SWARNANDHRA COLLEGE OF ENGINEERING AND TECHNOLOGY
(Autonomous)
Narsapur, West Godavari District, A.P. 534280
DEPARTMENT OF MECHANICAL ENGINEERING

LESSON PLAN

Course Code	Course Title	Semester	Branch	Conduct Periods /Week	A.Y	Date of commencement of Semester
20ME7O02	GREEN ENGINEERING SYSTEMS	VII	CSE,AIML, ECE	6	2025-26	09 -06-2025

COURSE OUTCOMES

1	**Recognize** the energy scenario and **explain** solar radiation conversion and collection phenomena. [K3]
2	**Illustrate** solar energy storage methods and applications and also explain the principles of wind energy, classification, conversion and applications [K4]
3	**Explain** the principle, classification, conversion and applications of Bio mass, geothermal energy and ocean energy. [K3]
4	Describe the importance of energy efficient systems and **interpret** working of a few mechanical and electrical efficient systems. [K3]
5	Identify the need of energy efficient processes and **analyze** their significance in view of their importance in the current scenario and their potential future applications. [K4]

UNIT	Out Comes/ Blooms Level	Topics No.	Topics/Activity	Text Book /Reference	Conduct Hour	Delivery Method
I	CO1: **Recognize** the energy scenario and **explain** solar radiation conversion and collection phenomena. [K3]		**1. INTRODUCTION, SOLAR RADIATION, SOLAR ENERGY COLLECTION**			
		1.1	Energy chain and common forms of usable energy – Present energy scenario – World energy status – Energy scenario in India, Traditional energy systems, Renewable energy – sources and features.	**T1, T2**	1	Classroom learning, PPT,
		1.2	Role and potential of new and renewable sources, the solar energy option, Environmental impact of solar power	T_1&T_2	1	
		1.3	structure of the sun, the solar constant	T_1& R_{11}	1	
		1.4	sun-earth relationships, coordinate systems and coordinates of the sun	T_1& R_1	1	
		1.5	extraterrestrial and terrestrial solar radiation, solar radiation on titled surface	T_1& R_1	1	
		1.6	instruments for measuring solar radiation and sun shine, solar radiation data	T_1& R_1	1	
		1.7	numerical problems	T_2& R_2	1	

		1.8	Photo voltaic energy conversion – types of PV cells, I-V characteristics.	T_2& R_2	1	
		1.9	Flat plate collector- classification, orientation and thermal analysis	T_2& R_2	1	
		1.10	concentrating collectors- classification	T_2& R_2	1	
		1.11	Orientation, Thermal analysis of concentrating collectors	T_2& R_2	1	
		1.12	Advanced collectors	T_2& R_2	1	
				Total	**12**	
II	**CO2: Illustrate** solar energy storage methods and applications and also explain the principles of wind energy, classification, conversion and applications [K4]	**2. SOLAR ENERGY STORAGE AND APPLICATIONS, WIND ENERGY**				
		2.1	Different methods, sensible, latent heat and stratified storage	T_1&T_2	1	Classroom learning, Videos, PPT, Quiz.
		2.2	Solar ponds	T_1& R_1	1	
		2.3	Solar applications- solar heating/cooling technique	T_1& R_1	1	
		2.4	Solar distillation	T_1& R_1	1	
		2.5	Solar drying, solar cookers, central power tower concept and solar chimney	T_1& R_1	1	
		2.6	Sources and potentials of wind energy	T_1& R_1	1	
		2.7	horizontal and vertical axis windmills	T_1& R_1	1	
		2.8	Performance characteristics, betz criteria	T_1& R_1	1	
		2.9	Types of winds,	T_1& R_1	1	
		2.10	Wind data measurement	T_1& R_1	1	
				Total	**10**	
	CO3: Explain the principle, classification, conversion and applications of Bio mass, geothermal energy and ocean energy. [K3]	**3. BIO-MASS, GEOTHERMAL ENERGY, OCEAN ENERGY**				
		3.1	Principles of bio-conversion, anaerobic/aerobic digestion	T_2& R_2	1	Classroom learning, PPT, Group discussion
		3.2	Types of bio-gas digesters, gas yield	T_2& R_2	1	
		3.3	Combustion characteristics of bio-gas, utilization for cooking	T_1 & T_2	1	
		3.4	Bio fuels, I.C. engine operation and economic aspects	T_1 & T_2	1	
		3.5	Resources of geothermal energy, types of wells	T_1 & T_2	1	
		3.6	methods of harnessing the energy, potential in India.	T_1 & T_2	1	
		3.7	OTEC, Principles of utilization	T_1 & T_2	1	

		3.8	setting of OTEC plants, thermodynamic cycles	T1, T2, R3	1	
		3.9	Tidal and wave energy: Potential and conversion techniques,	T1, T2, R3	1	
		3.10	mini-hydel power plants, and their economics.	T1, T2, R3	1	
				Total	**10**	
IV	**CO4:** Describe the importance of energy efficient systems and **interpret** working of a few mechanical and electrical efficient systems. [K3]	**4. ENERGY EFFICIENT SYSTEMS**				Classroom learning, PPT, Group discussion Case study, Quiz
		4.1	**ELECTRICAL SYSTEMS:** Energy efficient motors, energy efficient lighting and control	T_1 & T_2	1	
		4.2	Selection of luminaire, variable voltage variable frequency drives (adjustable speed drives)	T_1 & T_2	1	
		4.3	Controls for HVAC (heating, ventilation and air conditioning)	T_1 & T_2	1	
		4.4	Demand site management	T_2& R_1	1	
		4.5	**MECHANICAL SYSTEMS:** Fuel cells- principle, thermodynamic aspects	T_1& R_1	1	
		4.6	selection of fuels & working of various types of fuel cells	T_1& R_1	1	
		4.7	environmental friendly	T_1 & T_2	1	
		4.8	Energy efficient compressors	T_1 & T_2	1	
		4.9	Pumps	T_1 & T_2	1	
		4.10	**GREEN BUILDINGS** Definition features and benefits.	T_1 & T_2	1	
	C.B.S		Sustainable Digital future		1	
				Total	**11**	
V	**CO5**: Evaluate the various ISO standards that are used for testing the quality of a product in present scenario. [K3]	**5. ENERGY EFFICIENT PROCESSES**				Classroom learning, PPT,
		5.1	Environmental impact of the current manufacturing practices and systems	T3, R1	2	
		5.2	Benefits of green manufacturing systems	T3, R1	1	
		5.3	Selection of recyclable and environment friendly materials in manufacturing	T3, R1	2	
		5.4	Design and implementation of efficient and sustainable green production systems	T3, R1	2	

		5.5	Environmental friendly machining, Vegetable based cutting fluids.	T3, R1	2	
		5.6	Alternate casting , Joining techniques, Zero waste manufacturing.	T3, R1	2	
	CBS		Circular Economy and Sustainable Materials		1	
				Total	**12**	
				Cumulative Proposed Periods	**55**	

Where : **C.B.S** = Content Beyond the Syllabus

Text Books:

S.No	Authors, Book Title, Edition, Publisher, Year of Publication
T1	Sukhatme S.P. and J. K. Nayak, Solar Energy – Principles of Thermal Collection and Storage, Tata McGraw Hill 2016
T2	Khan B.H., Non-Conventional Energy Resources, Tata McGraw Hill, New Delhi, 2006.
T3	Green Manufacturing Processes and Systems, Edited by J. Paulo Davim, Springer 2017

Reference Books:

S.No.	Authors, Book Title, Edition, Publisher, Year of Publication
R1	K. S. Jagadeesh, B.V. Venkata Rama Reddy and K. S. Nanjunda Rao, Alternative Building Materials and Technologies, New Age International (P) Ltd, 2010
R2	Yogi Goswami, Frank Krieth and John F Kreider, Principles of Solar Engineering, Taylor and Francis, 2008

S.NO.	Details	Name	Signature
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ii.	Faculty	Mr.S.Surendar	
iii.	Course Coordinator Faculty	Mr.V.Rambabu	
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