

Semester	:	<b>VI</b>	
Course Code	:	<b>OE</b>	
Course Title	:	<b>Renewable Energy</b>	
Number of Credits	:	<b>3 (L: 3, T: 0, P: 0)</b>	
Prerequisite	:	NIL	
Course Category	:	<b>OE</b>	
<b>Course Objective</b>			
Following are the objectives of this course			
	To provide basic knowledge of different sources of renewable energy and Renewable energy plants		
<b>Course Content</b>			
		<b>Hrs/Unit</b>	
<b>Module 1</b>	<b>Unit 1</b>	<b>Introduction</b>	6
		1.1 Classification of energy: Primary and secondary energy, Commercial and non-commercial energy, Renewable and Non-renewable energy, Conventional and Non-conventional energy. 1.2 Advantage of Renewable energy 1.3 Sources of Renewable Energy: Solar Energy, Wind Energy, Biomass Energy, Hydro Energy, Geothermal Energy, Tidel and Ocean energy (only brief idea on all these)	
	<b>Unit II</b>	<b>Solar energy</b>	9
		2.1 Units of solar power and solar energy 2.2 Essential subsystem in solar energy plant: Solar collector or concentrator, energy transport medium, energy storage, energy conversion plant, power conditioning control and protection system, alternative or standby power supply. 2.3 Solar Electric System: Solar water Heater, Solar lighting system, Solar cooker, Electric vehicle charging station (Working principle only) 2.4 Idea on Photovoltaic Technology	
<b>Module 2</b>	<b>Unit III</b>	<b>Bioenergy</b>	7
		3.1 Introduction on Biogas, Sources of Bioenergy 3.2 Different forms of Biomass, their composition & fuel properties 3.3 Production of Biogas: working principle of fixed-dome type and floating gas holder type biogas plant 3.4 Idea of gasifier, digester 3.5 Use of Biogas	
	<b>Unit IV</b>	<b>Wind Energy</b>	6
		4.1 Basic working principle of Wind energy production	

		4.2 Speed and power relation, Average power of the wind 4.3 System components of wind Energy (e.g. Tower, Turbine, Blades etc). 4.4 Control of rotor speed	
<b>Module 3</b>	<b>Unit V</b>	<b>Hydropower</b>	5
		5.1 How hydropower plant works 5.2 Main components of Hydropower plant: Gate, penstock, surge tank, turbine, transformer etc. 5.3 Types of hydropower: Run-of-River power plant (no active storage), Plant with significance storage, Pumped storage, Tidal plant (Only basic idea)	
	<b>Unit VI</b>	<b>Measuring Instruments</b>	9
		6.1 Basic principle of Pyranometer for solar radiation measurement. 6.2 Idea on different instrument used in Hydroelectric power plant, Solar thermal plant, Wind power plant, Biogas plant (name of instruments and where to use in that plant.)	

#### Suggested Learning resources

Title	Author	Publisher
Non-Conventional Energy	ShobhNath Singh	Pearson
Renewable and Efficient Electric Power Systems	Gilbert M. Masters	Wiley
Alternative Energy Systems & Applications	B.K.Hodge	Wiley
Renewable Energy Technologies,	J.C.Sabonnadiere,	Wiley
Introduction to Renewable Energy	Vaughn Nelson	CRC Press
Renewable Energy: Power for a Sustainable Future	Godfrey Boyle	
Renewable Energy Technology	Jha, Sen, Tiwari, Kothari	New Age International
Renewable Energy Technology	Chetan Singh Solanki	PHI
Non-Conventional Energy Resources	S.H.Saeed, D.K.Sharma	S.K.Kataria& Sons
Energy Techonology: Nonconventional, Renewable & conventional	Rao, Parulekar	Khanna Publisher
Non-conventional Energy Sources	G.D. Rai	Khanna Publisher
Non-Conventional Energy Resources	B. H. Khan	McGraw Hill Publications.
Solar Energy – Principles of Thermal Collection and Storage	S. P. Sukhatme, J.K. Nayak	Tata McGraw-Hill, New Delhi
Solar Energy, Fundamentals and Applications	Garg, Prakash	Pearson
Solar energy	A.M. Rehman	Scitech

		Publications(India) Pvt. Ltd
Introduction to solar principles	Thomas E. Kissell	Pearson
Biogas Systems, Principle and	Mital KM.	New Age International Ltd.
<b>Course Outcome</b>		
At the end of the course student will be able to:	<ul style="list-style-type: none"> <li>➤ Classify different energy sources</li> <li>➤ Understand basics on solar energy, bioenergy, wind energy, and hydropower.</li> <li>➤ Identify different parts of solar energy plant.</li> <li>➤ Know various sources of biomass, and construction of biogas production plant</li> <li>➤ Understand concepts of wind energy, components and functions of it</li> <li>➤ Grow critical thinking and problem-solving skills to overcome obstacles to use renewable energy system.</li> <li>➤ Identify different measuring instruments related to specific renewable energy plant.</li> </ul>	