business– To– Business Mobile E– Commerce : Enterprise Enablement, Email and Messaging, Field Force Automation (Insurance, Real Estate, Maintenance, Healthcare), Field Sales Support (Content Access, Inventory), Asset Tracking and Maintenance/Management, Remote IT Support, Customer Retention (B2C Services, Financial, Special Deals), Warehouse Automation, Security.



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Text Books:

1. E.Brian Mennecke, J.Troy Strader, "Mobile Commerce: Technology, Theory and Applications", Idea Group Inc., IRM press, 2003.
2. Ravi Kalakota, B.Andrew Whinston, "Frontiers of Electronic Commerce", Pearson Education, 2003.

Reference Books:

1. P. J. Louis, "M-Commerce Crash Course", McGraw- Hill Companies February 2001.
2. Paul May, "Mobile Commerce: Opportunities, Applications, and Technologies Of Wireless Business" Cambridge University Press March 2001.

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DEPARTMENT OF INFORMATION TECHNOLOGY

IV Year – I Semester		L	T	P	C
		3	0	0	3
ETHICAL HACKING (Professional Elective-V)					

Course Objectives:

- The aim of the course is to introduce the methodologies and framework of ethical hacking for enhancing the security.
- The course includes-Impacts of Hacking; Types of Hackers; Information Security Models, Information Security Program, Business Perspective, Planning a Controlled Attack
- Framework of Steps (Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Deliverable and Integration)

Course Outcomes: At the end of the course, student will be able to

- Explain the concepts related to hacking, ports and protocols, pen testing and virtualization
- Determine the applicable footprinting techniques and scanning methods
- Explain the process of system hacking and Explain the concepts Trojans, backdoors, worms and virus and it's countermeasures
- Demonstrate systematic understanding of the concepts of Sniffing and Social Engineering and it's attacks
- Determine the applicable methods of cryptography, stegnography and Vulnerability Assessment

UNIT I:

Introduction to Hacking: Hacking, Types and phases of hacking, **Introduction to Ports & Protocols**: Ports, Protocols, Primary Network Types, **Virtualization & Introduction to Kali Linux:** Virtualization, Virtualization software, supported platforms, **Introduction to Penetration Testing:** Penetration test, Categories and Types of Penetration tests, Structure of Penetration Test Report.

UNIT II:

Footprinting: Footprinting, Types, Using ping and ns Lookup commands in Windows command line, **Scanning:** Scanning, Basics of Scanning, Basic Techniques of Scanning, Enumerating DNS using dns enum, Performing flag scan using hping3.

UNIT III:

Hacking into System: System Hacking, Password Cracking, Default password databases, Manual and Automated Password Cracking, Process of System Hacking, Using Keyloggers, **Trojans & Backdoors:** Trojans, Working of Trojan, Infection Techniques, Attack, Lifecycle and Classification of Virus, Worms, Virus Construction Kit.

UNIT IV:

Sniffing, Packet Analysis & Session Hijacking: Sniffing, Packet Analysis, Types of Sniffing, Active and Passive Sniffing Techniques, Session Hijacking, **Social Engineering:** Social Engineering, Process, Identity Theft, Human and Computer Based Social Engineering Techniques, Phishing Process, Types of Phishing Attacks, Social Engineering Toolkit (SET)

UNIT V:

Cryptography: Cryptography, Digital Signature, Hash Functions, **Steganography:** Steganography Process, watermarking, Steganography Methods and Attacks, Steganography tools, **Vulnerability Assessment:** Vulnerability, The Open Web Application Security Project (OWASP), Prevention, Damn Vulnerable Web Application (DVWA), installation and testing of DVWA

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Text Books:

1. Hacking: Be a Hacker with Ethics, Harsh Bothra, Khanna Publications, 2019
2. Ethical Hacking and Penetration Testing Guide, Rafay Baloch, 2014

Reference Books:

1. Kali Linux Wireless Penetration Testing Beginner's Guide, Vivek Ramachandran, Cameron Buchanan, Packt Publishing, 2015
2. SQL Injection Attacks and Defense, 1st Edition, Justin Clarke-Salt, Syngress Publication
3. Mastering Modern Web Penetration Testing, Prakhar Prasad, Packt Publishing, October 2016

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IV Year – I Semester		L	T	P	C
		3	0	0	3
UNIVERSAL HUMAN VALUES 2: UNDERSTANDING HARMONY					

Human Values Courses
This course also discusses their role in their family. It, very briefly, touches issues related to their role in the society and the nature, which needs to be discussed at length in one more semester forwhich the foundation course named as "H-102 Universal Human Values 2: Understanding Harmony"is designed which may be covered in their III or IV semester. During the Induction Program, students would get an initial exposure to human values through Universal Human Values – I. This exposure is to be augmented by this compulsory full semester foundation course.

Universal Human Values 2: Understanding Harmony
Course code: HSMC (H-102)
Credits: L-T-P-C 2-1-0-3 or 2L:1T:0P 3 credits
Pre-requisites: None. Universal Human Values 1 (desirable)

1. Objective:
The objective of the course is four fold:
1. Development of a holistic perspective based on self-exploration about themselves (human being),family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

2. Course Topics:
The course has 28 lectures and 14 practice sessions in 5 modules:

Module 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education
2. Purpose and motivation for the course, recapitulation from Universal Human Values-I
3. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration
4. Continuous Happiness and Prosperity- A look at basic Human Aspirations
5. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority
6. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
7. Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than asarbitrariness in choice based on liking-disliking

Module 2: Understanding Harmony in the Human Being - Harmony in Myself!
2. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
3. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
4. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
5. Understanding the characteristics and activities of 'I' and harmony in 'I'
6. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
7. Programs to ensureSanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

Module 3: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

8. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
9. Understanding the meaning of Trust; Difference between intention and competence
10. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
11. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
12. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family**.**

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

Module 4: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

18. Understanding the harmony in the Nature
19. Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature
20. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space
21. Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

Module 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics

22. Natural acceptance of human values
23. Definitiveness of Ethical Human Conduct
24. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
25. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people- friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
26. Case studies of typical holistic technologies, management models and production systems
27. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations
28. Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

3. READINGS:

3.1 Text Book

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books,New Delhi, 2010

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3.2 Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

4. MODE OF CONDUCT (L-T-P-C 2-1-0-3 or 2L:1T:0P 3 credits)

Lectures hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them.
Tutorial hours are to be used for practice sessions.
While analysing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.

In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self-exploration. Scenarios may be used to initiate discussion. The student is encouraged to take up" ordinary" situations rather than" extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions (tutorials)
would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.

It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional content may be offered in separate, higher courses.

This course is to be taught by faculty from every teaching department, including HSS faculty. Teacher preparation with a minimum exposure to at least one 8-day FDP on Universal Human Values is deemed essential.

5. ASSESSMENT:

This is a compulsory credit course. The assessment is to provide a fair state of development of the student, so participation in classroom discussions, self-assessment, peer assessment etc. will be used in evaluation.
Example:

Assessment by faculty mentor: 10 marks
Self-assessment: 10 marks
Assessment by peers: 10 marks

Socially relevant project/Group Activities/Assignments: 20 marks
Semester End Examination: 50 marks

The overall pass percentage is 40%. In case the student fails, he/she must repeat the course**.**

6. OUTCOME OF THE COURSE:

By the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.

They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

This is only an introductory foundational input. It would be desirable to follow it up by

a) faculty-student or mentor-mentee programs throughout their time with the institution

b) Higher level courses on human values in every aspect of living. E.g. as a professional

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IV Year – I Semester		L	T	P	C
		0	0	4	2
PYTHON: DEEP LEARNING (Skill Oriented Course)					

Course Outcomes:
At the end of the Course, Student will be able to:

- Demonstrate the basic concepts fundamental learning techniques and layers.
- Discuss the Neural Network training, various random models.
- Apply various optimization algorithms to comprehend different activation
- functions to understand hyper parameter tuning
- Build a convolutional neural network, and understand its application to build a
- recurrent neural network, and understand its usage to comprehend auto encoders to briefly explain transfer learning

Pre-requisite knowledge :

- Exploratory data analysis: Collecting, importing, pre-processing, organizing, exploring, analyzing data and deriving insights from data https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012666909428129792728_shared/overview
- Data visualization using Python: Data visualization functions and plots https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012605191343693824145 5_shared/overview
- Regression analysis: Regression, types, linear, polynomial, multiple linear, Generalized linear regression models https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01320408013336576065_shared/overview
- Clustering using Python: Clustering, techniques, Assessment and evaluation https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013044179942342656119 0_shared/overview
- Machine learning using Python: Machine learning fundamentals, Regression, classification, clustering, introduction to artificial neural networks https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012600400790749184237_shared/overview
- Time series analysis : Patterns, decomposition models, smoothing time, forecasting data https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012605180474425344128 0_shared/overview

List of Exercises:

Note: There are online courses indicated in the reference links section. Learners need to go through the contents in order to perform the given exercises

Exercise 1:

Course name : .Build a Convolution Neural Network for Image Recognition.
Go through the modules of the course mentioned and answer the self-assessment questions given in the link below at the end of the course.
Self Assessment - Deep Learning - Viewer Page | Infosys Springboard (onwingspan.com)

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Exercise 2:

Module name : Understanding and Using ANN : Identifying age group of an actor
Exercise : Design Artificial Neural Networks for Identifying and Classifying an actor using Kaggle Dataset.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_01277649241666355225 9_shared?collectionId=lex_auth_0127481425493114885 9_shared&collectionType=Course

Exercise 3:

Module name : Understanding and Using CNN : Image recognition
Exercise: Design a CNN for Image Recognition which includes hyper parameter tuning.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_01278569444316774491 0_shared?collectionId=lex_auth_0127481425493114885 9_shared&collectionType=Course

Exercise 4:

Module name : Predicting Sequential Data
Exercise: Implement a Recurrence Neural Network for Predicting Sequential Data.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_01279144948849868822_shared?collectionId=lex_auth_0127481425493114885 9_shared&collectionType=Course

Exercise 5:

Module Name: Removing noise from the images
Exercise: Implement Multi-Layer Perceptron algorithm for Image denoising hyperparameter tuning.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_01279205825881702427 2_shared?collectionId=lex_auth_0127481425493114885 9_shared&collectionType=Course

Exercise 6:

Module Name: Advanced Deep Learning Architectures
Exercise: Implement Object Detection Using YOLO.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_01310292337329766487 3_shared?collectionId=lex_auth_0127481425493114885 9_shared&collectionType=Course

Exercise 7:

Module Name: Optimization of Training in Deep Learning
Exercise Name: Design a Deep learning Network for Robust Bi-Tempered Logistic Loss.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_01310791722668032018 4_shared?collectionId=lex_auth_0127481425493114885 9_shared&collectionType=Course

Exercise 8:

Module name: Advanced CNN
Exercise: Build AlexNet using Advanced CNN.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_01311184442254131298 4_shared?collectionId=lex_auth_0127481425493114885 9_shared&collectionType=Course

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Exercise 9:

Module name: Autoencoders Advanced
Exercise: Demonstration of Application of Autoencoders.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013116455128989696 2081_shared?collectionId=lex_auth_0127481425493114885 9_shared&collectionType=Course

Exercise 10 :

Module name: Advanced GANs
Exercise:Demonstration of GAN.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013115545666428928 1901_shared?collectionId=lex_auth_0127481425493114885 9_shared&collectionType=Course

Exercise 11:

Module name : Capstone project
Exercise : Complete the requirements given in capstone project
Description: In this capstone, learners will apply their deep learning knowledge and expertise to a real world challenge.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013119291805696000651_shared?collectionId=lex_auth_0127481425493114885 9_shared&collectionType=Course

Exercise 12:

Module name : Capstone project
Exercise : Complete the requirements given in capstone project
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013119291805696000651_shared?collectionId=lex_auth_0127481425493114885 9_shared&collectionType=Course

Reference Books:

1. Goodfellow, I., Bengio,Y., and Courville, A., Deep Learning, MIT Press, 2016.
2. Bishop, C., M., Pattern Recognition and Machine Learning, Springer, 2006.
3. Navin Kumar Manaswi, “Deep Learning with Applications Using Python”, Apress, 2018.

Hardware and software configuration:

Experimental Environment	**Configuration Instructions**	
Hardware Environment	CPU	Intel® Core ™ i7-6700 CPU 4GHz
	GPU	Nvidia GTX 750, 4GB
	Memory	8 GB
Software Environment	Operating System	Ubuntu 14.04, 64 bit
	Programming Environment	Tensorflow deep learning framework and Python language

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Web Links: [Courses mapped to Infosys Springboard platform]

1. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_012782105116811264219_shared/contents [Introduction to Deep Learning]
2. https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013119291805696000651_shared [Deep learning for Developers]

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DEPARTMENT OF INFORMATION TECHNOLOGY

IV Year – I Semester		L	T	P	C
		0	0	4	2
SECURE CODING TECHNIQUES (Skill Oriented Course)					

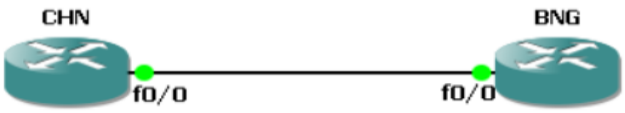
Course Outcomes:
At the end of the Course, Student will be able to:

- Implement Network Configuration
- Install Programming APIs and Implement OWASP design principles while designing a web application
- Write Python script to implement web request
- Understand the importance of security in all phases of SDLC
- Write secure coding using some of the practices in C/C++/Java and Python programming languages

List of Experiments:

EXPERIMENT-1:
1.1 Identification of classes of IPv4 addresses
1.2 Classification of IPv4 Address into public and private
1.3 Create a Sub net
1.4 To determine Network ID, Broadcast ID, Usable Host
Web link:
https://infyspringboard.onwingspan.com/web/en/viewer/pdf/lex_auth_01323957463569203224 0_shared?collectionId=lex_auth_012683751296065536354_shared&collectionType=Course

EXPERIMENT-2:
2.1 Configure the given topology deducing from the outputs following it



2.2 Troubleshoot the below topology with below operations

- Configure the below topology
- Protect the privileged mode by assigning it a password
- Display 'Welcome to BENGALURU' and 'Welcome to MYSURU' as message of the day, while entering the consoles of respective DC's



Web link:
https://infyspringboard.onwingspan.com/web/en/viewer/pdf/lex_auth_01323957463569203224 0_shared?collectionId=lex_auth_012683751296065536354_shared&collectionType=Course

EXPERIMENT-3:
3.1 Explore cryptography, input and output sanitization, error handling, input validation, logging and auditing, and session and exception management.
3.2 Install Programming interfaces (APIs), including those that offer different types of functionality, such

as Microsoft's Crypto API and Python's pycrypto, which both provide cryptographic functions.
3.3 Implement Concurrency, type safety, memory management, configuration parameter management, tokenizing, and sandboxing.
Web Link : https://springboard.percipio.com/courses/57a7fcde-9829-4f12-a9af-cb14eacf673e/videos/6135b4f6-29dc-4d44-98c5-60fcbfa859d0?tab=overview

EXPERIMENT-4:
4.1 Server-side and client-side code
4.2 scan a web app for vulnerabilities using OWASP ZAP and Burp Suite
4.3 explore secure coding using the OWASP ESAPI
Web Link : https://springboard.percipio.com/courses/79fb661e-26b5-4ae5-a008-2cf7d4e63e3c/videos/ccaa5e65-ab27-4bd4-8416-cc262569e96c

EXPERIMENT-5:
Defensive programming for C/C++ including inspections, testing, and input validation
Web Link: https://springboard.percipio.com/courses/f44c02f9-1bcc-11e7-b15b-0242c0a80b07/videos/f44ced50-1bcc-11e7-b15b-0242c0a80b07

EXPERIMENT-6:
6.1 Identify when to use Python, along with a working knowledge of how to write and run a Python script, are beneficial skills in secure coding
6.2 Create variables, containers including lists, dictionaries, and tuples, conditionals, loops, and functions in a Python script.
6.3 Imports and file reading and writing using a PowerShell script. Finally, you'll learn how to use a Python script to make a web request.
Web Link : https://springboard.percipio.com/courses/be99adad-1f65-47a8-a4b5-6b5346072b8e/videos/71397986-c553-419f-a525-105965ca3158

EXPERIMENT-7:
Consider the following code in C language:

```
int main() {
   mybufferOverflow();
}
void mybufferOverflow() {
char stringLine[10];
printf("Enter the text: ");
gets(stringLine);
 printf("You have entered: ", stringLine);
return 0;
}
```

What is a buffer overflow attack that can happen on this code? Rewrite the code prevent buffer overflow.

EXPERIMENT-8:
Create a login page with user name and password which will connect to a database which will store the name and password. You can use Java and HTML code and database as per convenience. Simulate an SQL injection attack. Write embedded SQL code to avoid SQL injection attack. Document how this is taken care in the later versions of Java.



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EXPERIMENT-9:
Create a login page with user name and password which will connect to a database which will store the name and password. You can use Python as a base and database as per convenience. Simulate an SQL injection attack. Write the revised code in Python that will sanitize the inputs and help prevent an SQL injection attack.

EXPERIMENT-10 :
Read and understand the Heartbleed vulnerability. Identify the code in C++ that can simulate this vulnerability and also code to fix it. Document the secure coding practices to take care of this vulnerability and the reasons for it to happen.

EXPERIMENT-11:
Go to OWASP.org. Read about the top 10 vulnerabilities mentioned. Document the following:
a. Name of the vulnerability
b. Causes
c. Mitigation

How will you prevent it in the programming language that you use, if applicable with example codes

EXPERIMENT-12:
Go to http://cwe.mitre.org/top25/archive/2021/2021_cwe_top25.html. Read about the top 10 vulnerabilities mentioned. Document the following:
a. Name of the programming error
b. Causes
c. Mitigation
d. How will you prevent it in the programming language that you use, if applicable with example codes

Web Link : http://cwe.mitre.org/top25/archive/2021/2021_cwe_top25.html

Web Links:
1. https://infyspringboard.onwingspan.com/web/en/viewer/pdf/lex_auth_01323957463569203224 0_shared?collectionId=lex_auth_012683751296065536354_shared&collectionType=Course
2. https://springboard.percipio.com/courses/57a7fcde-9829-4f12-a9af-cb14eacf673e/videos/6135b4f6-29dc-4d44-98c5-60fcbfa859d0?tab=overview
3. https://springboard.percipio.com/courses/79fb661e-26b5-4ae5-a008-2cf7d4e63e3c/videos/ccaa5e65-ab27-4bd4-8416-cc262569e96c
4. https://springboard.percipio.com/courses/f44c02f9-1bcc-11e7-b15b-0242c0a80b07/videos/f44ced50-1bcc-11e7-b15b-0242c0a80b07
5. https://springboard.percipio.com/courses/be99adad-1f65-47a8-a4b5-6b5346072b8e/videos/71397986-c553-419f-a525-105965ca3158
6. https://www.techtarget.com/searchsecurity/definition/buffer-overflow#:~:text=A%20buffer%20overflow%20occurs%20when,adjacent%20to%20the%20destination%20buffer
7. https://www.journaldev.com/34028/sql-injection-in-java
8. https://realpython.com/prevent-python-sql-injection/
9. https://www.securecoding.com/blog/finding-and-fixing-c-vulnerabilities/
10. https://owasp.org/www-project-top-ten/

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IV Year – I Semester	Minor Course	L	T	P	C
		3	0	2	4
SOFTWARE ENGINEERING					

Course Objectives:
This course is designed to acquire the generic software development skill through various stages of software life cycle and also to ensure the quality of software through software development with various protocol based environment

Course Outcomes:
Students taking this subject will gain software engineering skills in the following areas:

- Ability to transform an Object-Oriented Design into high quality, executable code
- Skills to design, implement, and execute test cases at the Unit and Integration level
- Compare conventional and agile software methods
- Prepare SRS document, design document, test cases and software configuration management and risk management related document.
- Develop function oriented and object oriented software design using tools like rational rose.
- Use modern engineering tools necessary for software project management, estimations, time management and software reuse
- Generate test cases for software testing

UNIT I:
The Nature of Software, Software Engineering, The Software Process, Software Engineering Practice, Software Myths. A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Technology.

UNIT II:
Agility, Agility and the Cost of Change, Agile Process, Extreme Programming (XP), Other Agile Process Models, A Tool Set for the Agile Process, Software Engineering Knowledge, Core Principles, Principles That Guide Each Framework Activity, Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Requirements Model, Negotiating Requirements, Validating Requirements.

UNIT III:
Requirements Analysis, Scenario-Based Modeling, UML Models That Supplement the Use Case, Data Modeling Concepts, Class-Based Modeling, Requirements Modeling Strategies, Flow-Oriented Modeling, Creating a Behavioral Model, Patterns for Requirements Modelling,.

UNIT IV:
Design within the Context of Software Engineering, The Design Process, Design Concepts, The Design Model, Software Architecture, Architectural Genres, Architectural Styles,
Assessing Alternative Architectural Designs, Architectural Mapping Using Data Flow, Components, Designing Class-Based Components, Conducting Component-Level Design, Component-Level Design for WebApps, Designing Traditional Components, Component- Based Development.

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UNIT V:
The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, Design Evaluation, Elements of Software Qualtiy Assurance, SQA Tasks, Goals & Metrics, Statistical SQA, Software Reliability, A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object-Oriented Software, Test Strategies for WebApps, Validation Testing, System Testing, The Art of Debugging, Software Testing Fundamentals, Internal and External Views of Testing, White-Box Testing, Basis Path Testing.

List of Experiments:
1) Perform the following, for the following experiments:
   i. Do the Requirement Analysis and Prepare SRS
   ii. Draw E-R diagrams, DFD, CFD and structured charts for the project.
1) Course Registration System
2) Students Marks Analyzing System
3) Online Ticket Reservation System
4) Stock Maintenance
5) Draw the UML Diagrams for the problem 1,2, 3, 4.
6) Design the test cases for e-Commerce application (Flipcart, Amazon)
7) Design and Implement ATM system through UML Diagrams.

Text Books:
1) Software Engineering a practitioner's approach, Roger S. Pressman, Seventh Edition, McGraw Hill Higher Education.
2) Software Engineering, Ian Sommerville, Ninth Edition, Pearson.

Reference Books:
1) Software Engineering, A Precise Approach, PankajJalote, Wiley India, 2010.
2) Software Engineering, Ugrasen Suman, Cengage.

e-Resources:
1) https://nptel.ac.in/courses/106/105/106105182/



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MINOR COURSES
PART B

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PART B	Minor Course	L	T	P	C
		3	0	2	4
OBJECT ORIENTED PROGRAMMING THROUGH C++					

Course Objectives:

- Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects
- Understand dynamic memory management techniques using pointers, constructors, destructors
- Describe the concept of function overloading, operator overloading, virtual functions and polymorphism
- Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming
- Demonstrate the use of various OOPs concepts with the help of programs

Course Outcomes:

By the end of the course, the student

- Classify object oriented programming and procedural programming
- Apply C++ features such as composition of objects, operator overloads, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling
- Build C++ classes using appropriate encapsulation and design principles
- Apply object oriented or non-object oriented techniques to solve bigger computing problems

UNIT I

Introduction to C++: Difference between C and C++, Evolution of C++, The Object Oriented Technology, Disadvantage of Conventional Programming, Key Concepts of Object Oriented Programming, Advantage of OOP, Object Oriented Language.

UNIT II

Classes and Objects &Constructors and Destructor: Classes in C++, Declaring Objects, Access Specifiers and their Scope, Defining Member Function, Overloading Member Function, Nested class, Constructors and Destructors, Introduction, Constructors and Destructor, Characteristics of Constructor and Destructor, Application with Constructor, Constructor with Arguments parameterized Constructor, Destructors, Anonymous Objects.

UNIT III

Operator Overloading and Type Conversion & Inheritance: The Keyword Operator, Overloading Unary Operator, Operator Return Type, Overloading Assignment Operator (=), Rules for Overloading Operators, Inheritance, Reusability, Types of Inheritance, Virtual Base Classes- Object as a Class Member, Abstract Classes, Advantages of Inheritance, Disadvantages of Inheritance.

UNIT IV

Pointers & Binding Polymorphisms and Virtual Functions: Pointer, Features of Pointers, Pointer Declaration, Pointer to Class, Pointer Object, The this Pointer, Pointer to Derived Classes and Base Class, Binding Polymorphisms and Virtual Functions, Introduction, Binding in C++, Virtual Functions, Rules for Virtual Function, Virtual Destructor.

UNIT V

Generic Programming with Templates & Exception Handling: Definition of class Templates, Normal Function Templates, Over Loading of Template Function, Bubble Sort Using Function Templates, Difference between Templates and Macros, Linked Lists with Templates, Exception Handling, Principles of Exception Handling, The Keywords try throw and catch, Multiple Catch Statements, Specifying Exceptions.

Overview of Standard Template Library, STL Programming Model, Containers, Sequence Containers, Associative Containers, Algorithms, Iterators, Vectors, Lists, Maps.

List of Experiments:

Exercise -1 (Classes Objects)
Create a Distance class with:
- •feet and inches as data members
- •member function to input distance
- •member function to output distance
- •member function to add two distance objects

1. Write a main function to create objects of DISTANCE class. Input two distances and output the sum.
2. Write a C++ Program to illustrate the use of Constructors and Destructors (use the above program.)
3. Write a program for illustrating function overloading in adding the distance between objects (use the above problem)

Exercise – 2 (Access)
Write a program for illustrating Access Specifiers public, private, protected
1. Write a program implementing Friend Function
2. Write a program to illustrate this pointer
3. Write a Program to illustrate pointer to a class

Exercise -3 (Operator Overloading)
1. Write a program to Overload Unary, and Binary Operators as Member Function, and Non Member Function.
2. Write a c ++ program to implement overloading assignment = operator

Exercise -4 (Inheritance)
Write C++ Programs and incorporating various forms of Inheritance
- i) Single Inheritance
- ii) Hierarchical Inheritance
- iii) Multiple Inheritances
- iv) Multi-level inheritance
- v) Hybrid inheritance

Exercise -5(Templates, Exception Handling)
1. Write a C++ Program to illustrate template class
2. Write a Program for Exception Handling Divide by zero
3. Write a Program to rethrow an Exception

Exercise -6
1. Write a C++ program illustrating user defined string processing functions using pointers (string length, string copy, string concatenation)
2. Write a C++ program illustrating Virtual classes & virtual functions.
3. Write C++ program that implement Bubble sort, to sort a given list of integers in ascending order

Text Books:
1) A First Book of C++, Gary Bronson, Cengage Learning.
2) The Complete Reference C++, Herbert Schildt, TMH.

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Reference Books:

1) Object Oriented Programming C++, Joyce Farrell, Cengage.
2) C++ Programming: from problem analysis to program design, DS Malik, Cengage Learning
3) Programming in C++, Ashok N Kamthane, Pearson 2nd Edition

e- Resources:

1) https://nptel.ac.in/courses/106/105/106105151/
2) https://github.com/topics/object-oriented-programming

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DEPARTMENT OF INFORMATION TECHNOLOGY

PART B	Minor Course	L	T	P	C
		3	0	2	4
DATA ANALYTICS USING PYTHON					

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PART B	Minor Course	L	T	P	C
		4	0	0	4
ARTIFICIAL INTELLIGENCE					

Course Objectives: The student will be able to

- Know the methodology of Problem solving
- Implement basic AI algorithms
- Design and carry out an empirical evolution of different algorithms on a problem formalization

Course Outcomes (COs): At the end of the course, student will be able to

- Understand the fundamental concepts in Artificial Intelligence
- Analyze the applications of search strategies and problem reductions
- Apply the mathematical logic concepts.
- Develop the Knowledge representations in Artificial Intelligence.
- Explain the Fuzzy logic systems.

UNIT I:
Introduction to artificial intelligence: Introduction ,history, intelligent systems, foundations of AI, applications, tic-tac-tie game playing, development of AI languages, current trends in AI.

UNIT II:
Problem solving: state-space search and control strategies: Introduction, general problem solving, characteristics of problem
Search Strategies: exhaustive searches, heuristic search techniques, iterative-deepening A*, constraint satisfaction

UNIT III:
Logic concepts: Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, predicate logic

UNIT IV:
Knowledge representation: Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR
Advanced knowledge representation techniques: Introduction, conceptual dependency theory, script structure.

UNIT V:
Expert system and applications: Introduction phases in building expert systems, expert system versus traditional systems, rule-based expert systems blackboard systems truth maintenance systems, application of expert systems, list of shells and tools.

Text Books:

1. Artificial Intelligence, Saroj Kaushik, CENGAGE Learning,
2. Artificial intelligence, A modern Approach , 2nd ed, Stuart Russel, Peter Norvig, PEA
3. Artificial Intelligence, Rich, Kevin Knight, Shiv Shankar B Nair, 3rd ed, TMH
4. Introduction to Artificial Intelligence, Patterson, PHI

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Reference Books:

1. Artificial intelligence, structures and Strategies for Complex problem solving, -George F Lugar, 5th ed, PEA
2. Introduction to Artificial Intelligence, Ertel, Wolf Gang, Springer
3. Artificial Intelligence, A new Synthesis, Nils J Nilsson, Elsevier

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PART B	Minor Course	L	T	P	C
		3	0	2	4
UNIX AND SHELL PROGRAMMING					

Course Objectives:
Understating the shell commands, shell programming, system calls of files and processes, signals, inter-process communication concepts and programming, TCP and UDP.

Course Outcomes: After finishing this course student will be able to:

- Gain good knowledge on Unix commands and awareness of shell programming
- Know about different system calls for files and directories
- Ability to know the working of processes and signals
- Application of client server program for IPC
- Knowledge about socket programming

UNIT-I:
Introduction, Architecture of unix, Responsibilities of shell, unix file system, vi editor. **Unix commands**: Some Basic Commands, file utilities, process utilities, text processing utilities, network utilities, disk utilities, backup utilities , Security by file permissions.

UNIT-II:
Shell Programming: shell variables, The Export command, The Profile File a Script Run During starting, The First Shell Script, The read command, Positional Parameters, The $? Variable , Knowing the exit Status- More about the Set Command, The Exit command, Branching Control Structures, Loop Control Structures, The Continue and Break Statement- The Expr Command, Performing Integer Arithmetic- Real Arithmetic in Shell Programs- The here Document(<<), The Sleep Command, Debugging Scripts, The Script command, The Eval command, The Exec Command, Sample programs.

UNIT-III:
Files - Introduction, file descriptors, open, creat, read, write, close, lseek, dup2, file status information-stat family, file and record locking- fcntl function, file permissions - chmod, fchmod, file ownership-chown, lchown, links-soft and hard links-symlink, link, unlink.

UNIT IV:
Directories-Creating, removing and changing Directories-mkdir, rmdir, chdir, obtaining current working directory-getcwd, Directory contents, Scanning Directories-opendir, readdir, closedir, rewinddir functions.

UNIT V:
Process Control: process identifiers, fork function, vfork function, exit function, wait and waitpid functions, exec functions, user identification. **Signals**: signal handling using signal function, kill and raise, alarm, pause, abort and sleep functions.

List of Experiments:

1)a) Study of Unix/Linux general purpose utility command list: man,who,cat, cd, cp, ps, ls, mv, rm, mkdir, rmdir, echo, more, date, time, kill, history, chmod, chown, finger, pwd, cal, logout, shutdown.
b) Study of vi editor
c) Study of Bash shell, Bourne shell and C shell in Unix/Linux operating system
d) Study of Unix/Linux file system (tree structure)
e)Study of .bashrc, /etc/bashrc and Environment variables.

2)Write a C program that makes a copy of a file using standard I/O, and system calls
3)Write a C program to emulate the UNIX ls –l command.
4)Write a C program that illustrates how to execute two commands concurrently with a command pipe.
Ex: - ls –l | sort

5) Implementation of fork (), wait (), exec() andexit (), System calls

Text Books:

1. Unix the ultimate guide, 3rd edition, Sumitabha Das, TMH.
2. Advanced programming in the Unix environment by W. Richard Stevens.
3. Unix network programming by W. Richard Stevens.

Reference Books:

1. Introduction to Unix and shell programming, Venkateshmurhty
2. Unix and shell programming by B.M. Harwani, OXFORD university press.

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PART B	Minor Course	L	T	P	C
		4	0	0	4
CLOUD COMPUTING					

Course Objectives:

- To explain the evolving computer model caned cloud computing.
- To introduce the various levels of services that can be achieved by cloud.
- To describe the security aspects in cloud.
- To motivate students to do programming and experiment with the various cloud computing environments.

Course Outcomes: At the end of the course, student will be able to

- Illustrate the key dimensions of the challenge of Cloud Computing
- Classify the Levels of Virtualization and mechanism of tools.
- Analyze Cloud infrastructure including Google Cloud and Amazon Cloud.
- Create Combinatorial Auctions for cloud resource and design scheduling algorithms for computing cloud
- Assess control storage systems and cloud security, the risks involved its impact and develop cloud application

UNIT I:
Systems Modeling, Clustering and Virtualization: Scalable Computing over the Internet-The Age of Internet Computing, Scalable computing over the internet, Technologies for Network Based Systems, System models for Distributed and Cloud Computing, , Performance, Security and Energy Efficiency

UNIT II:
Virtual Machines and Virtualization of Clusters and Data Centers: Implementation Levels of Virtualization, Virtualization Structures/ Tools and Mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data-Center Automation.

UNIT III:
Cloud Platform Architecture: Cloud Computing and Service Models, Public Cloud Platforms, Service Oriented Architecture, Programming on Amazon AWS and Microsoft Azure

UNIT IV:
Cloud Resource Management and Scheduling: Policies and Mechanisms for Resource Management, Applications of Control Theory to Task Scheduling on a Cloud, Stability of a Two Level Resource Allocation Architecture, Feedback Control Based on Dynamic Thresholds. Coordination of Specialized Autonomic Performance Managers, Resource Bundling, Scheduling Algorithms for Computing Clouds-Fair Queuing, Start Time Fair Queuing.

UNIT V:
Storage Systems: Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system.

Text Books:

1. Distributed and Cloud Computing, Kai Hwang, Geoffry C. Fox, Jack J. Dongarra MK Elsevier.
2. Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier.

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Reference Books:

4. Cloud Computing, A Hands on approach, ArshadeepBahga, Vijay Madisetti, University Press
5. Cloud Computing, A Practical Approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH
6. Mastering Cloud Computing, Foundations and Application Programming, Raj Kumar Buyya, Christen vecctiola, S Tammaraiselvi, TMH



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Suggested Courses for Honors Program

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II Year - II Semester	Honors Course	L	T	P	C
		4	0	0	4
MATHEMATICS FOR MACHINE LEARNING (AI & ML)					

Course Objectives:
The main objectives of this course is to make student understand and apply the basic mathematical concepts that are essential for machine learning algorithms

Course Outcomes:
By the end of the course, the student will be able to
- understand the basic notions of machine learning and of the related basic mathematical tools;
- comprehend the basic concepts and techniques of convex optimization
- have a good knowledge of the statistical and computational properties of some well known machine learning algorithms;
- implement machine learning algorithms on synthetic and real data sets using mathematical concepts like linear algebra, probability and calculus

UNIT-I
Linear Algebra: Systems of Linear Equations, Matrices, Solving Systems of Linear Equations, Vector Spaces, Linear Independence, Basis and Rank, Linear Mappings, Affine Spaces

UNIT-II
Analytic Geometry: Norms, Inner Products, Lengths and Distances, Angles and Orthogonality, Orthonormal Basis, Orthogonal Complement, Inner Product of Functions, Orthogonal Projections, Rotations

UNIT-III
Matrix Decompositions: Determinant and Trace, Eigenvalues and Eigenvectors, Cholesky Decomposition, Eigendecomposition and Diagonalization, Singular Value Decomposition, Matrix Approximation, Matrix Phylogeny

UNIT-IV
Vector Calculus : Differentiation of Univariate Functions, Partial Differentiation and Gradients, Gradients of Vector-Valued Functions, Gradients of Matrices, Useful Identities for Computing Gradients, Backpropagation and Automatic Differentiation, Higher-Order Derivatives, Linearization and Multivariate Taylor Series

UNIT-V
Probability and Distributions: Construction of a Probability Space, Discrete and Continuous Probabilities, Sum Rule, Product Rule, and Bayes' Theorem, Summary Statistics and Independence, Gaussian Distribution, Conjugacy and the Exponential Family, Change of Variables/Inverse Transform
Continuous Optimization: Optimization Using Gradient Descent, Constrained Optimization and Lagrange Multipliers, Convex Optimization

Text Books:
1. "Mathematics for Machine Learning", Marc Peter Deisenroth, A. Aldo Faisal and Cheng Soon Ong, Cambridge University Press.
2. The Elements of Statistical Learning: Data Mining, Inference, and Prediction, 2nd Edition, Trevor Hastie, Robert Tibshirani, Jerome Friedman, Springer 2017.

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Reference Books:

1. Machine Learning: An Applied Mathematics Introduction, Paul Wilmott, Panda Ohana Publishing 2019.

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	Honors Course	L	T	P	C
		4	0	0	4
TEXT MINING AND TIME SERIES ANALYSIS (AI & ML)					

Course Objectives: This course will cover the major techniques for mining and analyzing text data to discover interesting patterns, extract useful knowledge, and support decision making, with an emphasis on statistical approaches that can be generally applied to arbitrary text data in any natural language with no or minimum human effort. Develop the skills needed to do empirical research in fields operating with time series data sets. The course aims to provide students with techniques and receipts for estimation and assessment of quality of economic models with time series data.

Course Outcomes:
After completing the course Student will be able to:

- Student will be aware of fundamental concepts of text mining, unsupervised information extraction.
- Student will be aware of text clustering algorithms like feature selection, distance-based clustering and latent semantic indexing.
- Student will be aware of Text classification algorithm and text mining techniques.
- Student should aware of all the characteristics of time series and measures of dependencies.
- Student will be able to understand the ARIMA Models.

UNIT I:
Introduction to Text Mining: Introduction, Algorithms for Text Mining, Information Extraction from Text: Introduction, Named Entity Recognition, Relation Extraction, Unsupervised Information Extraction. Text Summarization Techniques: Extractive Summarization, Topic Representation Approaches, Influence of Context, Indicator Representation and Machine Learning for Summarization.

UNIT II:
Text Clustering Algorithms: Introduction, Feature Selection and Transformation Methods for Text Clustering, Distance-Based Clustering Algorithms, Word and Phrase-based Clustering, Probabilistic Document Clustering and Topic Modelling. Dimensionality Reduction and Topic Modelling: Latent Semantic Indexing, Topic Models and Dimension Reduction.

UNIT III:
Text Classification Algorithms: Introduction, Feature Selection for Text Classification, Decision Tree Classifiers, Rule-based Classifier, Probabilistic and Naïve Bayes Classifiers, Linear Classifier, Proximity-based Classifier, Meta-Algorithms for Text Classification, Probabilistic Models for Text Mining: Mixture models, Stochastic Processes in Bayesian Nonparametric Models, Graphical Models.

UNIT IV:
Characteristics of Time Series: Introduction, Nature of Time Series Data, Time Series Statistical Models, Measures of Dependence: Autocorrelation and Cross-Correlation, Stationary Time Series, Time Series Regression and Exploratory Data Analysis: Classical Regression, Exploratory Data Analysis, Smoothing.

UNIT V:
ARIMA Models: Introduction, Autoregressive Moving Average Models, Difference Equations, Autocorrelation and Partial Autocorrelation, Building ARIMA Models, Multiplicative Seasonal ARIMA Models, Spectral Analysis and Filtering: Cyclical Behaviour and Periodicity, Spectral Density, Periodogram and Discrete Fourier Transform, Nonparametric and Parametric Spectral Estimation, Linear Filters, Dynamic Fourier Analysis and Wavelets.

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Text Books:

1. Charu C. Aggarwal, Chengxing Zhai, "Mining Text Data", Kluver Academic Publishers, Springer, 2012.
2. Robert H. Shumway and David S. Stoffer, "Time Series Analysis and Its Applications with R Examples", Springer, 2016.

Reference Books:

1. James D. Hamilton, Time Series Analysis, Princeton University Press, 2004.
2. Avishek Pal and PKS Prakash, Practical Time Series Analysis, Birmingham - Mumbai, 2017.
3. Box, G.E.P., G.M. Jenkins and G.C. Reinsel. n Time Series Analysis, Forecasting, and Control, 3rd ed. Englewood Cliffs, NJ: Prentice Hall, 1994.
4. Chan, N.H. Time Series: Applications to Finance. 2002, New York: Wiley.
5. Fuller, W.A. Introduction to Statistical Time Series, 2nd ed. New York: Wiley, 1996.

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DEPARTMENT OF INFORMATION TECHNOLOGY

	Honors Course	L	T	P	C
		4	0	0	4
NATURAL LANGUAGE PROCESSING (AI & ML)					

Course Objectives:

- This course introduces the fundamental concepts and techniques of natural language processing (NLP).
- Students will gain an in-depth understanding of the computational properties of natural languages and the commonly used algorithms for processing linguistic information.
- The course examines NLP models and algorithms using both the traditional symbolic and the more recent statistical approaches.
- Enable students to be capable to describe the application based on natural language processing and to show the points of syntactic, semantic and pragmatic processing.

Course Outcomes: After completion of this course

- Demonstrate a given text with basic Language features
- To design an innovative application using NLP components
- Explain a rule based system to tackle morphology/syntax of a language
- To design a tag set to be used for statistical processing for real-time applications
- To compare and contrast the use of different statistical approaches for different types of NLP applications.

UNIT I:

Introduction : Origins and challenges of NLP, Language Modeling: Grammar-based LM, Statistical LM, Regular Expressions, Finite-State Automata, English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance.

UNIT II:

Word Level Analysis: Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging, Hidden Markov and Maximum Entropy models.

UNIT III:

Syntactic Analysis : Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar, Dependency Grammar, Syntactic Parsing, Ambiguity, Dynamic Programming parsing, Shallow parsing, Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs, Feature structures, Unification of feature structures

UNIT IV:

Semantics And Pragmatics: Requirements for representation, First-Order Logic, Description Logics, Syntax-Driven Semantic analysis, Semantic attachments, Word Senses, Relations between Senses, Thematic Roles, selectional restrictions, Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods, Word Similarity using Thesaurus and Distributional methods.

UNIT V:

Discourse Analysis And Lexical Resources : Discourse segmentation, Coherence, Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm, Coreference Resolution, Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).

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Text Books:

1. Daniel Jurafsky, James H. Martin, Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.
2. Steven Bird, Ewan Klein and Edward Loper, Natural Language Processing with Python, First Edition, OReilly Media, 2009.

Reference Books:

1. Breck Baldwin, Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015.
2. Richard M Reese, Natural Language Processing with Java, OReilly Media, 2015.
3. Nitin Indurkhya and Fred J. Damerau, Handbook of Natural Language Processing, Second, Chapman and Hall/CRC Press, 2010. Edition
4. Tanveer Siddiqui, U.S. Tiwary, Natural Language Processing and Information Retrieval, Oxford University Press, 2008.

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DEPARTMENT OF INFORMATION TECHNOLOGY

	Honors Course	L	T	P	C
		4	0	0	4
REINFORCEMENT LEARNING (AI & ML)					

Course Objectives:

By the end of the class students should be able to:

- Define the key features of reinforcement learning that distinguishes it from AI and non-interactive machine learning.
- Given an application problem (e.g. from computer vision, robotics, etc), decide if it should be formulated as a RL problem; if yes be able to define it formally (in terms of the state space, action space, dynamics and reward model), state what algorithm (from class) is best suited for addressing it and justify your answer.

Course Outcomes:

By the end of this course, students should be able to do the following:

1. Learn how to define RL problems like Tic-Tac-Toe, Multi-arm.
2. Student will be able to understand the finite markov decision processes.
3. Student will be to Understand Monte Carlo Methods and how it is work with tabular methods to solve classical control problems
4. Student should aware of Eligibility Traces and Understand how to find with approximate solutions.
5. Explore imitation learning tasks and solutions
6. Recognize current advanced techniques and applications in RL

UNIT I:

Reinforcement Learning Problem: Introduction, Elements of Reinforcement Learning, Limitations and Scope, Tic-Tac-Toe, Multi-arm Bandits: *n*-Armed Bandit Problem, Action-Value Methods, Incremental Implementation, Tracking Nonstationary Problem, Optimistic Initial Values, Upper-Confidence-Bound Action Selection, Gradient Bandit, Associative Search.

UNIT II:

Finite Markov Decision Processes: Agent-Environment Interface, Markov Property, Markov Decision Processes, Value Functions, Optimal Value Functions, Optimality and Approximation, Dynamic Programming: Policy- Evaluation, Improvement, Iteration, Value Iteration, Asynchronous Dynamic Programming, Generalized Policy Iteration, Efficiency of Dynamic Programming.

UNIT III:

Monte Carlo Methods: Monte Carlo- Prediction, Estimation of Action Values, Control, Control without Exploring Start, Temporal- Difference learning: TD Prediction, Advantages of TD Prediction Methods, Optimality of TD(0), Sarsa: On-Policy TD Control, Q-Learning, Games, Afterstates.

UNIT IV:

Eligibility Traces: *n*-Step TD Prediction, Forward and Backward View of TD(λ), Equivalences of Forward and Backward Views, saras(λ), Watkin's Q(λ), Off-policy Eligibility Traces using Important Sampling, Variable λ.

UNIT V:

Planning and Learning with Tabular Methods: Models and Planning, Integrating Planning, Acting and Learning, Prioritized Sweeping, Full vs. Sample Backups, Trajectory Sampling, Heuristic Search, Monte Carlo Tree Search.

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Text Book:

1. Rich S. Sutton, Andrew G. Barto, Reinforcement Learning: An Introduction, Second Edition, MIT Press, 2015.
2. Boris Belousov, Hany Abdulsamad, Pascal Klink, Simone parisi, Reinforcement Learning Algorithms: Analysis and Applications, 1st Edition, Springer, 2021.

Reference Books:

1. Phil Winder, Reinforcement Learning: Industrial Applications of Intelligent Agent, 1st Edition, O'Reilly, 2020.
2. Kyriakos G. Vamvoudakis, Yan Wan, Frank, L. Lewis, Derya Cansever, Handbook of Reinforcement Learning and Control, 1st Edition, Springer, 2021.

NPTEL Link: Reinforcement Learning:
https://onlinecourses.nptel.ac.in/noc22_cs34/preview

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II Year - II Semester	Honors Course	L	T	P	C
		4	0	0	4
INTERNET OF THINGS (Systems Engineering)					

Course Objectives:
The main objectives of this course are

- Vision and Introduction to Internet of Things (IoT).
- Understand IoT Market perspective.
- Data and Knowledge Management and use of Devices in IoT Technology.
- Understand State of the Art – IoT Architecture.
- Understand Real World IoT Design Constraints, Industrial Automation and Commercial.

Course Outcomes (COs):
At the end of the course, student will be able to

- Explain in a concise manner how the general Internet as well as Internet of Things work.
- Understand constraints and opportunities of wireless and mobile networks for Internet of Things.
- Use basic sensing and measurement and tools to determine the real-time performance of network of devices.
- Develop prototype models for various applications using IoT technology.

UNIT I:
The Internet of Things: An Overview of Internet of things, Internet of Things Technology, behind IoTs Sources of the IoTs, M2M Communication, Examples of IoTs, Design Principles For Connected Devices Internet Connectivity Principles, Internet connectivity, Application Layer Protocols: HTTP, HTTPS, FTP, Telnet.

UNIT II:
Business Models for Business Processes in the Internet of Things ,IoT/M2M systems LAYERS AND designs standardizations ,Modified OSI Stack for the IoT/M2M Systems, ETSI M2M domains and High-level capabilities ,Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability

UNIT III:
Design Principles for the Web Connectivity for connected-Devices, Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected-Devices.

UNIT IV:
Data Acquiring, Organizing and Analytics in IoT/M2M, Applications /Services /Business Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in the Internet Of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.

UNIT V:
Data Collection, Storage and Computing Using a Cloud Platform for IoT/M2M Applications/Services, Data Collection, Storage and Computing Using cloud platform Everything as a service and Cloud Service Models, IOT cloud-based services using the Xively (Pachube/COSM), Nimbits and other platforms Sensor, Participatory Sensing, Actuator, Radio Frequency Identification, and Wireless, Sensor Network Technology, Sensors Technology, Sensing the World.

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Text Books:

1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education
2. Internet of Things, A.Bahgya and V.Madisetti, Univesity Press,2015

Reference Books:

1. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley
2. Getting Started with the Internet of Things, CunoPfister , Oreilly

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	Honors Course	L	T	P	C
		4	0	0	4
DATA COMMUNICATIONS AND INFORMATION CODING THEORY (Systems Engineering)					

Course Objective:
The objective of this course is to introduce the basic concepts of information theory and coding, including information, source coding, channel model, channel capacity, channel coding and so on.

Course Outcomes:
The students at the end of the course will be able to:

- Understand and explain the basic concepts of information theory, source coding, channel and channel capacity, channel coding and relation among them.
- Describe the real life applications based on the fundamental theory.
- Calculate entropy, channel capacity, bit error rate, code rate, steady-state probability and so on.
- Implement the encoder and decoder of one block code or convolutional code using any program language

UNIT I:
Overview; Basic Concepts - Entropy and Mutual information; Lossless Source Coding – Source entropy rate; Kraft inequality; Huffman code; Asymptotic equipartition property; Universal coding; Noisy Channel Coding - Channel capacity

UNIT II:
Random channel codes; Noisy channel coding theorem for discrete memory-less channels; Typical sequences; Error exponents; Feedback; Continuous and Gaussian channels; Lossy Source Coding - Rate-Distortion functions; Random source codes; Joint source-channel coding and the separation theorem.

UNIT III:
Source coding- Text, Audio and Speech: Adaptive Huffman Coding, Arithmetic Coding, LZW algorithm – Audio: Perceptual coding, Masking techniques, Psychoacoustic model, MEG Audio layers I,II,III, Dolby AC3 - Speech: Channel Vocoder, Linear Predictive Coding

UNIT IV:
Source coding- Image and Video: Image and Video Formats – GIF, TIFF, SIF, CIF, QCIF – Image compression: READ, JPEG – Video Compression: Principles-I,B,P frames, Motion estimation, Motion compensation, H.261, MPEG standard

UNIT V:
Error control coding- Block codes: Definitions and Principles: Hamming weight, Hamming distance, Minimum distance decoding - Single parity codes, Hamming codes, Repetition codes - Linear block codes, Cyclic codes - Syndrome calculation, Encoder and decoder – CRC Error control coding

Text books:

1. Mark Kelbert(Author), Yuri Suhov, Information Theory and Coding by Example, Cambridge University Press,2013



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Reference books:

1. Simon Haykin and Michael Moher, Communication Systems, 5th Edition, Wiley, 2010
2. T.M. & Thomas, J.A. (2006). Elements of information theory. New York: Wiley.
3. Ad´amek, Foundations of coding, Wiley Interscience, 1991.
4. T. M. Cover and J. A. Thomas, Elements of information theory, Wiley, 1991.

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	Honors Course	L	T	P	C
		4	0	0	4
SERVICE ORIENTED ARCHITECTURES (Systems Engineering)					

Course Objectives:

- To gain understanding of the basic principles of service orientation
- To learn service oriented analysis techniques
- To learn technology underlying the service design
- To learn the concepts such as SOAP, Registering and Discovering Services.

Course Outcomes: At the end of this course, students are expected to gain the following learning:

1. Get the foundations and concepts of service based computing
2. Advocate the importance and means of technology alignment with business
3. Understanding the basic operational model of web services,
4. Gain the knowledge of key technologies in the service oriented computing arena
5. Apply and practice the learning through a real or illustrative project/case study.

UNIT I

Software Architecture: Need for Software Architecture**,** Objectives of Software Architecture, Types of Information Technology (IT) Architecture, Architectural Patterns and Styles

Architecting Process for Software Applications: Architectural Considerations, Architecting Process for Software Applications, Level 0: High-Level Architecture, Level 1: Solution Architecture Detailed Design

UNIT II

SOA and MSA Basics: Service Orientation in Daily Life, Evolution of SOA and MSA Service-oriented Architecture and Microservices architecture –Drivers for SOA, Dimensions of SOA, Conceptual Model of SOA, Standards And Guidelines for SOA, Emergence of MSA

Service-Oriented Architecture: Considerations for Enterprise-wide SOA, Strawman Architecture for Enterprise-wide SOA, Enterprise SOA Reference Architecture, Object-oriented Analysis and Design (OOAD) Process,Service-oriented Analysis and Design (SOAD) Process

UNIT III

Service-Oriented Applications: Considerations for Service-oriented Applications, Patterns for SOA, Pattern-based Architecture for Service-oriented Applications**,** Composite Applications, Composite Application Programming Model

Service-Oriented Analysis and Design: Need for Models, Principles of Service Design Non-functional Properties for Services, Design of Activity Services (or Business Services) Design of Data Services, Design of Client Services, Design of Business Process Services

UNIT IV

Microservices Architecture:

Trend in SOA – Microservices Architecture (MSA): Services Model for Cloud and Mobile Solutions, API Adoption on the Rise, Challenges and Takeways from SOA Implementations Architecture Trend – Microservices Architecture, Microservices Architecture in Action

Cloud and MSA: Cloud Services, Hybrid Cloud Services, Considerations for Hybrid Cloud Services, Cloud Services and MSA, MSA for SMAC Solutions

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UNIT V

Mobile and MSA: Mobile Technologies, Types of Mobile Applications, MSA for mobile solutions Case Study: SOA – Loan Management System (LMS) PoC, MSA – APIary PoC

Text Book:

1. Shankar Kambhampaty, Service - Oriented Architecture & Microservices Architecture, 3ed: For Enterprise, Cloud, Big Data and Mobile , ISBN: 9788126564064,Wiley.
2. Mark Richards, Microservices vs Service-Oriented Architecture, O'Reilly Media, Inc., 2016.

Reference Books:

1. Thomas Erl, Services-Oriented Architecture: Concepts, Technology and Design, Prentice Hall, 2005.
2. Guido Schmutz, Peter Welkenbach, Daniel Liebhart, Service-Oriented Architecture: An Integration Blueprint, Packt Publisher, 2010.

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	Honors Course	L	T	P	C
		4	0	0	4
DESIGN OF SECURE PROTOCOLS (Systems Engineering)					

Course Objectives:
The main objective of this course is that to explore various protocols and design of various protocols with deeper security.

Course Outcomes:
By the end of the course Student will
- Get the exposure to various protocols.
- Gain knowledge on various secure mechanisms through set of protocols.
- Efficiently design new set of protocols.
- Learn Security issues and overcome means with protocols.

UNIT – I:
OSI:ISO Layer Protocols: Application Layer Protocols, TCP/IP, HTTP, SHTTP, LDAP, MIME, POP & POP3, RMON, SNTP, SNMP. Presentation Layer Protocols, Light Weight Presentation Protocol Session layer protocols.

UNIT – II:
RPC protocols, transport layer protocols, ITOT, RDP, RUDP, TALI, TCP/UDP, compressed TCP. Network layer Protocols, routing protocols, border gateway protocol-exterior gateway protocol, internet protocol IPv4, IPv6, Internet Message Control Protocol, IRDP Transport Layer Security, TSL, SSL, DTLS

UNIT – III:
Data Link layer Protocol, ARP, In ARP, IPCP, IPv6CP, RARP, SLIP .Wide Area and Network Protocols, ATM protocols, Broadband Protocols, Point to Point Protocols, Other WAN Protocols, security issues.

UNIT – IV:
Local Area Network and LAN Protocols, ETHERNET Protocols, VLAN protocols, Wireless LAN Protocols, Metropolitan Area Network Protocol, Storage Area Network and SAN

UNIT – V:
Protocols, FDMA, WIFI and WIMAX Protocols, security issues. Mobile IP, Mobile Support Protocol for IPv4 and IPv6, Resource Reservation Protocol. Multicasting Protocol, VGMP, IGMP, MSDP .Network Security and Technologies and Protocols, AAA Protocols, Tunneling Protocols, Secured Routing Protocols, GRE- Generic Routing Encapsulation, IPSEC– Security.

Text Books:
1. Jawin: "Networks Protocols Handbook", 3rd Edition, Jawin Technologies Inc., 2005.
2. Bruce Potter and Bob Fleck : "802.11 Security", 1st Edition, O'Reilly Publications, 2002.

Reference Books:
1. Ralph Oppliger :"SSL and TSL: Theory and Practice", 1st Edition, Arttech House, 2009.
2. Lawrence Harte: "Introduction to CDMA- Network services Technologies and Operations", 1st Edition, Althos Publishing, 2004.
3. Lawrence Harte: "Introduction to WIMAX", 1st Edition, Althos Publishing, 2005

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	Honors Course	L	T	P	C
		4	0	0	4
NETWORK CODING (Systems Engineering)					

Course Objectives:

- Students will gain the understanding of core network programming by using sockets and transport layer protocols like TCP and UDP
- Students will gain the understanding of inter process communication and implementation of different forms of IPC in client-server environment
- Students will get an exposure to various application layer protocols which are designed using sockets and transport layer protocols

Course Outcomes:

By the end of the course, the student will be able to

- Explain the client-server paradigm and socket structures.
- Describe the basic concepts of TCP sockets and TCP echo client-server programs.
- Discuss the UDP sockets and UDP echo client-server programs.
- Explain Socket options and ability to understand IPC
- Apply the applications of sockets and demonstrate skill to design simple applications like FTP, TELNET etc.

UNIT-I:

Introduction to Network Programming: OSI model, transport layer protocols: TCP, UDP and SCTP, network architecture: client-server and peer-to-peer systems, Sockets-socket Address structures: IPv4, IPv6 and Generic-value result arguments, Byte ordering functions, Byte manipulation functions, Address conversion functions

UNIT-II:

TCP: introduction to TCP, TCP connection establishment and termination TIME_WAIT State. Elementary TCP sockets, Socket, connect, bind, listen, accept, fork, exec function, concurrent servers, Close function, read and write functions

UNIT-III:

TCP echo client server program, getsockname and getpeername functions I/O multiplexing: I/O models, Select function, TCP echo server using select function, shutdown function, Poll function

UNIT-IV:

UDP: Introduction to UDP, difference between TCP and UDP, recvfrom( ) and sendto( ) functions, UDP echo client server program, UDP echo client server using select function. Socket Options: IPv4 socket options, IPv6 socket options

UNIT-V:

Socket Options: Generic socket options, TCP socket options. IPC: Introduction to IPC, forms of IPC, UNIX kernel support for pipes, FIFO, message queues, semaphores and shared memory Network programming concepts Implementation: FTP, ping, arp, SMTP, TELNET



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Text Books:

1. Unix Network programming, the socket networking API, W.Richard Stevens, bill fenner, Andrew m.rudoff ,PHI.

References Books:

1. Advanced programming in the UNIX environment, W.Richard Stevens, pearson education

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II Year - II Semester	Honors Course	L	T	P	C
		4	0	0	4
PRINCIPLES OF CYBER SECURITY (Information Security)					

Course Objectives:
- To learn threats and risks within context of the cyber security architecture.
- Student should learn and Identify security tools and hardening techniques.
- To learn types of incidents including categories, responses and timelines for response.

Course Outcomes: At the end of the course, student will be able to
- Apply cyber security architecture principles.
- Demonstrate the risk management processes and practices.
- Appraise cyber security incidents to apply appropriate response
- Distinguish system and application security threats and vulnerabilities.
- Identify security tools and hardening techniques

UNIT–I:
Introduction to Cyber Security-Cyber security objectives, roles, differences between information security and cyber security, Cyber security principles-confidentiality, integrity, availability, authentication and non repudiation

UNIT–II:
Information Security within Lifecycle Management-Lifecycle management landscape, Security architecture processes, Security architecture tools, Intermediate lifecycle management concepts, **Risks & Vulnerabilities**-Basics of risk management, Operational threat environments, Classes of attacks

UNIT–III:
Incident Response-Incident categories, Incident response, Incident recovery, **Operational security protection**-Digital and data assets, ports and protocols, Protection technologies, Identity and access Management, configuration management

UNIT–IV:
Threat Detection and Evaluation Monitoring-Vulnerability management, Security logs and alerts, Monitoring tools and appliances, **Analysis**-Network traffic analysis, packet capture and analysis

UNIT–V:
Introduction to backdoor System and security-Introduction to metasploit, backdoor, demilitarized zone (DMZ), Digital signature, Brief study on Harding of operating system.

Text Books:
1. NASSCOM: Security Analyst Student Hand Book, Dec 2015
2. Information Security Management Principles, Updated Edition, David Alexander, Amanda Finch, David Sutton, BCS publishers, June 2013

Reference Books:
1. Cyber Security Fundamentals-Cyber Security, Network Security and Data Governance Security, 2nd Edition, ISACA Publishers, 2019

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	Honors Course	L	T	P	C
		4	0	0	4
COMPUTATIONAL NUMBER THEORY (Information Security)					

Course Objectives: This course will focus on designing efficient algorithms (and providing complexity analysis) for the most important problems from number theory, with major applications in coding theory and cryptography.

Course Outcomes:
Upon completing the course the student will be able to

- understand with basics of number theory and its applications.
- demonstrate the arithmetic of finite fields, polynomials.
- analyze the elliptic curves, testing and factorization.
- Student will be able to solve the discrete logarithms and large sparse linear systems.
- Student will be able to apply the skills for writing programs of cryptography algorithms.

UNIT I:
Arithmetic of Integers: Basic Arithmetic Operations, GCD, Congruences and Modular Arithmetic, Linear Congruences, Polynomial Congruences, Quadratic Congruences, Multiplicative Orders, Continued Fractions, Prime Number Theorem and Riemann Hypothesis, Running Times of Arithmetic Algorithms.

UNIT II:
Arithmetic of Finite Fields: Existence and Uniqueness of Finite Fields, Representation of Finite Fields, Implementation of Finite Field Arithmetic, Arithmetic of Polynomials: polynomials over Finite Fields, Finding Roots of Polynomials over Finite Fields, Factoring Polynomials over Finite Fields, Properties of Polynomials with Integer Coefficients, Factoring Polynomials with Integer Coefficients.

UNIT III:
Arithmetic of Elliptic Curves: Elliptic Curve, Elliptic-Curve Group, Elliptic Curve over Finite Fields, Pairing on Elliptic Curves, Elliptic-Curve Point Counting, Primality Testing: Introduction, Probabilistic Primality Testing, Deterministic Primality Testing, Primality Testing for Number of Special Forms.

UNIT IV:
Integer Factorization: Trial Division, Pollard's Rho Method, Pollard's *p-1* Method, Dixon's Method, CFRAC Method, Quadratic Sieve Method, Cubic Sieve Method, Elliptic Curve Method, Number-Field Sieve Method, Discrete Logarithms: Square-Root Methods, Algorithms: Prime Fields, Fields of Characteristic Two, General Extension Fields, Elliptic Curves(ECDLP).

UNIT V:
Large Sparse Linear Systems: Structured Gaussian Elimination, Lanczos Method, Wiedemann Method, Block Metods

Text Books:
1. Abhijit Das, Computational Number Theory, CRC Hall, 1st Edition, 2013.
2. T. H. Cormen, C. E. Leiserson, R. Rivest and C. Stein, Introduction to Algorithms, Prentice Hall India, 2nd Edition, 2002.

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Reference Books:

1. Victor Shoup, A Computational Introduction to Number Theory and Algebra, 2nd Edition, Cambridge Iniversity Press, 2008.
2. R. Lidl and H. Niederreiter, Introduction to finite fields and their applications, Cambridge University Press, 2021.
3. M. Mignotte, Mathematics for computer algebra, Springer-Verlag, 1992.

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		L	T	P	C
	Honors Course	**4**	**0**	**0**	**4**
CRYPTANALYSIS (Information Security)					

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		L	T	P	C
	Honors Course	**4**	**0**	**0**	**4**
ELLIPTIC CURVE CRYPTOGRAPHY (Information Security)					



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		L	T	P	C
	Honors Course	**4**	**0**	**0**	**4**

INTRODUCTION TO QUANTUM COMPUTING AND QUANTUM CRYPTOGRAPHY
(Information Security)

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	Honors Course	L	T	P	C
		4	0	0	4
PUBLIC KEY INFRASTRUCTURE AND TRUST MANAGEMENT (Information Security)					

Course objectives:
The course is designed to train the graduates in depth understanding of Public Key Cryptography, Public key Infrastructure, security credentials and design new or modify existing cryptographic techniques.

Course Outcomes:
Graduates after completing the course shall gain:

- In depth understanding of Public key cryptography and Infrastructure.
- Ability to design and analyze Public Key cryptographic techniques.
- Ability to solve network security issues in real time applications.
- Ability to take up doctoral level research work in security.

UNIT I:
Public key infrastructure: components and architecture. PKI interoperability, deployment and assessment PKI data structures – certificates, validation, revocation, authentication, cross-certification. Repository, Certification Authority (CA) and Registration Authority (RA), trusted third party, digital certificates.

UNIT II:
PKI Services: Authentication, Integrity and Confidentiality, Mechanisms, Secure Communication, Secure Time Stamping, Non-Repudiation, Privilege Management, Certificate policies, Certificate Authority, Registration Authority.

UNIT III:
Key and Certificate Management: Key/Certificate Life Cycle Management, Certificate Revocation: Periodic Public Mechanisms, performance, Scalability and Timeliness, Multiple Key pairs, Key Pair Uses, Real-World Difficulties, Independent Certificate Management.

UNIT IV:
Trust Models: Strict Hierarchy of Certification Authorities, Distributed Trust Architecture, Web Model, User-Centric Trust, Cross-Certification, Entity Naming, Certificate Path processing, PKI Information Dissemination: Repositories and Techniques, private Dissemination, Public and Repositories, In-Band Protocol Exchange.

UNIT V:
PKI Standards: Introduction, Major Standards Activities, X.509, PKIX, X.500, LDAP, ISO TC68, ANSI X9f, S/MIME, IPsec, TLS, SPKI, OpenPGP, EDIFACT.

Text Books:

1. Carlisle Adams, Steve Lloyd, Understanding Public-Key Infrastructure: Concepts, Standards, and Deployment Considerations, Sams, 1999.
2. John R. Vacca, Public Key Infrastructure, Building Trusted Applications and Web Services, Auerbach Publications, 2004.

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Reference Books:

1. Messaoud Benantar, Introduction to the Public Key Infrastructure for the Internet, Pearson Education, Prentice Hall, 2011.
2. Ashutosh Saxena, Public Key Infrastructure, Tata McGraw Hill.

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	Honors Course	L	T	P	C
		4	0	0	4
INFORMATION SECURITY ANALYSIS AND AUDIT (Information Security)					

Course Objectives:
- Understanding and knowledge of Security Auditing, and introduce the Threats and defense in the systems.
- Acquiring the knowledge on Evidence collection and evaluation techniques.

Course Outcomes:
At the end of the course, student will be able to
- Illustrate the fundamental concepts of information security and systems auditing
- Analyze the latest trend of computer security threats and defense
- Identify security weaknesses in information systems, and rectify them with appropriate security mechanisms
- Explain the security controls in the aspects of physical, logical and operational security control and case studies
- Evaluate the security of information systems

UNIT–I:
Overview of Information System Auditing- Effect of Computers on Internal Controls, Effects of Computers on Auditing, Foundations of information Systems Auditing, Conducting an Information Systems Audit.

UNIT–II:
The management Control Framework-I- Introduction, Evaluating the planning Function, Leading Function, Controlling Function, Systems Development Management Controls, Approaches to Auditing Systems Development, Normative Models of the Systems Development Process, Evaluating the Major phases in the Systems Development Process, Programming Management Controls, Data Resource Management Controls.

UNIT–III:
The Management Control Framework-II- Security Management Controls, Operations management Controls Quality assurance Management Controls, Case Studies.

UNIT–IV:
Evidence Collection- Audit Software, Code Review, Test Data, and Code Comparison, Concurrent Auditing techniques, Interviews, Questionnaires, and Control Flowcharts. Performance Management tools-Case Studies.

UNIT–V:
Evidence Evaluation- Evaluating Asset Safeguarding and Data Integrity, Evaluating System, Effectiveness, Evaluating System Efficiency, Information Systems Audit and Management: Managing the Information Systems Audit Function.

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Text Book:

1. Information Systems Control and Audit, 1st Edition, Ron Weber, Pearson Education, 2013

Reference Book:

1. Information System Audit and Assurance, D P Dube, TMH, New Delhi, 2008

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	Honors Course	L	T	P	C
		4	0	0	4
CLOUD AND IOT SECURITY (Information Security)					

Course Outcomes: At the end of the course, student will be able to

- Discuss about Security Requirements in IoT Architecture
- Explain Random number generation
- Demonstrate Authorization with Publish / Subscribe schemes
- Identify Lightweight and robust schemes for Privacy protection
- Explain about IoT cloud security architecture

UNIT I:

Introduction: Securing Internet of Things: Security Requirements in IoT Architecture, Security in Enabling Technologies, Security Concerns in IoT Applications. Security Architecture in the Internet of Things, Security Requirements in IoT, Insufficient Authentication /Authorization, Insecure Access Control, Threats to Access Control, Privacy, and Availability, Attacks Specific to IoT. Vulnerabilities, Secrecy and Secret-Key Capacity, Authentication/Authorization for Smart Devices, Transport Encryption, Attack, Fault trees

UNIT II:

Cryptographic Fundamentals for IoT: Cryptographic primitives and its role in IoT, Encryption and Decryption, Hashes, Digital Signatures, Random number generation, Cipher suites, key management fundamentals, cryptographic controls built into IoT messaging and communication protocols.

UNIT III:

Identity & Access Management Solutions for IoT: Identity lifecycle, authentication credentials, IoT IAM infrastructure, Authorization with Publish / Subscribe schemes and access control

UNIT IV:

Privacy Preservation and Trust Models for IoT: Concerns in data dissemination, Lightweight and robust schemes for Privacy protection, Trust and Trust models for IoT, self-organizing Things, Preventing unauthorized access.

UNIT V:

Cloud Security for IoT: Cloud services and IoT, offerings related to IoT from cloud service providers, Cloud IoT security controls, enterprise IoT cloud security architecture, New directions in cloud enabled IoT computing

Text Books:

1. Practical Internet of Things Security (Kindle Edition) by Bria Russell, Drew VanDuren

References Books:

1. Securing the Internet of Things, Elsevier
2. Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations

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	Honors Course	L	T	P	C
		4	0	0	4
WEB SECURITY (Information Security)					

Course Objectives:
- Underlying security principles of the web
- Overview of concrete threats against web applications
- Insights into common attacks and countermeasures
- Current best practices for secure web applications

Course Outcomes: At the end of the course, student will be able to
- Demonstrate security concepts, security professional roles, and security resources in the context of systems and security development life cycle
- Justify applicable laws, legal issues and ethical issues regarding computer crime
- Explain the business need for security, threats, attacks, top ten security vulnerabilities, and secure software development
- Apply information security policies, standards and practices, the information security blueprint
- Analyze and describe security requirements for typical web application scenario

UNIT–I:
Introduction-A web security forensic lesson, Web languages, Introduction to different web attacks, Overview of N-tier web applications, Web Servers-Apache, IIS.

UNIT-II:
Securing the Communication Channel- Understanding the dangers of an insecure communication channel. Practical advice on deploying HTTPS, and dealing with the impact on your application, Insights into the latest evolutions for HTTPS deployments.

UNIT–III:
Web Hacking Basics- HTTP & HTTPS URL, Web under the Cover Overview of Java security Reading the HTML source, Applet Security Servlets Security Symmetric and Asymmetric Encryptions, Network security Basics, Firewalls & IDS.

UNIT–IV:
Securely Handling Untrusted Data-Investigation of injection attacks over time, Understanding the cause behind both server-side and client-side injection attacks, Execution of common injection attacks, and implementation of various defenses.

UNIT–V:
Preventing Unauthorized Access-Understanding the interplay between authentication, authorization and session management. Practical ways to secure the authentication process prevent authorization bypasses and harden session management mechanisms, Securing Large Applications, Cyber Graffiti.

Text Books:
1. Web Hacking: Attacks and Defense, Latest Edition , McClure, Stuart, Saumil Shah, and Shreeraj Shah, Addison Wesley, 2003
2. Professional Java Security, 1.3 Edition, Garms, Jess and Daniel Somerfield, Wrox, 2001

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	Honors Course	L	T	P	C
		4	0	0	4
BLOCK CHAIN ARCHITECTURE DESIGN AND USE CASES (Information Security)					

Course Objectives:
By the end of the course, students will be able to

- Understand how block chain systems (mainly Bit coin and Ethereum) work and to securely interact with them,
- Design, build, and deploy smart contracts and distributed applications,
- Integrate ideas from block chain technology into their own projects.

Course Outcomes:
At the end of the course, student will be able to

- Demonstrate the foundation of the Block chain technology and understand the processes inpayment and funding.
- Identify the risks involved in building Block chain applications.
- Review of legal implications using smart contracts.
- Choose the present landscape of Blockchain implementations and Understand Crypto currencymarkets
- Examine how to profit from trading crypto currencies.

UNIT I
Introduction, Scenarios, Challenges Articulated, Blockchain, Blockchain Characteristics, Opportunities Using Blockchain, History of Blockchain.
Evolution of Blockchain : Evolution of Computer Applications, Centralized Applications, Decentralized Applications, Stages in Blockchain Evolution, Consortia, Forks, Public Blockchain Environments, Type of Players in Blockchain Ecosystem, Players in Market.

UNIT II
Blockchain Concepts: Introduction, Changing of Blocks, Hashing, Merkle-Tree, Consensus, Mining and Finalizing Blocks, Currency aka tokens, security on blockchain, data storage on blockchain, wallets, coding on blockchain: smart contracts, peer-to-peer network, types of blockchain nodes, risk associated with blockchain solutions, life cycle of blockchain transaction.

UNIT III
Architecting Blockchain solutions: Introduction, Obstacles for Use of Blockchain, Blockchain Relevance Evaluation Framework, Blockchain Solutions Reference Architecture, Types of Blockchain Applications.
Cryptographic Tokens, Typical Solution Architecture for Enterprise Use Cases, Types of Blockchain Solutions, Architecture Considerations, Architecture with Blockchain Platforms, Approach for Designing Blockchain Applications.

UNIT IV
Ethereum Blockchain Implementation: Introduction, Tuna Fish Tracking Use Case, Ethereum Ecosystem, Ethereum Development, Ethereum Tool Stack, Ethereum Virtual Machine, Smart Contract Programming, Integrated Development Environment, Truffle Framework, Ganache, Unit Testing, Ethereum Accounts, MyEtherWallet, Ethereum Networks/Environments, Infura, Etherscan, Ethereum Clients, Decentralized Application, Metamask, Tuna Fish Use Case Implementation, OpenZeppelin Contracts

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UNIT V

Hyperledger Blockchain Implementation, Introduction, Use Case – Car Ownership Tracking, Hyperledger Fabric, Hyperledger Fabric Transaction Flow, FabCar Use Case Implementation, Invoking Chaincode Functions Using Client Application.

Advanced Concepts in Blockchain: Introduction, InterPlanetary File System (IPFS), Zero-Knowledge Proofs, Oracles, Self-Sovereign Identity, Blockchain with IoT and AI/ML Quantum Computing and Blockchain, Initial Coin Offering, Blockchain Cloud Offerings, Blockchain and its Future Potential.

Text Books:

1) Ambadas, Arshad Sarfarz Ariff, Sham "Blockchain for Enterprise Application Developers", Wiley
2) Andreas M. Antonpoulos, "Mastering Bitcoin: Programming the Open Blockchain" , O'Reilly

Reference Books:

1) Blockchain: A Practical Guide to Developing Business, Law, and Technology Solutions, Joseph Bambara, Paul R. Allen, Mc Graw Hill.
2) Blockchain: Blueprint for a New Economy, Melanie Swan, O'Reilly

e-Resources:

1) https://github.com/blockchainedindia/resources

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II Year - II Semester	Honors Course	L	T	P	C
		4	0	0	4
DATA VISUALIZATION (Data Science)					

Course Objectives:
The main objective of this course is to make it easier to identify patterns, trends and outliers in large data sets

Course Outcomes:
On completion of this course, the student will be able to

- Identify and recognize visual perception and representation of data.
- Illustrate about projections of different views of objects.
- Apply various Interaction and visualization techniques.
- Analyze various groups for visualization.
- Evaluate visualizations

UNIT-I:
Introduction to Data Visualizations and Perception: Introduction of visual perception, visual representation of data, Gestalt principles, Information overload.

UNIT-II :
Visual Representations: Creating visual representations, visualization reference model, visual mapping, visual analytics, Design of visualization applications.

UNIT-III :
Classification of Visualization Systems: Classification of visualization systems, Interaction and visualization techniques misleading, Visualization of one, two and multi-dimensional data, text and text documents.

UNIT-IV :
Visualization of Groups: Visualization of groups, trees, graphs, clusters, networks, software, Metaphorical visualization. Various visualization techniques, data structures used in data visualization.

UNIT-V :
Visualization of Volumetric Data And Evaluation of Visualizations: Visualization of volumetric data, vector fields, processes and simulations, Visualization of maps, geographic information, GIS systems, collaborative visualizations, evaluating visualizations

Text Books:

1. Ward, Grinstein, Keim, Interactive Data Visualization: Foundations, Techniques, and Applications. Natick, 2nd edition,A K Peters, Ltd 2015.

Reference Books:

1. Tamara Munzner,Visualization Analysis & Design ,1st edition,AK Peters Visualization Series 2014
2. Scott Murray,Interactive Data Visualization for the Web ,2nd Edition, 2017

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF INFORMATION TECHNOLOGY

	Honors Course	L	T	P	C
		4	0	0	4
STATISTICAL FOUNDATIONS FOR DATA SCIENCE (Data Science)					

Course Objectives:
The course will introduce the fundamental concepts of probability and statistics required for a program in data science

Course outcomes:
By the end of the course, the student will be able to

- Use the statistical concepts in the field of data science.
- Employ the techniques and methods related to the area of data science in variety of applications.
- Apply logical thinking to understand and solve the problem in context.
- Explore statistical learning methods and their application to modern problems in science, industry, and society.
- Build analytics pipelines for regression problems and classification problems

UNIT I:
Basics of Data Science: Introduction; Typology of problems; Importance of linear algebra, statistics and optimization from a data science perspective; Structured thinking for solving data science problems.

UNIT II:
Probability, Statistics and Random Processes: Probability theory and axioms; Random variables; Probability distributions and density functions (univariate and multivariate); Expectations and moments; Covariance and correlation; Statistics and sampling distributions; Hypothesis testing of means, proportions, variances and correlations; Confidence (statistical) intervals; Correlation functions; White-noise process

UNIT III:
Probabilistic formulations of prediction problems: Plug-in estimators, empirical risk minimization, Linear threshold functions, perceptron algorithm, Risk bounds, Concentration inequalities, Uniform convergence, Rademacher averages; combinatorial dimensions, Convex surrogate losses for classification, Linear regression, Regularization and linear model selection, Feature Selection
Methods, Cross Validation methods.

UNIT IV:
Game-theoretic formulations of prediction problems, High Dimensional methods, Lasso, Ridge Regression, Dimensionality Reduction, Minimax strategies for log loss, linear loss, and quadratic loss, Universal portfolios, Online convex optimization.

UNIT V:
Neural networks: Stochastic gradient methods, Combinatorial dimensions and Rademacher averages, Hardness results for learning, Efficient learning algorithms.

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Text Books:

1. Bendat, J. S. and A. G. Piersol. Random Data: Analysis and Measurement Procedures. 4th Edition. John Wiley & Sons, Inc., NY, USA, 2010
2. Montgomery, D. C. and G. C. Runger. Applied Statistics and Probability for Engineers. 5th Edition. John Wiley & Sons, Inc., NY, USA, 2011.
3. James, G., Witten, D., Hastie, T., Tibshirani, R. An Introduction to Statistical Learning with Applications in R, Springer, 2013.

Reference Books:

1. Hastie, T., Tibshirani, R. and Friedman, J. The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Second Edition, Springer, 2009.

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DEPARTMENT OF INFORMATION TECHNOLOGY

	Honors Course	L	T	P	C
		4	0	0	4
MINING MASSIVE DATA SETS (Data Science)					

Course Objective: The course will discuss data mining and machine learning algorithms for analyzing very large amounts of data. The emphasis will be on MapReduce and Spark as tools for creating parallel algorithms that can process very large amounts of data.

Course Outcomes:
Upon completion of this course, the student will be able to:
- Discuss research directions in Mining Massive Datasets, such as similarity search, streaming data, clustering, and graph mining.
- Analyze policy, focusing on methods for mining massive datasets and potential policy and management applications, by synthesizing and summarizing the current state of the art, and facilitating discussion by posing questions, preliminary conclusions, and ideas to explore.
- Develop a research project relevant to Mining Massive Datasets and produce a report describing the project's background, methods, results, and conclusions.
- Knowledge of basic computer science principles and skills, at a level sufficient to write a reasonably non-trivial computer program.
- Good knowledge of Java and Python will be extremely helpful since most assignments will require the use of Spark

UNIT I:
Data Mining: Data Mining, Statistical Limits on Data Mining, MapReduce: Distributed File Systems, MapReduce, Algorithms Using MapReduce, Extensions to MapReduce.

UNIT II:
Finding Similar Items: Applications of Near-Neighbor Search, Shingling of Documents, Distance Measures, Theory of Locality-Senstive Functions, Applications of LSH Hashing.

UNIT III:
Mining Data Streams: Stream Data Model, Sampling Data in Streams, Filtering Streams, Link Analysis: PageRank, Efficient Computational of PageRank, Link Spam, Hubs and Authorities.

UNIT IV:
Frequent Itemsets: Market-Based Model, Market Based and A-Priori Algorithm, Limited- Pass Algorithms, Clustering: Introduction, Hierarchical Clustering and K-means Algorithm, CURE Algorithm.

UNIT V:
Dimensionality Reduction: Eigenvalues and Eigenvectors, Principal-Component Analysis, CUR Decomposition, Large-Scale Machine Learning: Machine Learning Model, Perceptrons, SVM's, Nearest Neighbors.

Text Books:
1. Jure Leskovec, Anand Rajaraman, Jeffery D. ULLman, Mining of Massive Datasets, Cambridge University Press, 2014.
2. Pattern Recognition and Machine Learning. Christopher Bishop. Springer-Verlag New York. 2006.

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DEPARTMENT OF INFORMATION TECHNOLOGY

Reference Books:

1. Machine Learning: A Probabilistic Perspective. Kevin Murphy. MIT Press. 2012
2. The Elements of Statistical Learning: Data Mining, Inference, and Prediction. Trevor Hastie, Robert Tibshirani, Jerome Friedman. Springer. 2013

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	Honors Course	L	T	P	C
		4	0	0	4
MEDICAL IMAGE DATA PROCESSING (Data Science)					

Course Objectives:
The course will provide the participants with an up-to-date background in current state-of-the-art in medical imaging and medical image analysis. The aim of the course is to show how to extract, model, and analyze information from medical data and applications in order to help diagnosis, treatment and monitoring of diseases through computer science.

Course Outcomes: At the End of the Course:
1. Student will be able to explain the basic concepts of Medical Imaging Technologies, Systems and Formation Principles.
2. Student will be able to analyze the Medical Image Storage and Processing.
3. Student will be able to visualize the MRI, NMR and Artifacts.
4. Student should expertise the Segmentation and Classification techniques on Medical Image Data.
5. Student will be able to analyze the Nuclear Imaging like PET, SPECT and 3D Images.

UNIT I:
Introduction: Introduction to Medical Imaging Technology, Systems, and Modalities. Brief History, Importance, Applications, Trends, Challenges. Medical Image Formation Principles: X-Ray physics, X-Ray generation, Attenuation, Scattering, Dose Basic Principles of CT, Reconstruction Methods, Artifacts, CT hardware.

UNIT II:
Storage and Processing: Medical Image Storage, Archiving and Communication Systems and Formats Picture archiving and communication system (PACS); Formats: DICOM Radiology Information Systems (RIS) and Hospital Information Systems (HIS). Medical Image Processing, Enhancement, Filtering Basic image processing algorithms Thresholding, contrast enhancement, SNR characteristics; filtering; histogram modeling.

UNIT III:
Visualization: Medical Image Visualization Fundamentals of Visualization, Surface and Volume Rendering/Visualization, Animation, Interaction. Magnetic Resonance Imaging (MRI) Mathematics of MR, Spin Physics, NMR Spectroscopy, Imaging Principles and Hardware, Image Artifacts.
UNIT IV:
Segmentation And Classification: Medical Image Segmentation, Histogram-Based Methods, Region Growing and Watersheds, Markov Random Field Models, Active Contours, Model-Based Segmentation. Multi-Scale Segmentation, Semi-Automated Methods, Clustering-Based Methods, Classification-Based Methods, Atlas-Guided Approaches, Multi-Model Segmentation. Medical Image Registration Intensity-Based Methods, Cost Functions, Optimization Techniques.

UNIT V:
Nuclear Imaging: PET and SPECT Ultrasound Imaging Methods, Mathematical Principles, Resolution, Noise Effect, 3D Imaging, Positron Emission Tomography, Single Photon Emission Tomography, Ultrasound Imaging, Applications. Medical Image Search and Retrieval Current Technology in Medical Image Search, Content-Based Image Retrieval, New Trends: Ontologies, Applications, Other Applications Of Medical Imaging Validation, Image Guided Surgery, Image Guided Therapy, Computer Aided Diagnosis/Diagnostic Support Systems.

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Text Books:

1. Paul Suetens, "Fundamentals of Medical Imaging", Second Edition, Cambridge University Press, 2009.
2. J. Michael Fitzpatrick and Milan Sonka, "Handbook of Medical Imaging, Volume 2. Medical Image Processing and Analysis", SPIE Publications, 2009.

Reference Books:

1. Kayvan Najarian and Robert Splinter, "Biomedical Signal and Image Processing", Second Edition, CRC Press, 2005.
2. Geoff Dougherty, "Digital Image Processing for Medical Applications", First Edition, Cambridge University Press, 2009.
3. Jerry L. Prince and Jonathan Links, "Medical Imaging Signals and Systems", First Edition 1, Prentice Hall, 2005.
4. John L. Semmlow, "Biosignal and Medical Image Processing", Second Edition, CRC Press, 2008.