

GUJARAT TECHNOLOGICAL UNIVERSITY

NANO TECHNOLOGY (39) NON-CONVENTIONAL ENERGY SOURCES SUBJECT CODE: 2163904 B.E. 6th SEMESTER

Type of course: Energy Science and Engineering

Prerequisite: Basic knowledge of Non-conventional energy sources such as geothermal, wind, solar, hydroelectric and bio-power.

Rationale: The Student will learn the concepts about energy sources like solar energy, wind energy, energy from biomass, geothermal energy, energy from the ocean. Recent advancements in energy generations like magneto hydrodynamic power generation, fuel cell technology, hydrogen energy and management of energy in the industries.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P		Theory Marks			Practical Marks			
			ESE (E)	PA (M)		ESE (V)		PA (I)		
				PA	ALA	ESE	OEP			
4	0	0	4	70	20	10	0	0	0	100

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	INTRODUCTION: Various non-conventional energy resources- availability, classification, relative merits and demerits.	6	9%
2	SOLAR CELLS AND SOLAR THERMAL ENERGY: Theory of solar cells. solar cell materials, solar cell power plant, limitations. Solar radiation flat plate collectors and their materials, applications and performance, focussing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations.	10	19%
3	FUEL CELLS: Principle of working of various types of fuel cells and their working, performance and limitations.	6	9%
4	BIO-MASS: Availability of bio-mass and its conversion theory. Applications i. Bio gas ii. Wood stoves iii. Bio diesel	6	9%
5	OCEAN THERMAL ENERGY CONVERSION (OTEC) Availability, theory and working principle, performance and limitations.	6	9%

6	WAVE AND TIDAL WAVE: Principle of working, performance and limitations	6	9%
7	WIND ENERGY Principle of working, performance and limitations	6	9%
8	MNETO-HYDRODYNAMICS (MHD): Principle of working of MHD Power plant, performance and limitations.	6	9%
9	GEOHERMAL ENERGY: Principle of working, performance and limitations	6	9%
10	NUCLEAR ENERGY Principle of working, performance and limitations	6	9%

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
22	21	20	7	00	00

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

Reference Books:

1. Andra Gabel, "A Handbook for Engineers and Economists".
2. A. Mani, "Handbook of Solar radiation Data for India".
3. Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by
4. Academic Press.
5. F.R. the MITTRE, "Wind Machines" by Energy Resources and Environmental Series.
6. Frank Kreith, "Solar Energy Hand Book".
7. N. Chermisinog and Thomes, C. Regin, "Principles and Application of Solar Energy".
8. N.G. Calvert, " Wind Power Principles".
9. W. Palz., P. Chartier and D.O. Hall, " Energy from Biomass".
10. G.D. Rai, Non-Conventional Energy Sources, Khanna Publishers, Delhi.
11. S Rao, B B Parulekar, Energy Technology: Non Conventional Renewable and Conventional, Khanna Publishers, Delhi.
12. H.P. Garg & Jai Prakash, Solar Energy: Fundamentals and Applications, Tata McGraw Hill, N Delhi
13. . S P Sukhatme, Solar Energy: Principles of Thermal Collection and Storage, Tata McGraw Hill, N Delhi.
14. Sutton, Direct Energy Conversion, McGraw Hill Inc., 1966.
15. Duffie and Beckman, Solar Energy Thermal processes, John Wiley, 1974.

Course Outcome:

After learning the course the students should be able to:

1. Understand difference way to produce energy by unconventional energy sources: solar energy, wind energy, tidal energy, geothermal energy, nuclear fusion,
2. Understand Special methods of energy production: fuel cells, MHD power plants
3. Understand Unconventional energy, transport ,accumulation and application:

List of Open Source Software/learning website:

<http://www.sciencebuddies.org/science-fair-projects/search.shtml?v=ia&ia=Energy>

<http://www.altenergy.org/>

https://en.wikipedia.org/wiki/Renewable_energy

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.