

GANPAT UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

Programme	Master of Technology					Branch/Spec.	Electrical (Electrical Power System) / (Renewable Energy)		
Semester	I					Version	1.0.0.1		
Effective from Academic Year			2025-2026			Effective for the batch Admitted in		July 2025	
Course Code	3EE1101		Course Name			Introduction to Renewable Energy System			
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

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Course Outcomes

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

CO1	Understand the basics of various renewable energy sources.
CO2	Analyze the working and efficiency of solar, wind, and bioenergy systems.
CO3	Evaluate different renewable technologies and their applications.
CO4	Apply concepts to design simple renewable energy systems.

Theory syllabus

Unit	Content	Hrs.
1	Introduction: Introduction to world energy scenario, Renewable energy resources, Radiation, Solar Geometry, radiation models.	04
2	Solar Energy: Solar Thermal, Optical efficiency, Thermal efficiency, Concentrators, Introduction to thermal systems (flat plate collector), Solar architecture, Solar still, Air heater, Panel systems. Photovoltaic: Introduction to semiconductor physics, Doping, P-N junction, Solar cell and its I-V characteristics, PV systems components.	09
3	Wind Energy: Introduction, Types of wind machines, C_p - λ curve & betz limits, Wind resource analysis.	07
4	Bioenergy: Types and availability of biomass resources, Various methods of biomass utilisation for energy generation, Gasification, Briquette, Palatization, Syngas, Anaerobic/Aerobic digestion, Ethanol and biodiesel production, Types of Bio-gas digesters, Combustion characteristics of biogas and its different utilizations.	09
5	Hydro Energy: Basic principle of hydroelectric power generation, Classification of hydropower projects (pico, micro, mini, Small hydro and large hydro projects), Types of hydro turbine, Various components of hydropower projects.	08
6	Fuel Cells and Hydrogen Energy: Introduction, Principle of fuel cells, Types of fuel cells, Fuel cell batteries, Hydrogen as a renewable energy source, Sources of hydrogen, Fuel for vehicles, Hydrogen production, Direct electrolysis of water, Thermal decomposition of water, Methods of hydrogen production, Geothermal, wave energy, ocean energy.	08

Practical content

Practicals, assignments and tutorials are based on above syllabus.

Text Books

1.	Mukherjee, D., & Chakrabarti, S. Fundamentals of renewable energy systems. New Age International.
2.	Kothari, D. P., Singal, K. C., & Ranjan, R. Renewable energy sources and emerging technologies. PHI Learning Pvt. Ltd.

Reference Books

1.	Tiwari, G. N., & Ghosal, M. K. Fundamentals of renewable energy sources. Alpha Science International Limited.
2.	Duffie, J. A., & Beckman, W. A. Solar engineering of thermal processes, fourth edition, Wiley.

3.	Sukhatme, S. P. Solar Energy Principles of Thermal Collection and storage Tata McGraw Hill Publishing Company Ltd.
ICT/MOOCs	
1.	https://onlinecourses.nptel.ac.in/noc23_ge47/preview

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	3	1	0	0	0	0	0	1	2	3	2	1
CO2	3	3	2	3	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