SARVAJANIK UNIVERSITY
Sarvajanik College of Engineering and Technology
Bachelor of Technology

B. Tech. Semester – VII

Subject Name: Renewable Energy Sources **SubjectCode:BTEL15701**

Type of course: **Open elective course**

Prerequisite: No official course prerequisite

Rationale: The Renewable Energy: Sources and Applications course provides a graduate-level understanding of the conversion principles and technology behind various renewable energy sources. The course presents the various sources of renewable energy including wind, solar, and biomass as potential sources of energy and investigates the contribution they can make to the energy profile of the nation. The technology used to harness these resources will be presented.

Teaching and Examination Scheme:

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

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

Content:

Sr. No.	Topics	Hours	Weightage %
1	**INTRODUCTION** Principles of renewable energy; energy and sustainable development, fundamentals and social implications. worldwide renewable energy availability, renewable energy availability in India, brief descriptions on solar energy, wind energy, tidal energy, wave energy, ocean thermal energy, biomass energy, geothermal energy, oil shale.	8	15
2	**SOLAR ENERGY** Fundamentals; Solar Radiation; Estimation of solar radiation on horizontal and inclined surfaces; Solar radiation Measurements. Solar Thermal systems: Flat plate collector; Solar distillation; Solar pond electric power plant. **SOLAR ELECTRIC POWER GENERATION** Principle of Solar cell, Photovoltaic system for electric power generation, advantages, Disadvantages and applications of solar photovoltaic system.	9	20

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3	**WIND ENERGY** Properties of wind, availability of wind energy in India, wind velocity and power from wind; major problems associated with wind power, Basic components of wind energy conversion system (WECS); Classification of WECS- Horizontal axis- single, double and multi blade system. Vertical axis- Savonius and darrieus types. **BIOMASS ENERGY** Introduction; Photosynthesis Process; Bio fuels; Biomass Resources; Biomass conversion technologies -fixed dome; Urban waste to energy conversion; Biomass gasification (Downdraft) .	**10**	**23**
4	**TIDAL POWER** Tides and waves as energy suppliers and their mechanics; fundamental characteristics of tidal power, harnessing tidal energy, advantages and limitations. Ocean Thermal Energy Conversion: Principle of working.	**9**	**21**
5	**GREEN ENERGY** Introduction, Fuel cells: Classification of fuel cells – H2; Operating principles, Zero energy Concepts. Benefits of hydrogen energy, hydrogen production technologies (electrolysis method only), hydrogen energy storage, applications of hydrogen energy, problem associated with hydrogen energy.	**9**	**21**

COURSE OBJECTIVES:

	CO Statement **After learning this subject, students will be able to**	**Marks % weightage**
CO1	Describe the principle of operation of the broad spectrum of renewable energy technologies.	**25**
CO2	Analyze renewable energy technologies from a systems' perspective.	**20**
CO3	Articulate the technical challenges for each of the renewable sources.	**15**
CO4	Describe economic, technical, and sustainability issues involved in the integration of renewable energy systems.	**20**
CO5	Develop the skills required in renewable energy and energy management fields.	**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**	**1**	**0**	**1**	**1**	**1**	**2**	**1**	**1**	**3**	**1**	**1**	**1**	**0**	**3**
CO-2	**1**	**2**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**1**	**2**	**3**	**2**	**3**
CO-3	**1**	**2**	**1**	**1**	**2**	**1**	**3**	**2**	**1**	**1**	**1**	**1**	**3**	**2**	**3**
CO-4	**2**	**1**	**0**	**2**	**2**	**2**	**3**	**2**	**2**	**3**	**2**	**2**	**1**	**2**	**3**
CO-5	**1**	**1**	**0**	**0**	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**3**	**0**	**0**	**3**

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Reference Books

1. G. D. Rai "Non-Conventional Energy Sources", Khanna Publishers, NewDelhi.
2. B. H. Khan "Non-Conventional Energy Resources", McGraw Hill Publishers,New Delhi.
3. Wind Turbines – Fundamentals: Technologies, Application, Economics. ErichHau, Springer – Verlag Berlin – Heidelbeg, 2000.
4. Non-Conventional Energy Resources, B. H. Khan, The McGraw HillPublishers
5. C.S. Solanki, Solar Photovoltaics: Fundamental, Technologies and Applications,Prentice Hall of India, 2011.
6. S.P. Sukhatme and J.K. Nayak, Solar Energy – Priniciples of thermalcollection and storage; Tata McGraw-Hill, New Delhi

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