Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information

Programme	B. Tech. (Mechanical Engineering)
Class, Semester	Third Year B. Tech., Sem. V
Course Code	5OE330
Course Name	Energy Engineering
Desired Requisites:	

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs./week	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-	-			
Interaction	-	**Credits: 2**			

Course Objectives

1	To introduce students about alternate energy sources, their importance, needs, global scenario and economic considerations.
2	To provide knowledge of solar, bio, wind and ocean energy plants and its design methodology.
3	To prepare the students to analyze the performance and economics of thermal energy systems.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Discuss global energy scenario and energy systems	Understand
CO2	Distinguish and analyze solar, wind and bio mass as alternate sources of energy.	Apply
CO3	Assess the performance and economic considerations of energy systems.	Analyze

Module	**Module Contents**	**Hours**
I	**Introduction to Non-Conventional Energy Sources** Introduction, Indian and global energy scenario, fossil fuels, India's energy production, consumption and demand of energy, solar energy and other non-conventional energy resources, role of alternate energy sources of worlds power generation in future	3
II	**Solar Energy** Extra-terrestrial solar radiation, solar radiation on earth, beam and diffused radiation, global radiation on a surface, solar radiation geometry, solar energy collectors, solar energy storage, solar pond, applications of solar energy, cooking, pumping, distillation, solar PV energy generation	5
III	**Wind Energy Conversion Systems** Wind data and energy estimation, availability of wind energy and wind velocity, site selection, basic wind energy conversion systems, types of wind machines, performance of wind m/c, energy storage, and applications of wind energy	5
IV	**Bio-Energy and Fuel cell** Bio-mass and photosynthesis, biogas generation, types of biogas plants, factors affecting biogas generation, community biogas plants, biogas digester design, design of community biogas plant for a village, problems related to biogas plant Fuel cells- Design and principle of Operation of a fuel cell, Classification and types of fuel cells, Advantages and Disadvantages of Fuel Cell, Applications of Fuel	5

	Cells, Batteries- Basic Batteries Theory, Classification of Batteries	
V	**Ocean Energy** Ocean thermal energy conversion (OTEC): principle of OTEC, open and closed cycle OTEC, working fluids for OTEC Tidal energy: principle of tide generation, tidal power plants, estimation of energy from tides, site selection for tidal power plants	4
VI	**Energy Economics and Environment** Life cycle costing, present worth factor, present worth of capital and maintenance cost, energy conservation opportunities, energy audit, co-generation systems, waste heat utilization, impact of conventional energy use on environment	4

	Text Books
1	G. D. Rai, "Non-Conventional Energy Sources", Khanna Publishers, 5th Edition, 2014
2	V. M. Domkundwar, "Solar Energy and Non-Conventional Energy Sources", Dhanpat Rai & Co. Ltd., 1st Edition, 2010
3	R. K. Singal, "Non-Conventional Energy Sources", Katson Publication, 2nd Edition, Reprint, 2013
	References
1	Jhon Twidell and Tony Weir, "Renewable Energy Resources", Roultledge Publication, 2nd Edition, 2005
2	S. P. Sukhatme, "Solar Energy", McGraw Hill Publication, 4th Edition, 2017
3	G. S. Sawhney, " Non-Conventional Resources of Energy", PHI Publication, 5th Edition, 2012
4	Recent reports of agencies: International Energy Agency (IEA), Ministry of New and Renewable energy (MNRE), Technology and Action for Rural Advancement (TARA)
	Useful Links
1	https://mnre.gov.in/
2	https://beeindia.gov.in/
3	https://ascelibrary.org/journal/jleed9
4	https://onlinecourses.nptel.ac.in/noc21_ch11/preview

Civil

CO-PO Mapping															
	Programme Outcomes (PO)												**PSO**		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1						1					1			
CO2	1	1			1		1					1			
CO3	2	1	2		1		1					1			
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															

Electronics

CO-PO Mapping															
	Programme Outcomes (PO)												**PSO**		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2											1			
CO2	1	1			1		1					1			
CO3	1	2	2		1		1					1			
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															

Electrical

CO-PO Mapping															
	Programme Outcomes (PO)												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2						2					1			
CO2	2	1			1		1					1			
CO3	2	2	2		1		1					1			
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															

Computer Science

CO-PO Mapping															
	Programme Outcomes (PO)												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2														
CO2	1	1			1										
CO3	1	1	2		1										
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															

Information Technology

CO-PO Mapping															
	Programme Outcomes (PO)												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2														
CO2	1	1			1										
CO3	1	1	2		1										
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															

Assessment (for Theory Course)
The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be 1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3, 4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course					
Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember				
2	Understand	7	8	20	**35**
3	Apply	8	7	17	**32**
4	Analyze	5	5	23	**33**
5	Evaluate				
6	Create				
Total		**20**	**20**	**60**	**100**