



B.Tech. Semester IV

Subject Name: Energy Technology

Subject Code: BTCH14402

Type of course: PEC

Prerequisite (if any): Basics of Mathematics, Basic calculations in chemical engineering,

Rationale: This course offers basic understanding of different energy sources, types of fuels, different technologies to harness energy.

Teaching and Examination Scheme:

TEACHING SCHEME				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	
3	0	0	3	60	25	15	-	-	100

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests CA2: Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems TEE: Term End Examination TEP: Term End Practical Exam (Performance and viva on practical skills learned in course) CA3: Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1.	Introduction : Energy sources - conventional & non-conventional, different forms of energy, energy chain, energy demand, energy management, energy audit & conservation, types of fuels, thermodynamics and basic energy calculations, units & conversion factors.	2	4%
2.	Fuels Solid Fuels : Wood & charcoal, peat, lignite, sub-bituminous & bituminous coals, semi-anthracite and anthracite coals, cannel & boghead coal, Rank of coal, composition of coal, analysis & properties of coal, Coal preparation, Clean Coal Technology, gasification of Coal. Processing of Solid Fuels Coal preparation, washability curve, dry & wet washing methods of coal, washer efficiency, gasification & liquefaction of solid fuels, problems. Liquid Fuels : Origin and classification of petroleum, refining, properties & testing of petroleum products, various petroleum products, petroleum refining in India, liquid fuels from other sources, storage and handling of liquid fuels Gaseous Fuels : Types of gaseous fuels: natural gases, methane from coal mines, manufactured gases, producer gas, water gas, biogas, refinery gas, LPG, hydrogen, acetylene, other fuel gases. Cleaning, purification and quality enhancement of gaseous fuels.	10	25%
3	Manufactured Fuels : Agro fuels, solid fuel handling, properties related to combustion, handling, and storage. Bio-Fuels: types of bio-fuels, production processes and technologies, Bio-fuel applications.	4	9%





4	Solar Energy : Introduction, applications of solar energy, solar radiation & related terms, measurement of solar radiation, solar energy collectors, applications & advantages of various collectors, solar energy storage systems, Solar Thermal Energy conversion systems and power plants.	4	9%
5	Wind Energy : Basic principles, wind energy conversion, site selection, basic components of wind energy conversion systems (WECS), classification of WECS, wind energy collectors, applications of wind energy.	3	6%
6.	Energy From Biomass : Introduction, biomass conversion technologies, biogas generation, factors affecting biogas generation, classification & types of biogas plants (including those used in India), thermal gasification of biomass, pyrolysis, alternative liquid fuels.	4	10%
7	Geothermal Energy : Introduction, applications of geothermal energy, Geothermal resource types, Classification and types of geothermal power plants.	4	9%
8.	Hydro energy : Introduction, Merits and demerits, Energy conversion systems, Power plants.	2	4%
9.	Energy from oceans : Energy from Tides, Methods of utilization of tidal energy, storage, components of tidal power plants, ocean waves, wave energy conversion devices	2	4%
10.	Fuel Cell : Introduction, types of fuel cells, Principle and operation of fuel cells, advantages & disadvantages, conversion efficiency, applications of fuel cells.	3	6%
11	Hydrogen : Properties of Hydrogen, production of hydrogen via different methods, storage & transportation, safety & management.	2	4%
12	Nuclear Energy : Fission, fuel for nuclear fission reactor, Nuclear Fuel Cycle, storage & transportation, different types of reactor, reactor control, nuclear reactor power plants, Nuclear waste management.	3	6%
13	Urban Waste to Energy : Introduction, various processes, applications.	2	4%

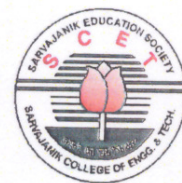
Suggested Specification table with Marks (Theory/Practical):

% Distribution of Marks					
R Level	U Level	A Level	N Level	E Level	C Level
40	35	25	-	-	-

Legends: R: Remembrance, U: Understanding; A: Application, N: Analyze, E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.





Reference Text Books:

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
1	Energy Technology	Rao & Parulaker	Khanna Publications	2015	3 rd Edition
2	Non-Conventional Energy Sources	G D Rai	Khanna Publications	2017	6 th Edition
3	Fuels & combustion	Samir Sarkar	CRC Press	2010	3 rd Edition

Course Outcome:

Sr. No.	CO Statement After learning this subject, students will be able to	Marks % weightage
CO-1	To make students aware about all the energy sources available and the ways to turn it into power.	15
CO-2	To understand the principles behind different non conventional energy sources.	15
CO-3	To make student understand the global scenario of energy sector and to work on better economical solutions of it.	15
CO-4	To utilize the renewable energy in problem solving where conventional energy are not fruitful and require replacement.	35
CO-5	To understand the design and applications of power generating devices using renewable energy sources as per industrial requirement	20

Mapping with POs:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	3	3	2	1	1	3	3	3	2	2	2	3	2	2	2
CO-2	3	3	2	1	1	3	3	3	2	2	2	3	2	2	1
CO-3	3	3	2	1	1	3	3	3	2	2	2	3	1	1	1
CO-4	3	3	2	1	1	3	3	3	2	2	2	2	3	3	3
CO-5	3	3	2	1	1	3	3	3	2	2	2	2	2	3	3
Rationale*	15	15	10	5	5	15	15	15	10	10	10	13	10	11	10

Rationale*: Explaining why it is matching this particular program outcome

List of Open Source/learning website:

- <https://nptel.ac.in/courses/103/107/103107157/>
 - Detail of coverage as per syllabus
- <https://nptel.ac.in/courses/121/106/121106014/>
 - Detail of coverage as per syllabus

