Course code	Course Name	L-T-P - Credits	Year of Introduction
EE463	**Computer Aided Power Systems Analysis**	**3-0-0-3**	2016

Prerequisite: EE306 Power system analysis

Course Objectives

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

Syllabus:
Development of network matrices from Graph theory-Formulation of Bus Impedance matrices-Load Flow Analysis-Optimal Power Flow-Network fault calculations-Contingency analysis in Power systems.

Expected outcome:

- The students will gain the ability to critically analyse the solution methods used in power system studies.

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

References:

1. I.J.Nagrath and D.P.Kothari, "Modern Power System Analysis", Tata McGraw Hill, 1980
2. J. Arriliga and N.R. Watson, Computer modelling of Electrical power systems, 2/e, John Wiley, 2001
3. LP. Singh, “Advanced Power System Analysis and Dynamics”, 3/e, New Age Intl, 1996.
4. Stagg and El Abiad, "Computer methods in Power system Analysis", McGraw Hill,1968.

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	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.	7	15%
II	Bus Reference Frame: Injections and Loads. Zbus and Y bus. Formulation of Bus Impedance matrix for elements without Mutual Coupling.	7	15%
FIRST INTERNAL EXAMINATION			
III	Inversion of YBUS for large systems using LDU factors, Tinney's Optimal ordering. Review of Gauss-Seidel Iteration using YBUS, Newton-Raphson method, Fast Decoupled Load Flow (FDLF) DC load flow, Three-phase Load Flow.	6	15%
IV	Adjustment of network operating conditions, Optimal power flow: concepts, active/reactive power objectives (Economic dispatch, MW and MVAr loss minimization) – applications- security constrained optimal power flow.	8	15%
SECOND INTERNAL EXAMINATION			

V	Network fault calculations using ZBUS and YBUS 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.	7	20%
VI	Contingency analysis in Power systems : Contingency Calculations using ZBUS and YBUS Table of Factors. State estimation – least square and weighted least square estimation methods for linear systems.	7	20%
END SEMESTER EXAM			

QUESTION PAPER PATTERN:

Maximum Marks: 100 Exam Duration: 3Hourrs.

Part A: 8 compulsory questions.
One question from each module of Modules I - IV; and two each from Module V & VI.
Student has to answer all questions. (8 x5)=40

Part B: 3 questions uniformly covering Modules I & II. Student has to answer any 2 from the 3 questions: (2 x 10) =20. Each question can have maximum of 4 sub questions (a,b,c,d), if needed.

Part C: 3 questions uniformly covering Modules III & IV. Student has to answer any 2 from the 3 questions: (2 x 10) =20. Each question can have maximum of 4 sub questions (a,b,c,d), if needed.

Part D: 3 questions uniformly covering Modules V & VI. Student has to answer any 2 from the 3 questions: (2 x 10) =20. Each question can have maximum of 4 sub questions (a,b,c,d), if needed.