SCHEME OF COURSE WORK

Course Details:

Course Title	**: Power System Control**		
Course Code	**:15EE2101**	**L P C**	**:3 0 3**
Program:	**: M.Tech.**		
Specialization:	**: Power System and Control Automation**		
Semester	**: I**		
Prerequisites	**: Power Generation Engineering, Power Transmission Engineering and Power System Operation and Control**		
Courses to which it is a prerequisite	**: Power System Stability**		

Course Outcomes (COs):

1	Solve Unit Commitment problem using simple priority list scheme and dynamic programming technique 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 techniques 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.

Program Outcomes (POs):

A graduate of M.Tech (Power System and Automation Control) will be able to

1	Acquire in depth knowledge in the area of power system control and automation.
2	Attain the ability to prepare models with respect to any kind of problem on hand and try to solve related to power system control and automation.
3	Obtain the capability of problem solving and original thinking to arrive at feasible and optimal solutions considering societal and environmental factors.
4	Have sufficient knowledge base, sufficient to apply the techniques and tools to solve power system problems.
5	Use the state-of-the-art tools for modeling, simulation and analysis of problems related to power systems.
6	Attain the capability to contribute positively to collaborative and multidisciplinary research to achieve common goals.
7	Demonstrate knowledge and understanding of power system engineering and management principles and apply the same for efficiently carrying out projects with due consideration to economical and financial factors.
8	Communicate confidently, make effective presentations and write good reports to engineering community and society.
9	Recognize the need for life-long learning and have the ability to do it independently.
10	Become socially responsible and follow ethical practices to contribute to the community for sustainable development of society.
11	Independently observe and examine critically the outcomes of his actions and reflect on to make corrective measures and move forward positively.

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, *W – weakly* correlated

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	CO-1	What is Unit Commitments and its constraints	Lecture Discussion	Mid- Test1 Assignment
2	Unit Commitment Solution methods- Priority List Scheme and Backward Dynamic Programming	CO-1	Solve Unit Commitment using Priority list scheme	Lecture Problem Solving	Mid Test 1 Assignment
3	Forward Dynamic Programming with example calculations	CO-1	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	CO-2	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	CO-2	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	CO-2	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	CO-3	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	CO-3	Explain how different compensations improve voltage profile	Lecture	Test 1 Assignment
9	**Test-1**				
10	Principles of Transmission System Compensation	CO-3	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	CO-3	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	CO-4	How contingency analysis is carried out using linear sensitivity coefficients	Lecture	Assignment Test 2
13	Power System State Estimation, Maximum Likelihood concepts, Matrix formulation	CO-4	What is Power System State	Lecture	Test 2

			Estimation and how it is done.		
14	State Estimation of an AC network – Development of method.	CO-4	Explain with an example power system state estimation	Lecture	Assignment
15	Optimal Power Flow(OPF) , Solution of OPFGradient Method	CO-5	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	CO-5	Describe the process of Optimal Power Flow using Gradient Method	Lecture	Test 2 Assignment
17	Overview and discussion of the course				
18	**Test-2**				
19/20	END EXAM				