

GUJARAT TECHNOLOGICAL UNIVERSITY

POWER ELECTRONICS (29)

COMPUTER APPLICATION IN POWER SYSTEM

SUBJECT CODE: 2732904

ME SEMESTER: III

Type of course: Major Elective-IV

Prerequisite: Fundamental Knowledge of Computer; Basics of Electrical & power system Engineering.

Rationale: This is a comprehensive Syllabus for introduces students to system behavior through computer calculations, giving students an understanding of power systems from the point of view of the central control facility. It explains the elements of transmission networks, bus reference frame, network fault and contingency calculations, power flow on transmission networks, generator base power setting, and state estimation from on-line measurements, helping students learn in-depth about them. In addition, the mathematical approach favored in helps students for the understandof application of the subject in real world problems.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P		Theory Marks		Practical Marks				
			ESE (E)	PA (M)	ESE (V)		PA (I)			
					ESE	OEP	PA	RP		
3	2#	2	5	70	30	20	10	10	10	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1.	Introduction: Modern Power Systems Operation and Control, Matrix representation of power systems, Gaussian elimination, Optimal ordering, Different types of Power System Analysis.	4	8
2.	SOLUTION OF LINEAR SYSTEMS Matrix representation of power systems, Triangularization, Gaussian elimination, LU and LDU factorization LDL^T , decomposition for sparse Matrices, Optimal ordering.	4	8
3.	Load Flow Analysis: Newton–Raphson iteration, Power system applications: Power flow, Formulation of Bus admittance matrix, regulating transformers, Gauss-Siedel, Newton-Raphson and Fast Decoupled methods of power flow, Treatment of voltage controlled buses, Accelerating factors, DC load flow.	8	20
4.	Analysis of Faulted Power System: Symmetrical and Asymmetrical Faults, Zbus Formulation, Short Circuit Analysis of Large Power Systems using Zbus, Analysis of Open Circuit faults.	8	20

5.	Stability Analysis: Classification of Power System Stability, Classical Model of Synchronous Machines and Excitation System, Transient Stability Analysis of Multi-Machine Systems, Eigen Analysis of Dynamical Systems, Small Signal Stability Analysis using Classical Model, Basic Concepts of Voltage Stability Analysis.	10	21
6.	Load Frequency Control: Automatic Load Frequency Control of Single Area System and Multi Area System, Steady State Instabilities.	4	8
7.	POWER SYSTEM STATE ESTIMATION: Power system state estimator, Method of Least Squares, Statistics, Errors and Estimates, Test for bad data, Network Topology Processing.	6	15

Reference Books:

1. Hadi Saadat, "Power System Analysis", Tata Mc Graw Hill, 2003.
2. A. K. Mahalanabis, "Computer Aided Power system analysis and control", Tata McGraw Hill 1991.
3. John J. Grainger, William D. Stevenson, JR. "Power System Analysis", McGraw Hill, 1994.
4. O. I. Elgerd, Electric Energy Systems Theory - An Introduction, McGraw-Hill, 1988.
5. A.R. Bergen and Vijay Vittal, *Power Systems Analysis*, Pearson Education Asia, 2001.

Course Outcome:

After learning the course the students should be able to:

1. Understand the mathematical approach of analysis power system.
2. Understand of application of the subject in real world problems.

List of Experiments and Open Ended Projects:

After learning the course the students should be able to:

1. To study Fault analysis .
2. To study the Transmission Line and Modeling.
3. To study the Formation of Y bus matrix by inspection / analytical method.
4. To study the Formation of Z bus using building algorithm.
5. To study the Gauss Siedel load flow analysis.
6. To study the Newton Raphson method of load flow analysis.
7. To study the Fast decoupled load flow analysis .
8. To study the Economic dispatch.

Major Equipment: Circuit Simulation Tools: open source software for simulation, MATLAB.

List of Open Source Software/learning website:

<http://nptel.iitm.ac.in/>

Review Presentation (RP): The concerned faculty member shall provide the list of peer reviewed Journals and Tier-I and Tier-II Conferences relating to the subject (or relating to the area of thesis for seminar) to the students in the beginning of the semester. The same list will be uploaded on GTU website during the first two weeks of the start of the semester. Every student or a group of students shall critically study 2 papers, integrate the details and make presentation in the last two weeks of the semester. The GTU marks entry portal will allow entry of marks only after uploading of the best 3 presentations. A unique id number will be generated only after uploading the presentations. Thereafter the entry of marks will be allowed. The best 3 presentations of each college will be uploaded on GTU website.

