FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2022-23

Programme: **Bachelor of Technology (Electrical Engineering)**

Semester: **V**

Course Code: **202090521**

Course Title: **Non-Conventional Energy Sources**

Course Group: **Open Elective-I**

Course Objectives: To provide a survey of the most important renewable energy resources and the technologies for harnessing these resources within the framework of a broad range of simple to state- of -the-art energy system**.**

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
				Theory		J/V/P*		Total
Lecture	Tutorial	Practical		Internal	External	Internal	External	
3	0	0	3	50 / 18	50 / 17	--	--	100 / 35

* **J**: Jury; **V**: Viva; **P**: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	**Introduction** World Production and reserve of conventional energy sources, Present energy scenario in Gujarat, India and World. Need of the non- conventional energy sources, Various conventional & non-conventional energy sources and their availability	2
2	**Solar radiation and measurement** Origin, nature and availability of solar radiation, Solar Constant, Solar radiation at Earth's Surface, radiation on tilted surface, Solar radiation geometry, Solar radiation measurement and estimation, Instruments for solar radiation measurements.	8
3	**Solar Energy Collectors** Types of solar collector, Flat Plate Collector (FPC)-Thermal Analysis of FPC, Concentrating collectors, Solar Pond	6

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4	**Application of Solar Energy** Solar water heating system, Space heating and cooling system, Solar Pumping, Solar Distillation, Solar Cooker, Solar furnace, Solar air conditioning system, Solar electric power generation, Photovoltaic solar cell, Solar cell modules and arrays, Solar cell types,Solar cell materials	**9**
5	**Wind Energy** Basic principle of wind energy conversion system, site selection consideration, basic components of WECS, classification of WEC systems, applications of wind energy.	**7**
6	**Energy from Biomass** Biomass conversion technologies, Biogas generation, Classification, advantage and disadvantage of biogas plants, gasification, types and application of gasifiers.	**6**
7	**Geothermal and Oceans Energy** Sites, potentiality, resources, different conversion systems and other uses of geo-thermal sources, advantages and limitations. Prospects of geothermal energy in India. Ocean Thermal Energy Conversion-Principle of utilization, open cycle OTEC system, closed cycle, hybrid cycle. Tidal Energy-Principle of working, performance and limitations.	**7**
	Total	**45**

Reference Books:

1	G. D. Rai, Non-Conventional Energy Sources, Khanna Publishers
2	G. N. Tiwari and M. K. Ghoshal, Renewable Energy Sources Basic Principles and Applications, Narosa Publishing House, New Delhi
3	S.P. Sukhatme, Solar Energy: Principles of Thermal Collection and Storage, Tata McGraw-Hill
4	Duffie,J.A.&W.A.Beckman,SolarEngineeringofThermalProcesses,JohnWiley&Sons
5	B H Khan , Non-Conventional Energy Resources, Tata Mc Graw Hill Education Pvt Ltd
	C. S. Solanki, 'Solar Photovoltaics: Fundamental Applications and Technologies, Prentice Hall of India
	ShobhNath Singh, Non-conventional energy resources, Pearson India
	Abbasi Tasneem, Renewable energy sources, PHI Learning
	R K Rajput, Non-Conventional Energy Source & Utilization, S Chand & Co Ltd

Supplementary learning Material:	
1	NPTEL Resources

Pedagogy:

- Direct classroom teaching
- Audio Visual presentations/demonstrations
- Assignments/Quiz
- Continuous assessment
- Interactive methods
- Industrial/ Field visits

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Internal Evaluation:

The internal evaluation comprised of written exam (40% weightage) along with combination of various components such as Certification courses, Assignments, Mini Project, Simulation, Model making, Case study, Group activity, Seminar, Poster Presentation, Unit test, Quiz, Class Participation, Attendance, Achievements etc. where individual component weightage should not exceed 20%.

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						**R**: Remembering; **U**: Understanding; **A**: Applying; **N**: Analyzing; **E**: Evaluating; **C**: Creating
R	**U**	**A**	**N**	**E**	**C**	
15%	25%	30%	10%	15%	5 %	

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 (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Understand the need for alternative sources of energy	25
CO-2	Know the solar energy conversion technologies and application	30
CO-3	Know Wind and biomass energy sources and their energy conversion techniques, applications, comparison.	30
CO-4	Analyze harnessing of geothermal and ocean energy	15

Curriculum Revision:	
Version:	2.0
Drafted on (Month-Year):	June-2022
Last Reviewed on (Month-Year):	--
Next Review on (Month-Year):	June-2025

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