GANPAT UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

Programme	Master of Technology	Branch/Spec.	Electrical (Electrical Power System)
Semester	I	Version	1.0.0.0
Effective from Academic Year	2025-2026	Effective for the batch Admitted in	July 2025
Course Code	3EE11PE6	Course Name	Modelling of Power System Components

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	20	30	50

Pre-requisites:

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Course Outcomes

On successful completion of the subject, students should be able to:

CO1	Model major power system components.
CO2	Develop equivalent circuit of generator, transmission line and load modelling.
CO3	Analyze performance of power system components using steady state modelling.
CO4	Integrate all component model for dynamic analysis of power system.

Theory syllabus

Unit	Content	Hrs
1	**Machine Point 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, Role of synchronous machine excitation in controlling reactive power.	**08**
2	**Equivalent Circuit in d q Axis:** Park transformation, Circuit model, Instantaneous power output, Applications, Voltage and current equations of stator and rotor, Direct and quadrature axis quantities, Self and mutual inductance matrix, Equivalent circuit of direct and quadrature axes, Per unit power and torque of the synchronous machine, Transient and sub-transient inductances, Time constants for cylindrical and salient pole machines.	**09**
3	**Steady-State Analysis:** Steady-state model, A steady-state analysis of synchronous machines, Three-phase short circuit analysis at generator terminals, Magnetic saturation in synchronous generators, Simplified dynamic model, Synchronous operation, Generator connected to infinite bus.	**07**
4	**Excitation and Prime Mover Modelling:** Types of Excitation system, Excitation system modelling, Block diagram and functions, System representation by state equation, Types of Prime mover, Hydro turbine modelling, Steam turbine modelling,	**08**
5	**Transmission Line Modelling:** Parameters of a transmission line, Performance equations of transmission line with distributed parameters, Surge impedance loading, Equivalent circuit model of transmission line, Voltage power characteristics of transmission lines, SVC modelling.	**08**
6	**Load modelling:** Types of load, Static and dynamic load modelling, Modelling of induction motors.	**05**

Practical content

Practicals, assignments and tutorials are based on above syllabus.

Text Books

1.	P.Kundur, “Power System Stability and Control,” McGraw Hill Inc.
2.	Vijay Vittal, Bergen, “Power Systems Analysis”, Pearson Education

Reference Books

1.	P. M. Anderson & A. A. Fouad “Power System Control and Stability,” Galgotia, New Delhi.
2.	J Machowski, J Bialek& J. R W. Bumby, “Power System Dynamics and Stability”, John Wiley & Sons.
3.	K.R.Padiyar “Power System Dynamics Control and Stability,” BS Publications.
4.	Peter W Sauer, M A Pai, “Power System Dynamics and Stability,” Prentice-Hall.
5.	EW Kimbark, “Power system stability,” John Wiley & Sons.

6.	L. P. Singh, “Advanced Power System Analysis and Dynamics”, New Age International.
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	2	2	1	0	0	0	0	0	1	2	3	2	1
CO2	3	3	2	2	1	1	0	0	0	2	2	2	3	2	1
CO3	3	3	2	2	1	1	0	0	0	2	2	2	2	2	2
CO4	3	3	2	2	2	1	0	0	0	2	1	2	3	2	2