

COURSE CODE: 1154EE118	COURSE TITLE: GREEN ENERGY RESOURCES							L	T	P	C	
								3	0	0	3	
COURSE CATEGORY:												
University Elective												
PREAMBLE :												
This course focuses on the renewable energy based electric energy generation: Solar, Wind, Bio Energy, Waste to energy, other renewable energy resources.												
PREREQUISITE COURSES:												
Basic Electrical Engineering												
COURSE EDUCATIONAL OBJECTIVES :												
To impart knowledge on <ul style="list-style-type: none"> • Concepts of the renewable energy sources like wind, solar, Bio and other renewable energy resources. • Environmental friendly energy production and consumption. • energy-efficient systems and products for various applications 												
COURSE OUTCOMES :												
Upon the successful completion of the course, students will be able to:												
CO Nos.	Course Outcomes							Knowledge Level (Based on revised Bloom's Taxonomy)				
CO1	Explain about Renewable Energy resources and its importance							K2				
CO2	Understand the process of photovoltaic power generation							K2				
CO3	Explain the process of power generation using wind energy resources							K2				
CO4	Summarize the power generation using Bio energy techniques.							K2				
CO5	Summarize the fundamentals and the other renewable energy resource applications							K2				
CORRELATION OF COS AND POS												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1											L	L
CO2		H	H					M	M			
CO3		H										
CO4			H		H	L	H				L	L
CO5		L			L			M	M		L	L
H-High: M: Medium L-Low.												

COURSE CONTENTS :		
UNIT I	INTRODUCTION	6
Energy needs of India, classification of energy sources, energy efficiency and energy security, importance of renewable energy resources.		
UNIT II	SOLAR ENERGY	12
Basic concepts, types of collectors, collection systems, photo voltaic (PV) technology: solar thermal effect, solar cells, characteristics of PV systems, equivalent circuit, and array design, building integrated PV system and efficiency calculations, applications.		
UNIT III	WIND ENERGY	9
Wind power systems, wind speed and power relation components, turbine types, turbine rating. Choice of generators and site selection, wind energy forecasting, variable speed operation, maximum power operation,		
UNIT IV	BIO ENERGY	9
Bio-mass and bio-gas: principles of bio-conversion, bio-gas digesters types, gas yield, and combustion characteristics, fermentation and wet processes, applications-utilization for cooking		
UNIT V	OTHER RENEWABLE ENERGY RESOURCES	9
Geothermal energy, ocean thermal energy, wave energy, Tidal energy, waste to energy, heat to energy, Fuel cells: types and applications.		
TOTAL: 45 PERIODS		
TEXTBOOKS:		
<ol style="list-style-type: none"> 1. Rai G.D, "Non conventional Energy Sources" khanna Publishers, 2006. 2. A.Duffie and W.A.Beckmann, Solar Engineering of Thermal Processes-John Wiley (1980) 		
REFERENCE BOOKS:		
<ol style="list-style-type: none"> 1.F.Kreith and J.F.Kreider, Principles of Solar Engineering, McGraw-Hill (1978). 1. T.N.Veziroglu, Alternative Energy Sources, Vol 5 and 6, McGraw-Hill (1978). 2. David Hu. Hand Book of Industrial Energy Conservation, Van Nostrand Co., 1983. 3. Handbook of Energy Engineering , Albert Thumann ,D. Paul Mehta, 2008 Fairmont Press, Inc 		
ONLINE RESOURCES:		
<ol style="list-style-type: none"> 1. books.google.co.in 2. www.scribd.com/.../Solar-engineering-of-Thermal-processes-Duffie 		