JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. EEE-II Sem

L	T/P/D	C
4	-/-/-	4

(A60222) COMPUTER METHODS IN POWER SYSTEMS

Objective:

This course introduces formation of Z bus of a transmission line, power flow studies by various methods. It also deals with short circuit analysis and analysis of power system for steady state and transient stability.

UNIT –I:

Power System Network Matrices: Graph Theory: Definitions, Bus Incidence Matrix, Y_{bus} formation by Direct and Singular Transformation Methods, Numerical Problems.

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 ZBus for the changes in network (Problems).

UNIT –II:

Power Flow Studies: Load Flows: Necessity of Power Flow Studies – Data for Power Flow Studies – Derivation of Static load flow equations.

Load flow solutions using Gauss Seidel Method: Acceleration Factor, Load flow solution with and without P-V buses, Algorithm and Flowchart. Numerical Load flow Solution for Simple Power Systems (Max. 3-Buses): Determination of Bus Voltages, Injected Active and Reactive Powers (Sample One Iteration only) and finding Line Flows/Losses for the given Bus Voltages.

Newton-Raphson Method in Rectangular and Polar Co-Ordinates Form: Load Flow Solution with or without PV Busses- Derivation of Jacobian Elements, Algorithm and Flowchart.

Decoupled and Fast Decoupled Methods: Comparison of Different Methods – DC load Flow.

UNIT – III:

Short Circuit Analysis: Per-Unit System of Representation: Per-Unit equivalent reactance network of a three phase Power System, Numerical Problems.

Symmetrical fault Analysis: Short Circuit Current and MVA Calculations, Fault levels, Application of Series Reactors, Numerical Problems.

Symmetrical Component Theory: Symmetrical Component Transformation,

Positive, Negative and Zero sequence components: Voltages, Currents and Impedances. Sequence Networks: Positive, Negative and Zero sequence Networks, Numerical Problems.

Unsymmetrical Fault Analysis: LG, LL, LLG faults with and without fault impedance, Numerical Problems.

UNIT –IV:

Steady State 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 and Methods to improve steady state stability.

UNIT –V:

Transient Stability Analysis: Derivation of Swing Equation. Determination of Transient Stability by Equal Area Criterion, Application of Equal Area Criterion, Critical Clearing Angle Calculation. - Solution of Swing Equation: Point-by-Point Method. Methods to improve Stability - Application of Auto Reclosing and Fast Operating Circuit Breakers.

TEXT BOOKS:

1. Computer Techniques in Power System Analysis, M.A.Pai, TMH Publications.
2. Computer techniques and models in power systems, K.Uma rao, I.K.International.

REFERENCE BOOKS:

1. Power System Analysis, PSR Murty, BS Publications.
2. Power system Analysis Operation and control, Abhijit Chakrabarth, Sunita Haldar, PHI.
3. Power System Analysis, Hadi Saadat , TMH.
4. Modern Power System Analysis, Turan Gonen, CRC Press.
5. Modern Power Systems Analysis, Xi – Fan Wang, Yonghua Song, Malcolm Lrving, Springer International.
6. Electrical Power Systems Analysis, Security and Deregulation, P. V. Venkatesh, B. V. Manikandan, S. Charles Raja, A.Srinivasan, PHI.
7. Modern Power system Analysis, I.J.Nagrath & D.P.Kothari: Tata McGraw-Hill Publishing Company.
8. Power System Analysis, T. K. Nagasarkar, M. S. Sukhija. Oxford University Press.
9. Power System Analysis by Grainger and Stevenson, Tata McGraw Hill.