M.E Semester: 2
Electrical Engineering (Electrical Power System)
Subject Name: Power System Dynamics & Control

A. Course Objective:

- To study steady state and dynamic modeling of generator
- To study dynamic modeling of Excitation Systems, Prime movers etc.
- To study response of SMIB and multi-machine systems for different cases.

B. Teaching / Examination Scheme

SUBJECT		Teaching Scheme				Total Credit	Evaluation Scheme					Total Marks
		L	T	P	Total		THEORY		IE	CIA	PR. / VIVO	
CODE	NAME	Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	
MEEPS202	Power System Dynamics & Control	4	0	2	6	5	3	70	30	20	30	150

C. Syllabus

SR No.	Unit No	Topic	No. of Hours	Weightage In Exam.
1	**Unit:1**	**Modelling of Generator:** Classical Machine Description, Voltage Generation, Open-Circuit Voltage, Armature Reaction, Terminal Voltage, Power Delivered by Generator, Synchronizing Generator to an Infinite Bus, Synchronous Condenser, Role of Synchronous Machine Excitation in Controlling Reactive Power, The Park Transformation, Park's Voltage Equation, Park's Mechanical Equation, Circuit Model, Instantaneous Power Output, Applications, Synchronous Operation, Steady-state Model, Simplified Dynamic Model, Generator Connected to Infinite Bus	16	30%
2	**Unit: 2**	**Modelling of Excitaion System:** Excitation System, Excitation System Modeling, Excitation System – Standard Block Diagram, System Representation by State Equation, Prime Mover Control System.	08	10%
3	**Unit: 3**	**Dynamics of a Synchronous Generator**: System Model, Synchronous Machine Model, Application of Model , Calculation of Initial Conditions, System Simulation, Consideration of Other Machine Model, Inclusion of SVC	12	20%

		Model.		
4	**Unit: 4**	**Single machine system Modeling:** Small Signal Analysis with Block Diagram Representation, Characteristic Equation (CE) and Application of Routh-Hurwithz Criteion, Synchronizing and Damping Torque Analysis, Small Signal Model : State Equation, Nonlinear Oscillations – Hopf Bifurcation.	12	20%
5	**Unit: 5**	**Multi-machine System:** Simplified system Model, Detailed models: Case I, Detailed models: Case II, Inclusion of Load and SVC dynamics, Modal Analysis of Large Power Systems, Case Studies.	12	20%

D. Instructional Methods

- At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
- Two internal exams may be conducted and average of the same may be converted to equivalent of 15 marks as a part of internal theory evaluation.
- Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of five marks in the overall internal evaluation.
- Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures.
- Experiments shall be performed in the laboratory related to course contents.

E. Students Learning Outcomes

- The student can identify problems related to multi-machine system and modeling of components of power system..

F. Recommended Study Materials

- **Text & Reference Books:**

1. Power Systems Analysis By Vijay Vittal, Bergen , Pearson Education
2. Power System Dynamics By K R Padiyar, B S Publications
3. Power System Stability & Control, By- P.Kundur,TataMcgraw hill
4. P.Sauer & M.A. Pai, 'Power System Dynamic & Stability' , Prentice Hall Publication.
5. www.**ee.iitb**.ac.in/~peps/**download**s.html

