GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 1

Electrical Engineering

Subject Name : Power System Modeling & Simulation

Sr No.	Course Content
1	Network Formulation and Graph Theory: Introduction, Network Equations ,Graph Theory, Development of Network Matrices from Graph Theoretic Approach, Augment Cutset Incidence Matrix Cutset and Circuit Equations, Building Algorithm for the Bus Impedance Matrix Modification of Z_{BUS} matrix due to changes in the primitive network
2	Load Flow Studies: Introduction, Different techniques such as Gauss Saidal method, Newton Raphson method, De-Coupled method, Fast Decoupled method, Modified Fast Decoupled, Concept of Optimal Power Flow, Solution of Optimal power flow by Gradient method, Solution of Optimal power flow by Newton's method Linear Programming Methods, DC load flow, Converter variables, DC per unit system, Derivation of equations, Incorporation of control equations, Control of converter AC terminal voltage, Inverter operation, Unified AC-DC solution Multiconverter Systems, Programming considerations, Three-phase load flow Mismatch equations, The power flow Jacobian, Newton's method, Performance of the power flow, Zero sequence blocking, Continuation power flow
3	Power System Security: Introduction, Factors Affecting Power System Security, Short Circuit Studies of a Large Power System Networks, Symmetrical Fault Analysis Using Bus Impedance Matrix, Algorithm for Formation of Bus Impedance Matrix, Contingency Analysis: Detection of Network Problems, Overview of security analysis, Linear Sensitivity Factors, Contingency Selection, Concentric Relaxation, Bounding
4	Introduction to State Estimation in Power Systems: Introduction, Power system state estimation, Maximum Likelihood Weighted Least Squares Estimation, Introduction, , Maximum Likelihood Concepts, Matrix Formulation, State Estimation of an AC network , Development of Method, State Estimation by Orthogonal Decomposition, An Introduction to Advanced topics in state estimation, Detection and Identification of Bad measurements, Estimation of quantities not being

	measured, Network Observability and Pseudo measurements, Application of Power Systems State Estimation
5	Sparsity Techniques, Transients and Stability of Power System: Introduction, Sparse System ,Theorems of Sparse Matrix Method , Various application areas and sparsity, Direct solution of sparse network equations by optimally ordered triangular factorization, Electromagnetic Transient Simulation, Introduction, Traveling waves on transmission lines, Successive Reflections, Bewle Lattice Diagram, Multimachine Systems, Multimachine Transient Stability
6	Numerical Integration Techniques: Numerical integration techniques: One step methods, Taylor series based methods, Forward -Euler's method, Runge-Kutte methods, Trapezoidal method, backward-Euler's method, Accuracy and error analysis, Numerical stability analysis, Stiff systems, Step-size selection, Differential algebraic systems, Power system applications: Transient stability analysis

List of Reference books:

1. Power Generation Operation & Control, John Wiley & Sons, Inc, 1996- A. J. Wood and B. F. Wollenberg
2. AC-DC Power System Analysis, IEE London UK, 1998- Jos Arrillaga and Bruce Smith
3. Advanced Power System Analysis and Dynamics, New Age International Ltd, New Delhi, 1992- L. P. Singh
4. Power System Analyssi, Tata Mcgraw Hill, New Delhi, 1999- Hadi Sadat
5. Computational methods for Electric Power Systems, CRC press- Mariesa Crow