

GANPAT UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

Programme	Master of Technology				Branch/Spec.	Electrical (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	3EE21PE11		Course Name		Hydro & Geothermal Energy Sources				
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	0	0	3	Theory	40	60	100
Hours	3	0	0	0	3	Practical	00	00	00

Pre-requisites:

Course Outcomes:

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

CO1	Understand various types of hydro and geothermal power developments
CO2	Apply the knowledge related to various hydropower and geothermal structures viz., dams, penstocks, spillways, Vapor dominated and liquid dominated systems etc.
CO3	Analyze and perform hydro power and geothermal potential assessment studies.
CO4	Evaluate the development and progress of hydro and geothermal power system.

[illegible]

Unit	Content	Hrs
1	Introduction: Introduction and historical development, Hydropower development power equation, Assessment of potential, Comparison of hydropower plant and nuclear power plant, Classifications, Power demand, Role of hydropower grid.	06
2	Dams, Water Conveyance System and Spillway: Dam: Introduction, Classification, Construction and design of various types. Water Conveyance System: Introduction, Classification, construction and design of different types. Spillway: Introduction, Classification, Conditions and design.	08
3	Hydraulic Turbines: Classification of turbines, Head and efficiency, Impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine, working principles, Work done, Efficiencies, Hydraulic design, Draft tube theory and deficiency. Performance of hydraulic Turbines: Geometric similarity, Unit and specific quantities, Characteristic curves, Governing of turbines, Selection of type of turbine, Cavitation, Surge tank, Water hammer.	09
4	Power House and Transmission System: Power House: Introduction, Site selection, Layout, Forebay, Hydropower unit's arrangement, Underground power station. Transmission system: Introduction, Importance, Components and use of transmission system.	07
5	Introduction to Geothermal Energy: Overview, Scientific challenges, Economic perspective, Development of geothermal reservoir engineering, Origins of heat, Heat transfer, Geological environments.	07
6	Geothermal Power System: Geothermal sources, Hydrothermal resources, Vapor dominated and liquid dominated systems, Hybrid plants, Geothermal preheat and fossil superheat, Applications, Advantages and disadvantages.	08

Practical content

Assignments and tutorials are based on above syllabus.

Text Books

1.	Arora, K.R. “Irrigation water power and Water Resources Engineering”, Standard Publisher Distributors, Delhi.
2.	Rosen, M.A. and Koohi-Fayegh, S. “Geothermal Energy. Sustainable Heating and Cooling Using the Ground”, John Wiley & Sons.

Reference Books

1.	Dandekar, M.M. “Water Power Engineering”, Vikas Publishing House Gaziabad, U.P. India.
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2.	Glassley, W.E,” Geothermal Energy”, CRC Press.
3.	Grant, M.A. and Bixley, P.F,”Geothermal Reservoir Engineering”, Elsevier [AG].
ICT/MOOCs	
1.	NPTEL :: Civil Engineering - Water Resources Engineering.
2.	NPTEL :: General - NOC:Non-Conventional Energy Resources.
3.	Non-conventional energy Resources - Course.
4.	NPTEL :: Physics - NOC:Physics of Renewable Energy Systems.

Mapping of CO with PO and PSO:

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