SCHEME OF COURSE WORK

Course Details:

Course Title	Renewable Sources of Energy
Course Code	15ME1151
Program	B.Tech.
Specialization	Information Technology
Semester	VIII
Prerequisites	Non Conventional Sources of Energy

Course Outcomes (COs):

1	Explain solar energy radiation; analyze different solar collectors, energy conversion systems.
2	Discuss power generation using geothermal and wind energy.
3	Describe power generation using biomass and bio-fuels.
4	Explain the electro chemical effects, fuel cells and hydrogen energy cycle.
5	Describe the direct energy conversion methods, wave and tidal energy.

Course Outcome versus **Program Outcomes:**

COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**	**PSO 3**
CO -1	3	2	2	3	3	3	3	2	3	2	2	3			
CO -2	2	3	3	3	2	3	2	2	3	3	2	2			
CO -3	2	3	2	3	2	3	3	3	2	3	3	3			
CO -4	3	2	3	3	3	2	3	2	3	2	2	3			
CO -5	2	2	3	3	2	3	2	3	2	3	2	3			

S - Strongly correlated, *M -Moderately* correlated, *Blank - No correlation*

Teaching - Learning and Evaluation

Week	TOPIC / CONTENTS	Course Outcomes	Sample questions	TEACHING-LEARNING STRATEGY
1	Introduction, Solar energy, Solar radiation geometry, Solar radiation data for India, Applications of solar energy.	CO1	Briefly explain about solar radiation geometry	Seminar / Case Study
2	Solar flat plate collectors & its performance analysis, Solar concentrating collectors - types , analysis & tracking of CPC	CO1	Explain the performance analysis of CPC	Seminar / Case Study
3	Photovoltaic system - efficiency , semiconductor materials, standards & applications	CO1	Explain about the conversion efficiency and power output in solar photo voltaic	Seminar / Case Study
4	Wind energy: wind energy conversion systems- classification, elementary design principles & performance characteristics	CO2	Explain the process of wind energy conversion using lift and drag	Seminar / Case Study
5	analysis of aerodynamic forces acting on blade applications environmental aspects- economic issues geothermal resources, principle of working	CO2	Give a brief note on prospects of geothermal energy in context to India	Seminar / Case Study
6	Geothermal energy: types, site selection, problems & applications of geothermal station - geothermal energy prospects in India.	CO2	Describe working principle of vapor dominated geothermal system with neat sketch	Seminar / Case Study
7	Principles of bio mass-conversion-photosynthesis-bio gas production - raw materials- properties of bio gas- producer gas-transportation of bio gas-	CO3	Explain Photosynthesis. What are the conditions necessary for it?	Seminar / Case Study
8	classification of bio gas plants-advantages, disadvantages, types problems involved in bio gas production- bio gas applications-biomass conversion techniques	CO3	How is biogas plants classified? Explain them briefly	Seminar / Case Study

9	**Mid Test – 1 , Quiz – 1 & Assignment - 1**			
10	energy recovery from urban waste- power generation from liquid waste- biomass cogeneration- energy plantation- fuel Properties- biomass resource development in India.	CO3	What is anaerobic digestion? What are the factors affecting it?	Seminar / Case Study
11	fuel cells - Principle of operation, classification, comparison between fuel cells, efficiency and EMF of fuel cells	CO4	What is fuel cell? Describe working principle of hydrogen fuel cell.	Seminar / Case Study
12	operating characteristics of fuel cells, advantages of Fuel cell power plants, future potential of fuel cells.	CO4	Derive the expressions for free energy and potential of fuel	Seminar / Case Study
13	Hydrogen energy: Properties , Production, Storage and Transportation	CO4	What are the different methods for hydrogen production?	Seminar / Case Study
14	Safety and management, development of hydrogen cell, economics of hydrogen fuel and its use.	CO4	Brief out safety precautions to handle hydrogen during production, storage and transportation	Seminar / Case Study
15	Ocean energy: principle, conversion, wave energy conversion machines, power Plants, thermoelectric OTEC-developments of OTEC.	CO5	Describe the closed cycle OTEC system with its advantages over open cycle	Seminar / Case Study
16	Tidal power: sources of tidal energy, fundamentals of tidal power, use of tidal energy & limitations	CO5	Explain the principle of operation of Tidal energy generation and also explain about the major components of tidal power generation	Seminar / Case Study
17	Direct energy conversion: Need , limitations & principles of DEC. thermoelectric Generators, MHD generators MHD accelerator- MHD engine	CO5	Explain the working principle of MHD generators	Seminar / Case Study
18	**Mid Test – 2 , Quiz – 2 & Assignment - 2**			
19/20	**End Semester Exam**			