SEMESTER S4

ENERGY ENGINEERING

Course Code	PEPOT 418	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:0:0:0	ESE Marks	60
Credits	3	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	None	Course Type	Theory

Course Objectives:

1. To gain a thorough understanding of the different forms of energy and the various methods and technologies employed for harnessing these energy resources efficiently
2. To understand the significance of energy conservation and learn about various strategies and techniques for reducing energy consumption in both industrial settings and daily life, fostering a culture of sustainability and environmental responsibility.

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SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	**Energy: -** general classification of energy, Indian energy resources and energy consumption, energy Crisis, energy alternatives, thermal, hydel and nuclear power plants, merits and demerits of the above power plants. **Solar energy: -** solar thermal systems, flat plate collectors, focusing collectors, solar water heating, solar cooling, solar distillation, solar refrigeration, solar dryers, solar pond, solar thermal power generation, solar energy application in India, photo voltaic systems, energy plantations.	9

2	**Ocean wave energy: -** conversion, ocean thermal energy conversion, tidal energy conversion, Wind energy, types of windmills, types of wind rotors, Darrieus rotor and Savanius rotor, wind electric power generation, wind power plants in India**.** **Biomass energy resources:** - thermo-chemical and biochemical methods of biomass conversion, combustion, gasification, pyrolysis, fermentation, anaerobic digestion	**9**
3	**Fuel cells: -** alkaline fuel cell, phosphoric acid fuel cell, molten carbonate fuel cell, solid oxide fuel cell, solid polymer electrolyte fuel cell, Basic concepts of Microbial Fuel Cell Magneto hydro dynamics: open cycle and closed cycle systems, geothermal energy.	**9**
4	**Energy audit and Energy conservation in chemical process plants: -** energy saving in heat exchangers, distillation columns, furnaces and boilers, steam economy in chemical plants, energy conservation in petroleum, fertilizer and steel industry, cogeneration (CHP), pinch technology, recycling for energy saving, electrical energy conservation in chemical Process plants, environmental aspects of energy use.	**9**

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Course Assessment Method

(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination-2 (Written)	Total
5	**15**	**10**	**10**	**40**

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks **(8x3 =24marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

At the end of the course students should be able to:

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	Course Outcome	Bloom's Knowledge Level (KL)
CO1	Identify different sources of energy, analyse the energy scenario and understand different conventional energy production systems	**K3**
CO2	Explain the concepts of solar and ocean energy conversion	**K2**
CO3	Explain the Wind and biomass energy conversion technologies	**K2**
CO4	Explain the working and types of fuel cells and MHD systems	**K2**
CO5	Explain the concepts of energy conservation and energy audit and apply the knowledge in process plants and daily life	**K3**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table:

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

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Energy Technology,	Rao S. &Parulekar B.B.	Khanna Publishers	3rdedn1994
2	Renewable Energy Sources & Conversion Tech	Bansal N.K., Kleeman M. &Meliss M.	Tata McGraw Hill.	1988
3	Energy for a Sustainable World	Goldmberg J., Johansson, Reddy A.K.N. & Williams R.H.	John Wiley	1987
4	A Text Book on Energy System and Engineering	Pandey G.N.	Vikas Publishing	1995

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Non-Conventional Energy Sources	Rai G. D	Khanna Publishers.	1988
2	Solar Energy,	Sukhatme S.P	Tata McGraw Hill	Fourth Edition 2017
3	Non-Conventional Energy Systems	Mittal K.M	Wheeler Publications	1999
4	Energy conservation and management	S.S.Thipse,	Narosa Publishing House	2014

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Video Links (NPTEL, SWAYAM…)	
Module No.	**Link ID**
1	Renewable Energy Engineering: Solar, Wind and Biomass Energy Systems, Prof. Vaibhav Vasant Goud, Prof. R. Anandalakshmi- IIT Guwahati https://nptel.ac.in/courses/103103206
2	Solar Energy Engineering and Technology, Prof. Pankaj Kalita -IIT Guwahati https://nptel.ac.in/courses/115103123
3	Fuel Cell Technology, Prof. S. Basu ,Dr. Anil Verma -IIT Delhi https://nptel.ac.in/courses/103102015
4	Environment Management, Prof. T.V. Ramachandra- IISc Bangalore https://nptel.ac.in/courses/120108004

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