SCHEME OF COURSE WORK

Course Details:

Course Title	**POWER SYSTEM CONTROL AND STABILITY**		
Course Code	**13EE2110**	**L P C**	**:4 0 3**
Program:	**Master of Technology.**		
Specialization:	**Power System Control & Automation**		
Semester	**II**		
Prerequisites	**Stability, synchronous machine, power system operation and control.**		
Courses to which it is a prerequisite	**Research**		

Course Outcomes (COs):

1	Park's Transformation
2	Simulation of Dynamics of synchronous generator connected to infinite bus.
3	Methodology of analyzing multi machine power system.
4	Design and application of power system stabilizers in power system
5	Analyze Sub synchronous resonance.

Program Outcomes (POs):

A graduate of Electrical & Electronics Engineering will be able to

1	Acquire in depth knowledge in the area of power system control and automation.
2	attain the ability to think critically and analyze complex engineering problems 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	Extract information through literature survey and apply appropriate research methodologies, techniques and tools to solve power system problems.
5	Use the state-of-the-art tools for modelling, simulation and analysis of problems related to power systems
6	Attain the capability to contribute positively to collaborative and multidisciplinary researchto 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 with 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 subsequently and move forward positively by learning through mistakes

Course Outcome Versus**Program Outcomes:**

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

S - Strongly correlated, *M* - *Moderately* correlated, *W-Weakly correlated*

AssessmentMethods:	Assignment / Quiz / Seminar / Group Discussions / Case Study / Mid-Test / End Exam

Teaching-Learning and Evaluation

Week	TOPIC / CONTENTS	Course Outcomes	Sample questions	TEACHING-LEARNING STRATEGY	Assessment Method & Schedule
1	MODELING OF SYNCHRONOUS MACHINE: Introduction, Synchronous Machine, Park's Transformation, Analysis of Steady State Performance. Per Unit Quantities, Equivalent Circuits of Synchronous Machine	CO-2,3	Explain the classical model of one machine connected to infinite bus.	▫ Lecture through Black Board & LCD ▫ Discussion	Seminar/Mid Test (Week 8 -9)
2	EXCITATION AND PRIME MOVER CONTROLLERS: Excitation System, Excitation System Modelling, Excitation Systems-Standard Block Diagram System Representation by State Equations, Prime-Mover Control System.	CO-2	Discuss about the stability of unregulated synchronous machine using swing equation.	▫ Lecture through Black Board & LCD ▫ Discussion	Seminar/Mid Test (Week 8 -9)
3	TRANSMISSION LINES, SVC AND LOADS: Transmission Lines, D-Q Transformation, Static VAR compensators, Loads	CO-1	Give a detailed dynamic performance comparison of SVC & STATCOM	▫ Lecture through Black Board & LCD ▫ Discussion	Seminar/Mid Test (Week 8 -9)
4,5	DYNAMICS OF A SYNCHRONOUS GENERATOR CONNECTED TO INFINITE BUS: System Model, Synchronous Machine Model, Application of Model, Calculation of Initial Conditions, System Simulation, Consideration of other Machine Models .	CO-1,2	Derive the approximate model of the complete exciter.	▫ Lecture through Black Board & LCD ▫ Problem solving	Seminar/Mid Test (Week 8 -9)
6,7	ANALYSIS OF SINGLE MACHINE SYSTEM: Small Signal Analysis with Block Diagram Representation, Characteristic Equation (CE) and Application of Routh-Hurwitz Criterion, Synchronizing and Damping Torques Analysis, Small Signal Model: State Equations.	CO-2,4		▫ Lecture through Black Board & LCD Problem solving	Seminar/Mid Test (Week 8 -9)
8	Seminar by the Students				Seminar (Week 8)
9	Mid-Test 1				Week 9
10	APPLICATION OF POWER SYSTEM STABILIZERS Introduction, Basic concepts in applying PSS, Control Signals, Structure and tuning of PSS, Field implementation and operating experience, Examples of PSS Design and Application	CO-4	Why are power system stabilizer are needed? Draw the block diagram simplified model and explain how lead compensation is used?	▫ Lecture through Black Board & LCD Discussion	Seminar/Mid Test (Week 15-16)

11,12	ANALYSIS OF MULTI-MACHINE SYSTEM A Simplified System Model, Detailed Models: Case-I, Detailed Model: Case-II, Inclusion of Load and SVC Dynamics, Modal Analysis of Large Power Systems, Case Studies	CO-2,3	Explain the classical Model of a multi machine system. Mention the assumptions made in building this model.	▫ Lecture through Black Board & LCD Discussion	Seminar/Mid Test (Week 15-16)
13,14	ANALYSIS OF SUB-SYNCHRONOUS RESONANCE: SSR in Series Compensated Systems, Modelling of Mechanical System, Analysis of the Mechanical system, Analysis of the Combined System , Computation of Ye(s) : Simplified Machine Model, Computation of Ye(s): Detailed Machine Model, Analysis of Torsional Interaction - A Physical Reasoning, State Space Equations and Eigenvalue Analysis.	CO-5	Explain Subsynchronous resonance with analysis of series compensated systems	▫ Lecture through Black Board & LCD Discussion	Seminar/Mid Test (Week 15-16)
15	**STUDENTS SEMINAR**				Seminar (Week 15)
16	**Mid-Test 2**				Week 16
	END EXAM				