III Year II Semester **L T P C**

Code: 20EE6642 **4 0 0 4**

COMPUTER AIDED POWER SYSTEMS

Preamble: The aim of this course is to allow the students to understand the graph theory, formulation of matrices, load flow analysis, fault calculations and contingency analysis.

Course Objectives

1. To introduce computer applications in the analysis of power systems
2. To understand the solution methods and techniques used in power system studies

Course Outcomes

1. The students will gain the ability to implement the programs for various power system problems
2. The students will gain the ability to analyse the solution methods used in power system studies.
3. The students will gain the ability to analyse the short circuit faults in power systems using *Zbus* matrix
4. The students will gain the ability to perform the contingency analysis of power system.

CO – PO & CO – PSO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	1		2		1				1				1	2	1
CO 2	1	1	1	2	1				1				1	2	1
CO 3	1	1	1	2	1				1				1	2	1
CO 4	1	1	1	2	1				1				1	2	1

1 – Weak, 2 – Moderate and 3 - Strong

Unit – 1: Graph Theory **10 Hours**

Overview of Graph theory -tree, co-tree and incidence matrix, Development of network matrices from Graph theoretic approach. Review of solution of Linear System of equations by Gauss Jordan method, Gauss elimination, LDU factorization.

Unit – 2: *Zbus* Formulation **10 Hours**

Bus Reference Frame: Injections and Loads *Zbus*. Formulation of Bus Impedance matrix for elements without Mutual Coupling.

Unit – 3: Load Flow Analysis **15 Hours**

Review of Gauss-Seidel Iteration using Y*bus*, Newton-Raphson method, Fast Decoupled Load Flow (FDLF)DC load flow, Three-phase Load Flow, Optimal power flow: concepts, active/reactive power objectives

Unit – 4: Network Fault Studies **15 Hours**

Network fault calculations using *Zbus* and Y*bus* Table of Factors, Algorithm for calculating system conditions after fault –three phase short circuit, three phase to ground, double line to ground, line to line and single line to ground fault.

Unit – 5: Contingency Analysis in Power Systems **12 Hours**

Contingency Calculations using ZBUS and YBUS Table of Factors. State estimation – least square and weighted least square estimation methods for linear systems.

Text Books:

1. Arthur R. Bergen, Vijay Vittal, Power Systems Analysis (English) 2nd Edition, Pearson Higher Education
2. G.L.Kusic, Computer Aided Power System Analysis, PHI, 1989
3. John J. Grainger, William D. Stevenson, Jr., Power System Analysis, Tata McGraw-Hill Series in Electrical and Computer Engineering.
4. M. A. Pai, Computer Techniques in Power Systems Analysis, Tata McGraw-Hill, Second edition 2005

Reference Books:

1. Computer Methods in Power System Analysis, Glenn Stagg and El-abiad, McGraw-Hill.
2. Computer-Aided Power Systems Analysis, George Kusic, CRC Press – Indian Edition.