

NON-CONVENTIONAL ENERGY RESOURCES

Course Code	20EE2701A	Year	IV	Semester	I
Course Category	OE-III	Branch	Common to All	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	Nil
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 process of energy collection, quantification, storage, conversion and applications of non-conventional sources. (L2)
CO2	Apply the knowledge of energy conversion for harvesting energy from different sources like light, heat, wind etc. (L3)
CO3	Apply basic laws of physics for the production of energy from Solar, wind, ocean, biomass, geothermal, fuel cell and hydrogen energy sources. (L3)
CO4	Analyze the theory and designing wind mills, MHD, Fuel cells. (L4)
CO5	Examine the performance of solar and wind generating units and economic aspects of MHD biomass and Ocean energy sources. (L4)
CO6	Ability to apply the various energy generation techniques and to measure the basic parameters and submit a report .

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3: High, 2: Moderate, 1: Low)

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

Syllabus

Unit No.	Contents	Mapped CO's
I	PRINCIPLES OF SOLAR RADIATION: Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extra-terrestrial and terrestrial solar radiation, solar radiation on titled surface. Measurement of Solar Radiation: Pyrometer, shading ring pyrheliometer, sunshine recorder, schematic diagrams and principle of working.	CO1, CO2, CO3, CO6
II	SOLAR ENERGY COLLECTION AND STORAGE: Solar Light Energy: Photovoltaic effect, characteristics of photovoltaic cells, conversion efficiency, solar batteries and applications of photovoltaic energy conversion.	CO1, CO2 CO3, CO5,

	Solar Heat Energy: Sensible, latent heat of Heat storage, solar ponds. Applications- solar heating/cooling technique, solar distillation and drying.	CO6
III	WIND ENERGY: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria OCEAN ENERGY: OTEC, types of OTEC plants, mini-hydel power plants	CO1, CO2, CO3, CO4, CO5, CO6
IV	BIO-MASS: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters. GEOTHERMAL ENERGY: Resources, methods of harnessing the energy.	CO1, CO3, CO5, CO6
V	MHD Generators: Basic principles of MHD generator and Hall Effect, different types of MHD generators. Fuel Cells: Introduction, principle of fuel cells, thermodynamic analysis of fuel cells, types of fuel cells, fuel cell batteries, applications of fuel cells.	CO1, CO3, CO4, CO6

Learning Resources

Text Books

1. G.D. Rai, Non-Conventional Energy Sources, Khanna publishers, 5th Ed., 2014.
2. S. Rao and B. B.Parulekar, Energy Technology- Non conventional, Renewable and Conventional , Khanna Pub ,3rd Ed., 1999.

Reference Books

1. Ashok V Desai, Non-Conventional Energy, New age publishers, 1st Ed., 1990.
2. B.H.Khan, Non-Conventional Energy Sources, Tata Mc Graw-hill Publishing Company, 2nd Ed., 2013.
3. B.T. Nijaguna, Biogas Technology, New Age International Pub, First edition 2002.
4. Tiwari and Ghosal, Renewable Energy resources, Narosa, 2nd Ed., 2005

Web links

1. <https://www.coursera.org/learn/renewable-energy-technology-fundamentals>
2. <https://nptel.ac.in/courses/121106014>