

19BSP704					RENEWABLE ENERGY AND ENERGY HARVESTING					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
4	0	0	4	4	25	50	25	--	--	100

COURSE OBJECTIVES

- ☐ To provide knowledge on renewable energy resources and applications in the relevant fields such as power generation.
- ☐ To introduce basic concepts of aerodynamics, horizontal and vertical axis wind turbines.
- ☐ To provide the knowledge of solar energy harvesting and their fundamental understanding.
- ☐ To introduce the fundamental understanding of geothermal, hydro, piezo, electromagnetic and carbon renewable energy resources

UNIT 1 FOSSIL FUELS AND ALTERNATE SOURCES OF ENERGY**14 Hrs.**

Present scenario, Fossil fuels and their limitation, need of renewable energy, non-conventional energy sources, Basics of energy, unit conversions. An overview of developments in alternate sources of energy; Energy and environment correlations: Environmental Impact Assessment and Life cycle analysis (LCA); Energy conservation: Audits, Implementation and Planning; Power grids and Grid codes (IEEE / Indian standards).

UNIT 2 SOLAR ENERGY HARVESTING**14 Hrs.**

Solar energy, its importance, applications, basic terminology: sun angle, radiations, air mass etc., solar to thermal energy conversion, solar concentrator, solar pond, solar water heater: features and applications, solar PV system, solar cells, characteristics, materials generation, and efficiency.

UNIT 3 WIND ENERGY HARVESTING**14 Hrs.**

Fundamentals of Wind Energy, Wind Turbines and different electrical machines in wind turbines, Power electronic interfaces, and grid interconnection topologies. Ocean Energy- Ocean Energy Potential against Wind and Solar, Wave Characteristics and Statistics, Wave Energy Devices, Tide characteristics and Statistics, Tide Energy Technologies, Ocean Thermal Energy, Osmotic Power, Ocean Bio-mass.

UNIT 4 OTHER RENEWABLE SOURCES**14 Hrs.**

Geothermal Energy- Geothermal Resources, Geothermal Technologies. Hydro Energy- Hydropower resources, hydropower technologies, the environmental impact of hydropower sources. Piezoelectric Energy harvesting- Introduction, Physics and characteristics of piezoelectric effect, Piezoelectric energy harvesting applications. Electromagnetic Energy Harvesting- Linear generators, recent applications. Carbon captured technologies, cell, batteries, and power consumption.

Max. <56> Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

CO1 – Identify different renewable sources of energy and technologies to harness them,

CO2 - Understand the national and international regulations pertaining to renewable energy technologies as well as relevant policy initiatives

CO3 – Correlate storage technologies, regulation and control, distribution options etc.

CO4 - Identify and explain the different resources of solar energy harvesting.

CO5 - To explain and analysis the basic terminology of solar energy and analysis the solar cell characteristics.

CO6 - Explain design and analysis the basic operating mechanism of energy harvesting from geothermal, hydro, piezo, electromagnetic and carbon energy resources

TEXT/REFERENCE BOOKS

1. S. Rao and Dr. B. B. Parulekar, "Energy Technology", Khanna Publishers.
2. N. K. Bansal, "Renewable energy sources and conversion technology", Tata McGraw-Hill Publishing Company.
3. G. D. Rai, "Non-conventional energy sources", Khanna Publishers.
4. S. P. Sukhatme, "Solar Energy principles of thermal collection and storage", Tata McGraw Hill Publishing Company Ltd., New Delhi.
5. Godfrey Boyle, "Renewable Energy, Power for a Sustainable Future", Oxford University Press, U.K.
6. L. L. Freris, "Wind Energy Conversion systems", Prentice Hall, UK.
7. G. S. Sawhney, "Non-conventional energy sources", PHI learning Pvt. Ltd.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks: 100**

Part A/Question: 3 Questions of each unit carrying 3 marks each

Part B/Question 2 Questions from each unit, each carrying 8 marks each

Exam Duration: 3 Hrs

36 Marks

64 Marks