

ME427 Non-Conventional Energy Sources										
L	T	P	Credit	Area		CWS	PRS	MTE	ETE	PRE
3	0/1	2/0	4	DEC/GEC		15/25	25	20/25	40/50	-

Course Objective: To familiarize the students with basics of non-conventional energy sources. To impart in-depth knowledge of geothermal energy resources, tidal and wave energy.

Syllabus		Contact Hours
Unit-1	Introduction to Non-Conventional Energy Sources. Overview of global energy demand and non-conventional energy potential; Advantages and limitations of non-conventional energy sources; Energy scenario in India and the world; Environmental and economic benefits of renewable energy systems	6
Unit-2	Solar Energy Systems. Solar radiation and its measurement; Solar photovoltaic (PV) systems: Types, working principles, and applications; Solar thermal systems: Solar water heaters, solar dryers, and solar cookers; Solar power plants: Parabolic troughs, solar towers, and Fresnel systems	6
Unit-3	Wind Energy. Wind Energy: Principles of wind energy conversion, wind turbines, wind resource assessment, and wind farms	8
Unit-4	Geothermal Energy. Geothermal Energy: Geothermal energy resources, technologies for electricity generation, and direct applications (space heating, agriculture). Environmental impacts and feasibility of wind and geothermal energy	8
Unit-5	Bioenergy and Energy from Waste. Biomass energy: Types of biomass and conversion technologies (combustion, gasification, pyrolysis). Biogas production: Anaerobic digestion process and applications. Biodiesel production: Feedstocks, transesterification process, and uses. Energy recovery from municipal and industrial waste	6
Unit-6	Emerging Non-Conventional Energy Technologies. Tidal and wave energy: Principles, devices, and challenges. Hydrogen energy: Production methods, storage, and fuel cells. Ocean thermal energy conversion (OTEC): Working principles and potential applications. Hybrid energy systems and their integration into smart grids	8
Total		42

Reference Book:	
1	"Non-Conventional Energy Resources" by B.H. Khan, McGraw-Hill.
2	"Solar Energy: Principles of Thermal Collection and Storage" by S.P. Sukhatme and J.K. Nayak, Publisher: Tata McGraw-Hill
3	"Renewable Energy Resources" by John Twidell and Tony Weir, Publisher: Routledge
4	"Solar Engineering of Thermal Processes" by John A. Duffie and William A. Beckman, Wiley.
5	"Renewable Energy Engineering and Technology: Principles and Practice" by V.V.N. Kishore, TERI Press.
6	"Introduction to Renewable Energy" by Vaughn C. Nelson, CRC Press.
7	"Biogas Technology: Towards Sustainable Development" by K. M. Mittal, TERI Press.
8	"Hydrogen and Fuel Cells: Emerging Technologies and Applications" by Bent Sørensen, Academic Press.
9	"Energy from Waste" by Nickolas J. Themelis, Springer.

Course Outcomes

CO1	Understand the principles, significance, and potential of non-conventional energy sources in addressing energy challenges.
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CO2	Analyze the technical and economic aspects of non-conventional energy systems such as solar, wind, and geothermal energy.
CO3	Apply knowledge of bioenergy systems, including biogas, biodiesel, and biomass combustion technologies.
CO4	Evaluate the role of emerging technologies like hydrogen energy, tidal, and wave energy systems in the global energy mix.
CO5	Design and assess non-conventional energy systems for practical applications with a focus on sustainability and environmental impact.
CO6	Applications of Non-Conventional Energy Sources

CO-PO/PSO Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	1	2	2	1	1	1	1	2	2	1	3
CO2	3	3	2	2	2	2	2	1	1	1	1	3	3	2	2
CO3	3	3	3	2	2	2	1	1	1	1	1	2	2	1	3
CO4	3	3	3	3	2	2	2	1	1	1	1	2	3	1	2
CO5	3	3	3	3	3	2	2	1	1	1	1	3	3	2	3
CO6	3	3	3	3	3	2	2	2	1	1	1	2	3	2	3