



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3150507

Semester – V

Subject Name: Energy Technology

Type of course: Open elective course

Prerequisite: None

Rationale:

To provide an idea of the challenges in the field of energy management and to provide a perspective on energy technology. Students will learn the systems dimensions of the energy problems and its historical perspective on energy technology and system development. For different types of energy sources utilization in industries, the procedure of power generation, transportation along with conventional and advanced application in different sectors should be known by the student. This subject will guide students in the same direction.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination marks				Total marks
L	T	P		Theory marks		Practical marks		
				ESE (E)	PA (M)	PA (I)	ESEV)	
3	0	0	4	70	30	0	0	100

Content:

Sr. No.	Content	Total Hrs	%weigh tage
1	An Introduction to Energy Sources: Energy consumption, world energy future, energy sources and their availability, Conventional and Non-conventional energy, primary and secondary energy resources, energy and environment, energy needs for growing economy, energy sector reforms, energy security, energy audit, energy conservation and its importance	7	15
2	Energy Efficiency in Thermal Utilities Fuels and Combustion: Introduction to fuels, properties of fuel oil, coal and gas, storage, handling and preparation of fuels, principles of combustion, proximate and ultimate analysis, calorific values, gasification, composition of coal. Steam System: Properties of steam, assessment of steam distribution losses, steam leakages, steam trapping, condensate and flash steam recovery system, identifying opportunities for energy savings. Insulation and Refractories: Insulation-types and application, economic thickness of insulation, heat savings and application criteria, Refractory-types, selection and application of refractories, heat loss. Waste Heat Recovery: Classification, advantages and applications, commercially viable waste heat recovery devices, saving potential.	10	20



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3	Solar energy Solar radiation and related terms, measurement of solar radiation, solar energy collectors-flate plate collector, air collector, concentrating collectors, application and advantages of various collectors, solar energy storage system (thermal, chemical, mechanical), solar pond, application of solar energy	10	15
4	Fuel cell Introduction, hydrogen- oxygen fuel cell, ion exchange membrane cell, fossil fuel cell, molten carbonate cell. Advantages and disadvantages, conversion efficiency, polarization, type of electrodes, application of fuel cell	07	20
5	Energy from biomass Introduction, biomass conversion technology, photosynthesis, biogas generation, factors affecting biogas generation, classification of biogas plants and their comparison, types of biogas plant, biogas from plant wastes, community plants and site selection, digester design consideration, design calculations, methods of maintaining and starting of biogas plant, properties and utilization of biogas, thermal gasification of biomass, pyrolysis	10	15
6	Wind energy Basic principles, power in wind, force on blades and turbines, wind energy conversion, site selection, basic components of wind energy conservation system (WECS), classification of WECS, wind energy collectors, applications of wind energy.	07	15

Reference Books:

1. Fuels & combustion by Samir Sarkar, Orient Longmans(1974)
2. Solar Energy: Principles of Thermal Collections and Storage, S. P. Sukhatame and J. K. Nayak, Tata McGraw Hill, New Delhi
3. Energy Technology by Rao &Parulaker.
4. Energy Sources 2nd Ed. by G. D. Rai, Khanna Publications, NewDelhi

Suggested Specification table with Marks (Theory): (For BE only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
30	15	15	5	5	0

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and 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.

Course Outcomes:



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Sr. No.	CO statement	Marks % weightage
CO-1	To understand the basic knowledge of available energy sources, energy conservation and energy audit	15
CO-2	To Evaluate the energy saving & conservation in different thermal utilities	20
CO-3	To understand the design and applications of power generating devices using solar energy	15
CO-4	To understand the basics of fuel cell and able to design different types of cells	20
CO-5	To classified various biomass conversion methods and able to design/develop biogas plant	15
CO-6	To understand the design and applications of power generating devices using wind energy	15

List of Tutorials: Students can select any type of renewable energy and try to find out the application in chemical or other industries and can suggest modification in the energy production techniques, which can make the surrounding of plant environmental friendly and economical at the same time. Each group of students are expected to create a way to utilize renewable energy in innovative way and prepare report of project assigned to his/her group. In addition, each group is expected to give a power point presentation during the semester. The presenter will be selected randomly just prior to the presentation.

List of Open Source Software/learning website: Students can refer to video lectures available on various websites including NPTEL. → Students can refer to the CDs which are available with some reference books for the → solutions of problems using softwares. Students can develop their own programs for the solutions using excel, Chemical and other simulation softwares.