**Lecture Schedule**

**Department of ELECTRICAL AND ELECTRONICS Engineering**

# Branch & Section : III B.Tech - II Sem & EEE Regulation : R13

**Subject : Power System Analysis Academic Year : 2017 -2018**

**Name of the Faculty : GSR Sanjeevini**

**Course Objectives**

* To study the development of impedance diagram (p.u) and formation of Y-bus
* To study the Gauss Seidel, Newton raphson, decoupled and fast decoupled 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.
* To study the rotor angle stability analysis of power systems.

**Course Outcomes**

* Calculate Z bus, Y bus for a power system network by singular transformation method
* Analyze the solutions for power system network by Gauss siedal, Newton-Raphson , and Decoupled load flow methods, Fast decoupled load flow method.
* Explain the concepts of symmetrical component theory and analyze symmetrical faults and unsymmetrical faults
* Discuss the concepts on steady state stability and methods to improve
* Explain the concepts on Transient state stability, solution to swing equation, and discuss methods to improve transient state stability.

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| **UNIT** | **TOPIC** | No. of Periods |
| **I** | **Per Unit Representation & Topology** |  |
|  | Per Unit Quantities-need of calculating, Base Power, Base Voltage, Base current, Base Impedance, p.u voltage, p.u power ,p.u current, p.u impedance.  | 1 |
| Finding per unit impedance in terms of new base values ,problems on per units | 1 |
| Single Line Diagram-Apparatus Symbols, Single line diagram of an electrical power system, Impedance and reactance diagram. | 1 |
| Problems on drawing impedance and reactance diagram. | 1 |
| Graph theory-basic concepts, Formation of element node incidence and bus incidence matrices, Primitive network, Formation of YBUS by Singular transformation | 1 |
| Problems on YBUS by Singular transformation | 1 |
| Formation of YBUS by direct inspection, problems on that | 1 |
| **Total number of periods** | **7** |
| **II** | **Power Flows Studies** |  |
|  | Necessity of Power Flow studies, Derivation of static power flow equations, Classification of Bus bars  | 1 |
| Power Flow equations, Power flow solution by Gauss-Siedel Method | 1 |
| Problems on Power flow solution by Gauss-Siedel Method | 3 |
| Power Flow solution using Newton-Raphson(NR) Method  | 1 |
| Power Flow solution by NR(Rectangular Coordinate form) | 2 |
| Power Flow solution by NR( polar coordinate form) | 3 |
| Power Flow solution using NR Decoupled method | 1 |
| Power Flow solution using NR fast- Decoupled method | 1 |
| **Total number of periods** | **13** |
| **III** | **Z-Bus formulation** |  |
|  | ZBUS formulation-by inverting YBUS, Current Injection Technique,ZBUS Buliding Algorithm, problem | 2 |
| Mutually coupled branches in ZBUS - Algorithm | 2 |
| Problems on ZBUS –With and without mutually coupling | 3 |
| **Total number of periods** | **7** |
| **IV** | **Symmetrical Fault Analysis** |  |
|  | Introduction, Transient on a transmission line  | 1 |
| Short circuit of a unloaded Synchronous machine | 1 |
| Problems on SC of an unloaded Synchronous machine | 1 |
| Short circuit of a loaded Synchronous machine | 1 |
| Short circuit calculation computation trough the Thevenin theorem | 1 |
|  | Selection of Circuit Breakers | 1 |
| Algorithm for Short Circuit Studies | 1 |
| Problems on Short Circuit of a synchronous machine | 3 |
| **Total number of periods** | **10** |
| **V** | **Symmetrical Components & Fault analysis** |  |
|  | Synthesis of Unsymmetrical phasors from their symmetrical components, The symmetrical components of unsymmetrical phasors-problems | 1 |
| Phase shift in Star-delta transformers | 1 |
| Power in terms of Symmetrical components-problems | 1 |
| Sequence networks for Power System components | 2 |
| Sequence network for LG ,LL fault | 1 |
| Sequence network for LLG,LLL | 1 |
| Problems on Unsymmetrical Faults on power System | 3 |
| **Total number of periods** | **10** |
| **V** | **Power System stability Analysis** |  |
|  | Introduction, Classification of stability | 1 |
|  | Rotor Dynamics and the swing Equation | 1 |
|  | Power Angle Curve, Steady –state stability limit, Transfer reactance | 1 |
|  | Synchronizing power coefficient | 1 |
|  | Equal area criterion of Stability | 2 |
|  | Step-by-step solution of the swing curve | 1 |
|  | Problems on equal area criterion | 2 |
|  | Methods to improve steady state and transient stability | 1 |
|  | **Total number of periods** | **10** |

**Total Number of Hours:57**

**Text Books:**

1. Power System Analysis by Grainger and Stevenson, Tata McGraw Hill.

2. Modern Power System Analysis-by I.J Nagarath & Kothari,Tata MC Graw Hill

3. Electrical Power Systems –Ashfaq Hussian-5th Edition ,CBS