

GANPAT UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

Programme	Master of Technology				Branch/Spec.	Electrical (Electrical Power System)/ (Renewable Energy)			
Semester	II				Version	1.0.0.0			
Effective from Academic Year			2025-2026		Effective for the batch Admitted in			July 2025	
Course code	3EE2102		Course Name		Modern Power System Protection				
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 course, the students will be able to:

CO1	Analyze the operation and coordination of various protection schemes used in power systems.
CO2	Design appropriate protection systems for transmission lines, transformers, generators, and busbars considering reliability and selectivity.
CO3	Evaluate the performance of digital and numerical relays using modern tools and techniques.
CO4	Apply software tools to simulate fault conditions and assess the effectiveness of protection strategies.

Theory syllabus

Unit	Content	Hrs
1	Power System Protection Basics: Need for protective systems, Nature and causes of faults, Types of faults, Effects of faults, Fault statistics, Evolution of protective relays, Zones of protection, Primary and back-up, Protection, Essential qualities of protection, Classification of protective relays, Classification of protective schemes, Automatic reclosing, Current transformers for protection, Potential transformer, Summation transformer, Phase-sequence current segregating network, Basic relay terminology.	08
2	Digital & Numerical Relaying: Digital relaying Algorithms, Differential equation technique, Discrete fourier transform technique, Walsh-Hadamard transform technique, Rationalized Haar transform technique, Modern numerical relays, Digital differential protection	10
3	Protection of Transmission Line: Over current protective schemes, Directional and distance protection schemes, Adaptive relaying fault location algorithms.	07
4	Protection of Electrical Machines: Protection of Generators, Class A, B and C protection scheme, Transformer protection biased-differential protection scheme, A.C. Motors comprehensive protection schemes.	08
5	Bus-Zone Protection: Protection schemes for bus-zone, Frame leakage protection.	05
6	Reclosing & Synchronizing of Circuit Breaker: Auto reclosing, Needs of reclosing & synchronizing, Advantages of auto-reclosing, Classification of auto-reclosing, Auto-reclosing based on number of phases, Number of attempts and speed.	07

Practical content

Practicals, assignments and tutorials are based on above syllabus.

Text Books

1.	Badri Ram, D.N. Vishwakarma , “Power System Protection and Switchgear” McGraw Hill.
2.	T.S. MadhavaRao, “Power System Protections (Static Relays)”, Tata Mc Graw-hill.

Reference Books

1.	A.R. van C Warrington, "Protective Relays", Chapman and Hall London.
2.	El Hawaray "Electrical Power Applications with Fuzzy systems", IEEE Press.
3.	S. H. Horowitz and A. G. Phadke, "Power System Relaying", John Wiley & Sons, New York.
4.	P. M. Anderson, "Power System Protection", IEEE Press, Wiley Interscience, A John Wiley & Sons Inc; New York.
5.	Y. G. Paithankar, "Fundamentals of Power System Protection", PHI Publication.

6.	Bhavesh Bhalja, R. P. Maheshwari and N. G. Chothani, “Protection and Switchgear”, Oxford University Press, New Delhi.
ICT/MOOCs	
1.	https://youtu.be/3iVYaH09poA
2.	https://youtu.be/TiEDG4l0HxY
3.	https://youtu.be/g9hmpZUs3dk
4.	https://youtu.be/-ZLRw6Y9S90

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	1	3	1	0	1	0	0	0	2	2	1	0	2
CO2	3	3	1	3	1	1	0	0	0	0	2	2	1	2	2
CO3	3	2	3	0	3	2	2	1	3	0	2	2	0	2	3
CO4	3	3	2	3	1	0	0	0	0	0	2	2	3	2	2