



**Chemical Engineering**

**Subject Code: 01CH0408**

**Subject Name: Energy Technology**

**B.Tech. Year – II (Semester IV)**

**Objective:** This course helps the students to provide the knowledge of different types of energy and their utilization techniques.

**Credits Earned:** 3 Credits

**Course Outcomes:** After completion of this course, student will be able to:

1. Understand the science behind the energy produced from different sources.
2. Analyze the advantages and limitation of solar and wind energy
3. Suggest new upcoming renewable energy sources as per industrial requirement.
4. Utilize the renewable energy in problem solving where conventional energy are not fruitful

**Pre-requisite of course:** None

**Teaching and Examination Scheme**

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	IA (I)	CSE (C)	Viva (V)	Term work (TW)	
3	0	0	3	50	30	20	0	0	100

**Contents:**

Unit	Topics	Contact Hours
1	<b>An Introduction to Energy Sources:</b> Energy sources, primary & secondary energy sources, national energy strategy & plan, energy management, Proximate & ultimate analysis, calorific values, rank of coal, coking & caking.	8
2	<b>Solar Energy</b> Solar radiation, measurement of solar radiation, solar energy collectors – flat plate collector, air collector, collectors with porous absorbers, concentrating collectors, applications & advantages of various collectors, selective absorber coatings, solar energy storage systems (thermal, electrical, chemical & mechanical), applications.	10
3	<b>Wind Energy</b> Basic principles, power in wind, wind energy conversion, basic components of wind energy conversion systems (WECS), classification of WECS, wind energy collectors, applications of wind energy.	10
4	<b>Hydrogen and Fuel Cell</b> Properties of Hydrogen, production and application of hydrogen, thermochemical methods, solar methods, storage & transportation, safety & management, hydrogen – oxygen fuel cell, ion exchange membrane cell, fossil fuel cell, molten carbonate cell, conversion efficiency, applications of fuel cells	10
	<b>Total Hours</b>	38

**References:**

1. "Fuels & combustion", Samir Sarkar, Orient Longmans, 1974.
2. "Solar Energy: Principles of Thermal Collection and Storage", K. Sukhatme, Suhas P. Sukhatme, Tata McGraw Hill Education, New Delhi, 2009.
3. "Energy Technology (Non Conventional, Renewable and Conventional)", Sunil S. Rao and B.B. Parulekar, Khanna Publisher, 1994.
4. "Non Conventional Energy Sources", G. D. Rai, Khanna Publisher, New Delhi, 1988.

**Suggested Theory distribution:**

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
20%	35%	25%	20%	-	-

**Instructional Method:**

- a. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
- b. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
- c. Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
- d. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

**Design Based Problems (DP)/ Open Ended project (OEP) :**

In the beginning of the session, subject faculty will allot an OEP / DP to the students. Students will be free to choose a topic of their choice which will be relevant to the syllabus and they will either prepare a working model/ report / presentation / poster on their topic.

**Web Resources:**

- a. <https://nptel.ac.in/courses/121106014>
- b. <https://nptel.ac.in/courses/115103123>
- c. <https://www.coursera.org/learn/renewable-energy-technology-fundamentals>