

4EE58: NON-CONVENTIONAL ENERGY SOURCES

CREDITS = 4 (LTP: 3, 0, 1)

Course Objective:

The subject aims to provide the student with the knowledge of various renewable energy sources, systems and applications in the present context and need.

Teaching and Assessment Scheme:

Teaching Scheme (Hours per Week)			Credits	Assessment Scheme				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE	CE	ESE	CE	150	
3	0	2	4	60	40	20		30

Details of Assessment Instruments under CE Practical Component:

Hands-on and experiments related to the course contents. .

Term work [15]	Allied Evaluation [15]
Attendance/report/Assignment	Performance/Attitude-Aptitude/Quiz/ Questions & Answers/ Discussion

Course Contents:

Unit No.	Topics	Teaching Hours
1	Introduction: Renewable sources of energy, grid-supplied electricity, distributed generation- renewable, various non-conventional energy resources; introduction, availability, classification, relative merits and demerits, energy policy and regulations, CDM prospects (carbon credits).	4
2	Solar Energy: Introduction, photo voltaic power generation, spectral distribution of energy in solar radiation, solar cell configurations, voltage developed by solar cell, solar cell efficiency and losses, methods to get MPPT, practical solar cell performance, commercial photo voltaic systems, specifications for PV systems, applications of PV systems, design of roof top solar PV system, introduction and application of solar thermal energy, various converter topologies and their comparison, integration issues of solar energy with grid, case studies.	11

Unit No.	Topics	Teaching Hours
3	Wind Energy: Introduction, site selection criterion, classification of wind power plants, wind characteristics, performance and limitations of energy conversion systems. power from wind, properties of air and wind, types of wind turbines, operating Characteristics, converter topologies, onshore and offshore wind farms, new developments, integration issues of wind energy with grid case studies.	08
4	Geothermal Energy: Introduction, resources of geothermal energy, types of geo thermal energy, environmental consideration, power generation methods, and hybrid systems.	04
5	Wave and Tidal Energy: Introduction, mechanism and wave motion, properties of waves and power content, vertex motion of waves, device applications, types of ocean thermal energy conversion systems, application of Ocean Thermal Energy Conversion (OTEC) systems, numerical.	04
6	Biomass Energy Conversion: Introduction, technologies available for thermal and power generation applications, bio-fuels and decentralized energy systems (co—operative rural power plant, biogas generation, waste minimization and utilization.	06
7	Advanced Technologies: Introduction of green building concepts, CO ₂ sequestration, electric vehicle, fuel cells, hydrogen energy, building material selection, designing of building, heat transfer concepts, green building rating systems etc. introduction to software for renewable energy system.	08
Total		45

List of References:

1. G.D Rai, “Non-conventional energy sources”, Khanna Publishers.2008
2. Chetan Singh Solanki, “Solar Photovoltaic Technology and Systems: A Manual for Technicians, Trainers and Engineers”, PHI Publisher, 2013.
3. S. P. Sukhatme, “Solar Energy - Principles of thermal collection and storage”, TMH, 2008.
4. Dr.R.K Singal, “Non-Conventional Energy Resources”, S.K Kataria & Sons.2012
5. Thomas Ackermann, “Wind Power in Power System”, John Willey & Sons, 2005.

Web resources:

1. NPTEL Video Lectures on “Non-conventional energy source” by Prof. Prathap Haridoss, IIT Madras at <https://nptel.ac.in/courses/121/106/121106014/>

2. NPTEL Web Course on “Non-Conventional energy source “by Dr .L.Umanand, IISC Bangalore at <https://nptel.ac.in/courses/108/108/108108078/#>

Course outcomes (cos):

After learning this course the students will be able to:

1. Understand Energy technologies
2. To solve the problems related to solar and wind energy system
3. Ability to solve the problems in different other renewable energy fields.
4. Understand Energy generation and Problem using field case studies.

List of experiments:

Experiment No.	Suggest List of Experiment
1	To understand the basic concept of Solar Energy
2	To measure the voltage and current of the solar cells
3	To measure of the voltage and current of the solar cells in series & parallel combinations
4	To calculate the efficiency (η) of solar cell
5	Solar Power and V-I Characteristics
6	Various modes of Constant Voltage Charging technique
7	Buck Converter topology and measurement of voltage
8	Boost Converter topology and measurement of voltage
9	To find out Torque and axial thrust using computer program
10.	To find out energy generated from tidal power plant using computer program
11	To understand the basic concept of wind energy and Hybrid Energy
12	Mini Project