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DEPARTMENT OF ELECTRICAL ENGINEERING Govt. Polytechnic, Balasore

LESSON PLAN FOR ACADEMIC SESSION - 2025-26 Th4. RENEWABLE ENERGY SYSTEMS (Elective – B)

Course Code : Th-3	Semester : 6TH
Total Periods : 75(60L+15T)	Examination : 3 Hours
Theory Periods : 4 P/Week	Internal Assessment : 20 Marks
Tutorial : 1 P/Week	End Semester Examination : 80 Marks
Maximum Marks : 100	
Semester From Date : 22/12/2025	To Date :
Name of Teaching Faculty: Er. Biswajit Mallik, Sr. Lect (ELECT.)	

WEEK	PERIOD	TOPIC
1st	1 st	UNIT 1: INTRODUCTION TO R.E. Environmental consequences of fossil fuel use.
	2 nd	Importance of renewable sources of energy.
	3 rd	Sustainable Design and development; Types of RE sources.
	4 th	Limitations of RE sources; Present Indian and International energy scenario.
	5 th	Doubt clearing on energy scenarios and fossil fuel impacts.
2 nd	1 st	UNIT 2: SOLAR ENERGY. Solar photovoltaic system - Operating principle.
	2 nd	Photovoltaic cell concepts: Cell, module, and array.
	3 rd	Series and parallel connections of PV cells.
	4 th	Maximum power point tracking (MPPT).
	5 th	Numerical problems on series/parallel PV cell connections.
3 rd	1 st	Classification of energy Sources; Extra-terrestrial and terrestrial Radiation.

	2 nd	Solar Geometry: Azimuth angle and Zenith angle.
	3 rd	Solar Geometry: Hour angle, Irradiance, and Solar constant.
	4 th	Solar collectors: Types and performance characteristics.
	5 th	Calculation of solar angles and irradiance levels.
	4 th	1 st
	2 nd	Applications: Street lighting and water pumping.
	3 rd	Applications: Solar cooker and Solar Pond.
	4 th	Summary and revision of Solar Energy module.
	5 th	Case study on local solar water pumping installations.
	5 th	1 st
	2 nd	Types of wind turbines.
	3 rd	Aerodynamics of wind rotors.
	4 th	Wind turbine control systems.
	5 th	Comparative study of horizontal and vertical axis turbines.
		1 st
2 nd		Grid connected and self-excited induction generator operation.
3 rd		Constant voltage and frequency generation with power electronic control.
4 th		Single and double output systems.
5 th		Solving problems on wind generator power output.
	1 st	Characteristics of wind power plant.
	2 nd	Revision of Wind Energy conversion and aerodynamics.
	3 rd	Discussion on wind power plant site selection.
	4 th	UNIT 4: BIOMASS POWER. Energy from Biomass as a RE source.
	5 th	Doubt clearing and review of wind turbine characteristics.
	1 st	Types of Biomass Fuels - Solid, Liquid and Gas.
	2 nd	Biomass processing: Combustion and fermentation.
	3 rd	Anaerobic digestion principles.

	4 th	Types of biogas digester.
	5 th	Comparison of combustion vs. fermentation processes.
9 th	1 st	Wood gassifier technology.
	2 nd	Pyrolysis process.
	3 rd	Applications: Bio gas and Bio diesel.
	4 th	Summary of Biomass power conversion technologies.
	5 th	Design factors for different biogas digesters.
10 th	1 st	UNIT 5: OTHER ENERGY SOURCES. Tidal Energy: Energy from the tides.
	2 nd	Barrage and Non Barrage Tidal power systems.
	3 rd	Ocean Thermal Energy Conversion (OTEC).
	4 th	Geothermal Energy – Classification.
	5 th	Analysis of OTEC efficiency and tidal cycles.
11 th	1 st	Hybrid Energy Systems: Need for Hybrid Systems.
	2 nd	Diesel-PV hybrid systems.
	3 rd	Wind-PV hybrid systems.
	4 th	Microhydel-PV hybrid systems.
	5 th	Sizing a basic Diesel-PV hybrid system.
12 th	1 st	Electric and hybrid electric vehicles.
	2 nd	Advantages and limitations of Electric Vehicles.
	3 rd	Charging infrastructure for hybrid electric vehicles.
	4 th	Future trends in Hybrid Energy systems.
	5 th	Discussion on EV battery technologies.
13 th	1 st	Revision: Unit 1 and Unit 2 solar radiation calculations.
	2 nd	Revision: Unit 2 MPPT and PV cell characteristics.
	3 rd	Revision: Unit 3 Wind turbine control and generators.
	4 th	Revision: Unit 4 Biomass and Biogas applications.
	5 th	Previous year question paper discussion (Part 1).
14 th	1 st	Revision: Unit 5 Tidal, OTEC, and Geothermal systems.
	2 nd	Revision: Unit 5 Hybrid systems and EV/HEV.
	3 rd	Class Test / Internal Assessment (20 Marks).

	4 th	Discussion of Class Test results and common errors.
	5 th	Previous year question paper discussion (Part 2).
15 th	1 st	Comprehensive review of the entire syllabus.
	2 nd	Important numerical problems from Solar and Wind energy.
	3 rd	Final doubt clearing session for all units.
	4 th	Examination tips and strategy for the 80-mark end semester exam.
	5 th	Final revision and preparation for End Semester Examination.

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22/12/25

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