SCHEME OF COURSE WORK

Course Details:

Course Title	**: Power Generation, Operation and Control**		
Course Code	**: 13EE2101**	**L P C**	**: 4 0 3**
Program:	**: M.Tech.**		
Specialization:	**: Power System Control and Automation**		
Semester	**: I**		
Prerequisites	**: Power Generation Engineering, Power Transmission Engineering and Power System Operation and Control.**		
Courses to which it is a prerequisite	**:**		

Course Outcomes (COs):

1	Solve Unit Commitment problem using simple priority list scheme and dynamic programming technique using for a given power system.
2	Estimate the frequency deviation for a given change of load and design control systems for making steady-state frequency error to zero.
3	Select appropriate voltage control technique for improving voltage profile in a transmission system.
4.	Estimate system security level using contingency analysis and understand state estimation.
5.	Solve optimal power flow problem using Gradient Method and Newton's Method.

Course Outcome Versus **Program Outcomes:**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO-1	S	W	S	W	W	M	S	W	W	W	S
CO-2	S	S	S	W	S	M	M	W	W	W	S
CO-3	S	S	S	W	W	W	W	W	W	W	S
CO-4	S	S	W	W	M	W	W	W	W	W	W
CO-5	S	S	W	W	S	W	W	W	W	W	S

S - Strongly correlated, *M* - *Moderately* correlated, *Blank* - *No correlation*

Assessment Methods:	Assignment / Quiz / Seminar / Case Study / Mid-Test / End Exam

Teaching-Learning and Evaluation

Week	TOPIC / CONTENTS	Course Outcomes	Sample questions	TEACHING-LEARNING STRATEGY	Assessment Method & Schedule
1	Introduction to Unit Commitment	CO1	What is Unit Commitments and its constraints	Lecture Discussion	Mid- Test1 Assignment
2	Unit Commitment Solution methods- Priority List Scheme and Backward Dynamic Programming	CO1	Solve Unit Commitment using Priority list scheme	Lecture Problem Solving	Mid Test 1 Assignment
3	Forward Dynamic Programming with example calculations	CO1	Explain the process involved in obtaining unit commitment solution using Forward DP	Lecture Discussion Problem solving	Test1
4	Active Power and Frequency Control; Load Frequency control of an isolated power system; Composite characteristics of Power Systems	CO2	Explain the steady-state behavior of frequency of an isolated power system.	Lecture	Test 1 Seminar
5	Response rates of Turbine-Governing systems; Fundamentals of AGC and related problems	CO2	How frequency is controlled using AGC scheme.	Lecture	Mid- Test 1
6	Two-area load frequency control; Tie-line bias control; Under Frequency Load Schedding	CO2	How frequency control improves with two-area control	Lecture, Demonstration with an example.	Test I
7	Introduction to Reactive Power and Voltage Control; Production and Absorption of Reactive Power, Methods of Voltage Control	CO3	What is the need of Reactive Power Control and how is it done?	Lecture	Test 1
8	Shunt Reactor, Shunt Capacitor, Series Capacitor, Synchronous Condensers	CO3	Explain how different compensations improve voltage profile	Lecture	Test 1 Assignment
9	**Test I**				
10	Principles of Transmission System Compensation	CO3	What is the need for transmission system compensation and how is it done	Lecture Discussion	Test 2
11	Factors affecting Power System Security; Contingency Analysis; DC Load Flow	CO3	What is power system security? And how the contingency analysis carried out?	Lecture	Test 2
12	Linear Sensitivity Factors; AC Power Flow Methods; Contingency Selection	CO4	How contingency analysis is carried out using linear sensitivity coefficients	Lecture	Assignment Test 2
13	Power System State Estimation, Maximum Likelihood concepts, Matrix formulation	CO4	What is Power System State Estimation and how it is done	Lecture	Test 2
14	State Estimation of an AC network – Development of method.	CO4	Explain with an example power system state estimation	lecture	Assignment
15	Optimal Power Flow(OPF) , Solution of OPF-Gradient Method	CO5	What is optimal power flow and how is it different from Economic Load dispatch	Lecture	Test 2
16	Newton's Method; Linear Sensitivity Analysis; Sensitivity coefficients of an AC network model	CO5	Describe the process of Optimal Power Flow using Gradient Method	Lecture Discussion	Test 2 Assignment
17	Overview and discussion of the course				
18	Test 2				
19/20	END EXAM				