GANPAT UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

Programme	Master of Technology		Branch/Spec.	Electrical (Renewable Energy)	
Semester	I		Version	1.0.0.0	
Effective from Academic Year	2025-2026		Effective for the batch Admitted in	July 2025	
Course code	3EE11PE10	Course Name	Power System Dynamics & Control		

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	1	0	4	Theory	40	60	100
Hours	3	0	2	0	5	Practical	30	20	50

Pre-requisites:

-

Course Outcomes:

On successful completion of the course, the students will be able to:

CO1	Understand the basic modeling of synchronous generators from both machine and circuit perspectives.
CO2	Remember the excitation systems and prime mover controllers used in generator control.
CO3	Analyze the dynamic behavior and stability of single and multi-machine systems.
CO4	Apply modeling techniques to transmission lines, SVCs, and loads in power systems.

Theory syllabus

Unit	Content	Hrs
1	**Modeling of Generator:** **Machine Point of View:** Classical machine description, Voltage generation, Open circuit voltage, Armature reaction, Terminal voltage, Power delivered by generator, Synchronizing generator to an infinite bus, Role of synchronous machine Excitation in controlling reactive power. **Circuit Point of View:** Energy conversion, Application to synchronous machine, Park transformation, Circuit model, Instantaneous power output, Applications, Synchronous operation, Steady-state model, Simplified dynamic model, Generator connected to infinite bus.	**12**
2	**Excitation and Prime Mover Controllers:** Excitation system, Excitation system modeling, Excitation System – standard block diagram, System representation by state equation, Prime mover control system	**10**
3	**Dynamics of a Synchronous Generator:** Connected to infinite bus, System model, Synchronous machine model, Calculation of initial conditions, System simulation, Consideration of other machine model.	**08**
4	**Analysis of Single & Multi Machine System:** Small Signal Analysis with Block Diagram Representation, Characteristic equation and application of Routh-Hurwitz Criterion, Synchronizing and damping Torque analysis, Small signal model, State Equation, Nonlinear Oscillations, 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.	**08**
5	**Transmission Lines, SVC and Loads**: Transmission lines, D-Q Transmission using variables, Static VAR compensators, loads.	**07**

Practical content

Practicals, assignments, and tutorials are based on the above syllabus.

Text Books

1.	K. R. Padiyar, “Power System Dynamics”, B S Publications.
2.	Vijay Vittal, Bergen, “Power Systems Analysis”, Pearson Education

Reference Books

1.	P. Kundur, “Power System Stability & Control”, Tata Mc Graw hill.
2.	L. P. Singh, “Advanced Power System Analysis and Dynamics”, New Age International
3.	Allen J. Wood, and Bruce F. Wollenberg, “Power Generation, Operation and Control”, John Wiley & Sons, Inc., New York
4.	I.J. Nagrath& D.P. Kothari, “ Power System Engineering”, Tata McGraw Hill Publishing Co., Ltd.

ICT/MOOCS

1.	https://nptel.ac.in/courses/108/105/108105133/
2.	https://nptel.ac.in/courses/108/101/108101004/

3.	https://nptel.ac.in/courses/108/106/108106026/

Mapping of CO with PO and PSO:															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	0	0	0	0	0	0	0	0	0	0	2	1	2
CO2	3	3	2	2	0	0	0	0	0	2	0	2	3	2	1
CO3	3	3	2	2	0	0	0	0	0	2	0	2	2	2	1
CO4	3	3	2	2	0	0	0	0	0	2	0	2	3	2	1