

RENEWABLE ENERGY SOURCES

Course Code	23EE2501	Year	III	Semester	I
Course Category	OE-I	Branch	Except EEE	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	PS - I
Continuous Internal Evaluation:	30	Semester End Evaluation:	70	Total Marks:	100

Course Outcomes	
Upon successful completion of the course, the student will be able to	
CO1	Understand the fundamentals, significance, and working principles of various renewable energy sources. (L2)
CO2	Apply appropriate concepts to analyze the components and operations of solar, wind, and ocean energy systems. (L3)
CO3	Illustrate the processes and technologies involved in biomass, geothermal, hydel, and hydrogen energy systems. (L3)
CO4	Analyze the potential, advantages, and limitations of emerging energy technologies such as fuel cells, MHD, and storage systems. (L4)
CO5	Work effectively in a team and communicate technical information related to renewable energy systems through reports and presentations.

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3: High, 2: Medium, 1: Low)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	3		1									1	3	2
CO3	3		1									1	3	2
CO4		3	1									1	3	2
CO5									3	3				

SYLLABUS		
Unit No.	Contents	Mapped CO
I	SOLAR ENERGY Introduction - Renewable Sources - prospects, solar radiation at the Earth Surface - Equivalent circuit of a Photovoltaic (PV) Cell - I-V & P-V Characteristics - Solar Energy Collectors: Flat plate Collectors, concentrating collectors - Solar Energy storage systems and Applications: Solar Pond - Solar water heating - Solar Green house.	CO1 CO2 CO4 CO5
II	WIND ENERGY Introduction - basic Principles of Wind Energy Conversion, the nature of Wind - the power in the wind - Wind Energy Conversion - Site selection considerations - basic components of Wind Energy Conversion Systems	CO1 CO2 CO5

	(WECS) - Classification - Applications.	
III	BIOMASS, HYDEL AND GEOTHERMAL ENERGY Biomass: Introduction - Biomass conversion technologies- Photosynthesis. Factors affecting Bio digestion. Hydro plants: Basic working principle – Classification of hydro systems: Large, small, micro hydel plants. Geothermal Energy: Introduction, Geothermal Sources – Applications - operational and Environmental problems.	C01 C03 C05
IV	ENERGY FROM OCEANS, WAVES & TIDES: Oceans: Introduction - Ocean Thermal Electric Conversion (OTEC) – methods - prospects of OTEC in India. Waves: Introduction - Energy and Power from the waves - Wave Energy conversion devices. Tides: Basic principle of Tide Energy -Components of Tidal Energy.	C01 C02 C05
V	CHEMICAL ENERGY SOURCES Fuel Cells: Introduction - Fuel Cell Equivalent Circuit - operation of Fuel cell - types of Fuel Cells - Applications. Hydrogen Energy: Introduction - Methods of Hydrogen production - Storage and Applications Magneto Hydro Dynamic (MHD) Power generation: Principle of Operation - Types.	C01 C03 C04 C05

Learning Resources	
Text Books:	
1. G.D.Rai, Non-Conventional Energy Sources, Khanna Publications, 2011. 2. John Twidell& Tony Weir, Renewable Energy Sources, Taylor & Francis, 2013.	
Reference Books:	
1. S.P.Sukhatme&J.K.Nayak, Solar Energy-Principles of Thermal Collection and Storage, TMH, 2011. 2. John Andrews & Nick Jelly, Energy Science- principles, Technologies and Impacts, Oxford, 2 nd edition, 2013. 3. ShobaNath Singh, Non- Conventional Energy Resources, Pearson Publications, 2015.	
E-Resources:	
1. https://archive.nptel.ac.in/courses/103/103/103103206 2. https://archive.nptel.ac.in/courses/103/107/103107157	