22EEEEVAC02	ALTERNATIVE SOURCES OF ENERGY	L	T	P	C
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COURSE OBJECTIVES

- To review the conventional resources and bring out the need for alternative forms
- To study the Solar PV system as an energy source and identify its characteristics
- To learn the wind as a source of energy and understand the principle of energy conversion
- To introduce Biogas as a source and explain the theory of energy conversion
- To analyze the benefits of Geothermal and Ocean forms of energy

UNIT I: INTRODUCTION

Overview of conventional resources - Depleting nature - Environmental issues and challenges - Compliance of clean energy act - Need for alternative sources - Merits and demerits.

UNIT II: SOLAR ENERGY

Introduction - Solar radiation spectra - Estimation of solar energy availability - Solar PV Technologies - Principle of Solar Photo voltaic cell - Solar Photo Voltaic Power generation - V-I characteristics of a PV panel - Solar energy storage systems - Solar pump - Solar hydrogen energy - Solar refrigerator.

UNIT III: WIND ENERGY

History of wind power- Indian and Global statistics - Wind physics - Tip speed ratio - Basic principle of wind energy conversion - Site selection consideration - Fixed and Variable speed wind turbines - Basic theory of Induction Generators - Applications of wind energy - Environmental aspects.

UNIT IV: ENERGY FROM BIO-MASS

Bio-gas generation principle - Types of bio-gas plants - Bio-mass as a source of energy - Energy plantation - Energy from agricultural waste - Agro thermal power plant - Bagasse basedco-generation programme - Integrated waste management.

UNIT V: GEO-THERMAL ENERGY

Nature of geo-thermal energy sources - Advantages and Disadvantages of Geo-thermal energy - Principle of ocean thermal energy conversion (OTEC) - Open cycle OTEC system - Basic principle and components of tidal power plant - Site requirements - Storage advantages and limitations of tidal power generation.

TEXT BOOKS

1. Non-Conventional Energy Sources, G.D. Rai, Khanna Publishers, Delhi, 2000.
2. Solar Energy Utilization, G.D. Rai, Khanna Publishers, Delhi, 2000.
3. Generation of Electrical Energy, B.R. Gupta, S. Chand and Company Ltd., New Delhi, 2001.

REFERENCES

1. Non-conventional Energy Resources, B.H. Khan, Tata McGraw Hill, Second Edition, 2010.
2. Solar Energy Utilization, G.D. Rai, Khanna Publishers, Delhi, 2000.
3. Renewable Energy Applications, G. N. Tiwari and M. K. Ghosal, Narosa Publications, 2004.

COURSE OUTCOMES

At the end of this course work, students will be able to

1. Understand the challenges in the use of conventional energy resources.
2. Learn the basics of Solar PV Systems.
3. Understand the basic concepts of wind energy conversion system.
4. Acquire knowledge to use biomass as a source of energy.
5. Explore the use of geothermal as an energy source.

Mapping with Programme Outcomes															
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	**2**	**1**				**2**	**2**	**1**					**2**	**1**	**1**
CO2	**2**	**2**		**2**		**2**	**2**	**2**					**2**	**1**	**1**
CO3	**2**	**2**		**1**		**2**	**2**	**2**					**2**	**1**	**1**
CO4	**3**	**2**		**2**		**2**	**2**	**2**					**2**	**2**	**1**
CO5	**3**	**2**		**1**		**2**	**2**	**1**					**2**	**1**	**1**