

Devi Ahilya University, Indore, India Institute of Engineering & Technology			1 Year M.E.(Design & Thermal Engg.) Full Time				
Subject Code & Name	Instructions Hours per Week			Credits			
DTRIG2 Non Conventional Energy Systems	L	T	P	L	T	P	Total
	3	1	0	3	1	0	4
Duration of Theory Paper: 3 Hours							

Objective: The objective of the subject to acquaint the students the renewable energy technological systems, its principle ,working, system design and analysis of present systems, to analysis the environmental and cost economics of using renewable energy sources compared to fossil fuels.

Pre requisites: Thermal Engineering, Heat and Mass transfer, fluid mechanics, steam engineering, combustion technology.

COURSE CONTENT

UNIT-1

Solar Energy

Solar radiation its measurements and prediction - solar thermal flat plate collectors concentrating collectors – applications - heating, cooling, desalination, power generation, drying, cooking etc - principle of photovoltaic conversion of solar energy, types of solar cells and fabrication. Photovoltaic applications: battery charger, domestic lighting, street lighting, and water pumping, power generation schemes. Design and Thermal analysis.

UNIT-2

Wind Energy

Atmospheric circulations – classification - factors influencing wind - wind shear – turbulence - wind speed monitoring - Betz limit - Aerodynamics of wind turbine rotor- site selection - wind resource assessment - wind energy conversion devices - classification, characteristics, and applications. Hybrid systems - safety and environmental aspects.

UNIT-3

Bio-Energy

Biomass resources and their classification - chemical constituents and physicochemical characteristics of biomass - Biomass conversion processes - Thermo chemical conversion: direct combustion, gasification, pyrolysis and liquefaction - biochemical conversion: anaerobic digestion, alcohol production from biomass - chemical conversion process: hydrolysis and hydrogenation. Biogas - generation - types of biogas Plants-applications Design of bio gas digesters, landfill gas systems and gasifiers.

UNIT-4

Hydrogen and Fuel Cells

Thermodynamics and electrochemical principles - basic design, types, and applications - production methods - Bio photolysis: Hydrogen generation from algae biological pathways - Storage gaseous, cryogenic and metal hydride and transportation. Fuel cell – performance characteristics ,principle of working- various types - construction and applications.

UNIT-5

Other Types of Energy

Ocean energy resources - principles of ocean thermal energy conversion systems - ocean thermal power plants - principles of ocean wave energy conversion and tidal energy conversion – hydropower – site selection, construction, environmental issues - geothermal energy - types of geothermal energy sites, site selection, and geothermal power plants, MHD, Thermal analysis

Note: HMT Data-books and certified notes are allowed in the examination hall.

BOOKS RECOMMENDED:

- [1] Sukhatme, S.P., Solar Energy, Tata McGraw Hill, 1984.
- [2] Twidell, J.W. and Weir, A., Renewable Energy Sources, EFN Spon Ltd., 1986.
- [3] Kreith, F and Kreider, J. F., Principles of Solar Engineering, McGraw-Hill, 1978.