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DEPARTMENT OF ME

ACADEMIC YEAR: 2022-2023

SEMESTER: IV-II

REGULATION: VR19

COURSE CODE: **1003194251**

COURSE NAME: **Green Engineering Systems**

LESSON PLAN

Lec.No.		Topic	Methodology	ICT Resources
		Course overview: COs, unit-wise outcomes		
1	1.1	Introduction to Renewable energy, potential and impact on environment	Chalk and Board	
2	1.2	Structure of the sun, the solar constant, sun-earth relationships, coordinate systems	ICT Tools	R1: W1
3	1.3	Extra-terrestrial and terrestrial solar radiation, solar radiation on tilted surface	Chalk and Board	
4	1.4	Instruments for measuring solar radiation and sunshine, solar radiation	ICT Tools	R1: W2
5	1.5	Photo voltaic energy conversion – types of PV cells, I-V characteristics	Case Study	
6	1.6	Flat plate and concentrating collectors	Chalk and Board	
7	1.7	Classification of concentrating collectors	Chalk and Board	
8	1.8	Orientation and thermal analysis	Chalk and Board	
9	1.9	Advanced collectors	Problem based	
10	1.10	Advanced collectors	Chalk and Board	
11	1.11	Tutorial/ revision class	ICT Tools	Google Form
12	2.1	Solar energy storage and application	Chalk and Board	



13	2.2	Sensible, latent heat and stratified storage	Chalk and Board	
14	2.3	Solar ponds, solar applications, solar heating/cooling technique	ICT Tools	
15	2.4	Solar distillation and drying, solar cookers	Chalk and Board	
16	2.5	Central power tower concept and solar chimney	Chalk and Board	
17	2.6	Wind energy: sources and potentials, horizontal and vertical axis windmills	Chalk and Board /ICT Tools	R2: W4
18	2.7	Performance characteristics, betz criteria, types of winds, wind data measurement	Chalk and Board /ICT Tools	
19	2.8	Tutorial/ revision class	ICT Tools	Google Form
20	3.1	Bio-mass: Principles of bio-conversion, anaerobic/aerobic digestion	Chalk and Board	
21	3.2	Types of bio-gas digesters, gas yield, combustion characteristics of bio-gas	Chalk and Board	
22	3.3	Utilization for cooking, bio fuels, I.C. engine operation and economic aspects	ICT Tools	R3: W6
23	3.4	Geothermal energy: Resources, types of wells	Chalk and Board /ICT Tools	
24	3.5	Methods of harnessing the energy, potential in India	ICT Tools	
25	3.6	Ocean energy: OTEC, Principles of utilization	ICT Tools	R4:W7
26	3.7	Setting of OTEC plants, thermodynamic cycles	Chalk and Board /ICT Tools	
27	3.8	Tidal and wave energy: Potential and conversion techniques	Chalk and Board	



28	3.9	Mini-hydel power plants, and their economics	Chalk and Board /ICT Tools	
29	3.10	Tutorial / Revision class	ICT Tools	Google Form
30	4.1	Energy efficient motors, energy efficient lighting and control, selection of luminaire	ICT Tools	R3: W7
31	4.2	Variable voltage variable frequency drives (adjustable speed drives)	ICT Tools	
32	4.3	Controls for HVAC (heating, ventilation and air conditioning), demand site management.	Chalk and Board /ICT Tools	
33	4.4	Fuel cells- principle	Chalk and Board	
35	4.5	Thermodynamic aspects, selection of fuels	Chalk and Board	
36	4.6	Working of various types of fuel cells	Chalk and Board	
37	4.7	Environmentally friendly and Energy efficient Compressors and pumps	Chalk and Board	
38	4.8	Tutorial / Revision class	ICT Tools	Google Form
39	5.1	Environmental impact of the current manufacturing practices and systems	ICT Tools	R3:W4
40	5.2	Benefits of green manufacturing systems	Chalk and Board	
41	5.3	Current manufacturing practices and systems, benefits of green manufacturing systems, selection of recyclable and environment friendly materials in manufacturing	Chalk and Board	
42	5.4	Environmental friendly machining, vegetable based cutting fluids, alternate casting and joining techniques, zero waste manufacturing	Chalk and Board /ICT Tools	
43	5.5	Green buildings: definition, features and benefits	Chalk and Board /ICT Tools	




44	5.6	Sustainable site selection and planning of buildings for maximum comfort	Chalk and Board	
45	5.7	Environmental friendly building materials like bamboo, timber, rammed earth, hollow blocks, lime & lime pozzolana cement, agro materials and industrial waste	Seminar	
46	5.8	Ferro cement and Ferro-concrete, alternate roofing systems	Chalk and Board	
47	5.9	Eco-paints to reduce heat gain of the buildings. Energy management	Chalk and Board	
48	5.10	Tutorial / Revision class	ICT Tools	Google Form

Digital References:

R1	NPTEL : Renewable Energy Engineering: Solar, Wind and Biomass Energy Systems, IIT Guwahati Prof. Vaibhav Vasant Goud, Prof. R. Anandalakshmi	https://nptel.ac.in/courses/103103206
R2	Physics of Renewable Energy Systems, IIT Kharagpur Prof. Amreesh Chandra	https://nptel.ac.in/courses/115105127
R3	Non-conventional energy resources Prof. Prathap Haridoss Department of Metallurgical and Materials Engineering IIT Madras	https://archive.nptel.ac.in/courses/121/106/121106014/#
R4	Coursera : Hydro, Wind & Solar power: Resources, Variability & Forecast	https://www.coursera.org/learn/hydro-wind-solar-power-resources-variability-forecast

Text/Reference Books

1. Sukhatme S. P., Nayak J. K., Solar Energy: Principles of thermal Collection and Storage, 3 rd Ed., Tata McGraw-Hill Education Pvt. Ltd 2008.

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2. Twidell, J. and Tony W., Renewable Energy Resources, 2nd Edition, Taylor & Francis 2006.
3. Khan B. H., Non-Conventional Energy Resources, 2nd Edition, Tata McGraw-Hill Education Pvt. Ltd. 2009.
4. Prabir Basu, Biomass Gasification, Pyrolysis and Torrefaction, Academic Press, Elsevier, 2013.

References

1. <https://nptel.ac.in/courses/103103206>
2. <https://nptel.ac.in/courses/115105127>
3. <https://archive.nptel.ac.in/courses/121/106/121106014/#>
4. <https://www.coursera.org/learn/hydro-wind-solar-power-resources-variability-forecast>

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