



**DEPARTMENT OF ELECTRONICS & COMMUNICATION
 ENGINEERING**

LESSON PLAN

Course Code	Course Title	Year/Sem	Branch	Contact Hrs/Week	Section
R203102F	RENEWABLE ENERGY SOURCES	III/I	ECE	5	ECE-B

COURSE OUTCOMES:

At the end of the course students are able to :

CO1: Analyze solar radiation data, extra-terrestrial radiation, radiation on earth's surface and solar Energy Storage.

CO2: Illustrate the components of wind energy systems.

CO3: Illustrate the working of biomass, digesters and Geothermal plants.

CO4: Demonstrate the principle of Energy production from OTEC, Tidal and Waves.

CO5: Evaluate the concept and working of Fuel cells & MHD power generation.

Unit No.	Out Comes	TOPIC(S)	BOOK Reference	Total periods	Delivery Method	GATE/ IES	
UNIT-I SOLAR ENERGY							
1	CO1: Analyze solar radiation data, extra-terrestrial radiation, radiation on earth's surface and solar Energy Storage.	1.1	Introduction - Renewable Sources - prospects	T1, T2, R1	12	Chalk & Talk, Active Learning & Tutorial	GATE
		1.2	Solar radiation at the Earth Surface	T1, T2, R1			
		1.3	Equivalent circuit of a Photovoltaic (PV) Cell - I-V & P-V Characteristics	T1, T2, R1			

		1.4	Solar Energy Collectors	T1, T2, R1			
		1.5	Flat plate Collectors	T1, T2, R1			
		1.6	Concentrating collectors	T1, T2, R1			
		1.7	Solar Energy storage systems and Applications: Solar Pond	T1, T2, R1			
		1.8	Solar water heating	T1, T2, R1			
		1.9	Solar Green house	T1, T2, R1			

UNIT - II WIND ENERGY

2	CO2: Illustrate the components of wind energy systems.	2.1	Introduction - basic Principles of Wind Energy Conversion	T1, T2, R2	12	Chalk & Talk, Tutorial, Active Learning	
		2.2	Basic Principles of Wind Energy Conversion	T1, T2, R2			
		2.3	The nature of Wind	T1, T2, R2			
		2.4	The power in the wind	T1, T2, R2			
		2.5	Wind Energy Conversion	T1, T2, R2			
		2.6	Site selection considerations	T1, T2, R2			
		2.7	Basic components of Wind Energy Conversion Systems (WECS	T1, T2, R2			
		2.8	Classification	T1, T2, R2			
		2.9	Applications.	T1, T2, R2			

UNIT - III BIOMASS AND GEOTHERMAL ENERGY

3	CO3: Illustrate the working of biomass, digesters and Geothermal plants.	3.1	Biomass: Introduction - Biomass conversion technologies	T1, T2	12	Chalk &	
		3.2	Photosynthesis, factors affecting Bio	T1, T2			

			digestion			Talk	
		3.3	Classification of biogas plants	T1, T2			
		3.4	Types of biogas plants -	T1, T2			
		3.5	Selection of site for a biogas plant	T1, T2			
		3.6	Geothermal Energy: Introduction, Geothermal Sources	T1, T2			
		3.7	Applications	T1, T2			
		3.8	Operational and Environmental problems.	T1, T2			

UNIT - IV ENERGY FROM OCEANS, WAVES & TIDES

4	CO4: Demonstrate the principle of Energy production from OTEC, Tidal and Waves.	4.1	Oceans: Introduction	T1, T2, R3	12	Chalk & Talk, PPT, Tutorial	
		4.2	Ocean Thermal Electric Conversion (OTEC) methods	T1, T2, R3			
		4.3	Methods - prospects of OTEC in India.	T1, T2, R3			
		4.4	Waves: Introduction - Energy and Power from the waves	T1, T2, R3			
		4.5	Wave Energy conversion devices. Energy.	T1, T2, R3			
		4.6	Tides: Basic principle of Tide Energy	T1, T2, R3			
		4.7	Components of Tidal Energy.	T1, T2, R3			

UNIT - V CHEMICAL ENERGY SOURCES

5	CO5: Evaluate the concept and working	5.1	Fuel Cells: Introduction	T1, T2	12		
		5.2	Fuel Cell Equivalent Circuit	T1, T2			
		5.3	Operation of Fuel cell	T1, T2			

of Fuel cells & MHD power generation.	5.4	Types of Fuel Cells - Applications.	T1, T2	Chalk & Talk, PPT Tutorial, Active Learning & Seminars
	5.5	Hydrogen Energy: Introduction	T1, T2	
	5.6	Methods of Hydrogen production	T1, T2	
	5.7	Storage and Applications	T1, T2	
	5.8	Magneto Hydro Dynamic (MHD) Power generation: Principle of Operation	T1, T2	
	5.9	Types.	T1, T2	
TOTAL				60

CO1	Analyze solar radiation data, extra-terrestrial radiation, radiation on earth's surface and solar Energy Storage.	ANALYZE	K4
CO2	Illustrate the components of wind energy systems.	UNDERSTANDING	K2
CO3	Illustrate the working of biomass, digesters and Geothermal plants.	UNDERSTANDING	K2
CO4	Demonstrate the principle of Energy production from OTEC, Tidal and Waves.	UNDERSTANDING	K2
CO5	Evaluate the concept and working of Fuel cells & MHD power generation.	APPLY	K3

CO-PO MAPPING: (1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High]; '-': No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1-K4	3	-	3	-	2	2	2	-	3	-	3	3
CO2-K4	3	-	3	-	2	2	2	-	3	-	3	3
CO3-K4,K5	3	2	3	2	2	2	2	-	3	-	3	3
CO4-K5	3	-	3	-	2	2	2	-	3	-	3	3
CO5-K5	3	-	3	-	2	2	2	-	3	-	3	3

S.NO	GRADUATE ATTRIBUTION	ACTION VERBS	LEVEL
1	ENGINEERING KNOWLEDGE	APPLY	K3
2	PROBLEM ANALYSIS	ANALYZE	K4
3	DESIGN DEVELOPMENT OF SOLUTIONS	UNDERSTANDING	K2
4	INVESTIGATION OF COMPLEX PROBLEMS	APPLY	K3
5	MODERN TOOL USAGE	APPLY	K3
6	ENGINEER AND SOCIETY	APPLY	K3
7	ENVIRONMENT AND SUSTAINABILITY	ANALYZE	K4
8	ETHICS		
9	INDIVIDUALS AND TEAM WORK	APPLY	K3
10	COMMUNICATION		
11	PROJECT MANAGEMENT AND FINANCE	APPLY	K3
12	LIFE LONG LEARNING	APPLY	K3

Text Books:

S.No.	AUTHORS, BOOK TITLE, EDITION, PUBLISHER, YEAR OF PUBLICATION
1.	G.D.Rai, Non-Conventional Energy Sources, Khanna Publications, 2011.
2.	John Twidell & Tony Weir, Renewable Energy Sources, Taylor & Francis, 2013

Reference Books:

S.No.	AUTHORS, BOOK TITLE, EDITION, PUBLISHER, YEAR OF PUBLICATION
1.	S.P.Sukhatme & J.K.Nayak, Solar Energy-Principles of Thermal Collection and Storage, TMH 2011.
2.	John Andrews & Nick Jelly, Energy Science- principles, Technologies and Impacts, Oxford, 2nd edition, 2013.
3.	Shoba Nath Singh, Non- Conventional Energy Resources, Pearson Publications, 2015.

	Name	Signature with Date
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ii. Class Coordinator	Mrs. B Lalitha	

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PRINCIPAL