GANPAT UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

Programme	Master of Technology		Branch/Spec.	Electrical (Electrical Power System)	
Semester	II		Version	1.0.0.0	
Effective from Academic Year	2025-2026		Effective for the batch Admitted in	July 2025	
Course code	3EE21PE2	Course Name	Distributed Generation		

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:

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Course Outcomes:

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

CO1	**Understand** the concepts, types, and importance of Distributed Generation, DERs, and related standards.
CO2	**Apply** the working principles of solar, wind, and other DER systems in power networks.
CO3	**Analyze** microgrid configurations and converter technologies; **evaluate** their impact on performance and protection.
CO4	**Evaluate** economic and policy aspects of DG and **design** optimal DG placement in distribution systems.

Theory syllabus

Unit	Content	Hrs
1	**Distributed Generation:** Introduction, significance and growth of DG, DG planning and comparison of centralized vs. distributed generation, Types of DGs: renewable and non-renewable, Impact of DG on environment, reliability, and power quality, Standards for DG: IEEE 1547, IEC standards	**07**
2	**Distributed Energy Resources:** Solar PV systems: components, I-V characteristics, MPPT algorithms, Wind energy systems: wind turbine types, Cp-λ curves, generator types (DFIG, PMSG), Microturbines, biomass, geothermal, fuel cells, and diesel generators, Hybrid energy systems and economics, optimal placement of DG sources in distribution systems.	**12**
3	**Microgrid:** Introduction, Types of micro-grids, Autonomous and non-autonomous grids, Sizing of micro-grids, AC & DC Micro Grids, Comparison, Micro-grids with power electronic interfacing units, DG Micro Grid Topologies, Transients in micro-grids, Protection of micro-grids,Case studies.	**12**
4	**Converters for DG:** DC-DC converters for PV and storage systems, Inverters for DG: VSI, CSI, control strategies (PWM, SPWM, SVPWM), Grid synchronization: PLL, Anti-islanding, Bidirectional converters for energy storage systems, Harmonic compensation and filtering	**10**
5	**Economic and Regulatory Aspects:** Economic dispatch and cost modelling of DG, Tariff mechanisms and incentive schemes, Net metering, feed-in tariff, Regulatory framework and government policies, Market participation of DG and demand response.	**04**

Practical content

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

Text Books

1.	H. Lee Willis, Walter G. Scott,"Distributed Power Generation – Planning and Evaluation", Marcel Decker Press.
2.	G. Boyle – Renewable Energy: Power for a Sustainable Future

Reference Books

1.	A. Keyhani, Integration of Green and Renewable Energy in Electric Power Systems
2.	M. H. Rashid – Power Electronics: Circuits, Devices and Applications
3.	N. Mohan – Power Electronics: Converters, Applications, and Design
4.	IEEE Std 1547-2018 – Standard for Interconnection and Interoperability of Distributed Energy Resources with Associated Electric Power Systems Interfaces
5.	T. Ackermann – Distributed Generation: Technologies, Planning and Integration
6.	M.GodoySimoes, Felix A.Farret, "Renewable Energy Systems – Design and Analysis with

	Induction Generators", CRC press.
ICT/MOOCS	
1.	https://www.youtube.com/watch?reload=9&v=ptiaNGkuylY
2.	http://kcl.digimat.in/nptel/courses/video/108108034/L29.html
3.	https://www.youtube.com/watch?v=vEFWXyOIYmU
4.	http://kcl.digimat.in/nptel/courses/video/108108034/L01.html

Mapping of CO with PO and PSO:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	3	3	3	0	2	0	2	3	1	3	3
CO2	3	3	2	3	3	3	3	0	2	0	2	2	3	3	3
CO3	3	2	3	3	3	3	2	0	2	0	2	2	2	3	3
CO4	3	0	0	0	2	3	1	0	1	0	0	1	1	2	2