LESSON PLAN FOR RENEWABLE ENERGY SYSTEMS[Th4]

Discipline: Electrical Engineering	**Semester:6th**	**Name of the Teaching Faculty: DEEPIKA SARKAR(LECT IN ETC)**
Subject: RENEWABLE ENERGY SOURCE	**Numbers of classes per week:5**	**Semester from date: 10.03.22 to date:10.06.22** Number of required weeks:15
week	**Class day**	**Theory**
1st	1st	**1. Introduction to Renewable energy:** 1.1. Environmental consequences of fossil fuel use. 1.2. Importance of renewable sources of energy.
	2nd	1.3. Sustainable Design and development.
	3rd	1.4. Types of RE sources
	4th	1.5. Limitations of RE sources. 1.6. Present Indian and international energy scenario of conventional and RE sources
	5th	Tutorial
2nd	1st	**2. Solar Energy:** 2.1. Solar photovoltaic system-Operating principle.
	2nd	2.2. Photovoltaic cell concepts
	3rd	2.2.1. Cell, module, array, Series and parallel connections. Maximum power point tracking (MPPT).
	4th	2.2.1. Cell, module, array, Series and parallel connections. Maximum power point tracking (MPPT).(contd.)
	5th	Tutorial
	1st	2.3. Classification of energy Sources.

	2nd	2.3. Classification of energy Sources(contd.)
3rd	3rd	2.4. Extra-terrestrial and terrestrial Radiation.
	4th	2.4. Extra-terrestrial and terrestrial Radiation.(contd.)
	5th	Tutorial
	1st	2.5. Azimuth angle, Zenith angle, Hour angle, Irradiance, Solar constant.
	2nd	2.5. Azimuth angle, Zenith angle, Hour angle, Irradiance, Solar constant.(contd.)
4th	3rd	2.6. Solar collectors, Types and performance characteristics,
	4th	2.7. Applications: Photovoltaic - battery charger, domestic lighting, street lighting, water pumping, solar cooker, Solar Pond.
	5th	Tutorial
	1st	**3. Wind Energy:** 3.1. Introduction to Wind energy.
5th	2nd	3.2. Wind energy conversion.
	3rd	3.3. Types of wind turbines
	4th	3.3. Types of wind turbines(contd.)
	5th	Tutorial
	1st	3.4. Aerodynamics of wind rotors.
6th	2nd	3.5. Wind turbine control systems; conversion to electrical power:
	3rd	3.6. Induction and synchronous generators.
	4th	3.7. Grid connected and self-excited induction generator operation
	5th	Tutorial

	1st	3.8. Constant voltage and constant frequency generation with power electronic control.
	2nd	3.9. Single and double output systems. 3.10. Characteristics of wind power plant.
7th	3rd	**4. Biomass Power:** 4.1. Energy from Biomass.
	4th	4.2. Biomass as Renewable Energy Source
	5th	Tutorial
	1st	4.3. Types of Biomass Fuels - Solid, Liquid and Gas.
	2nd	4.3. Types of Biomass Fuels - Solid, Liquid and Gas.(contd.)
8th	3rd	4.4. Combustion and fermentation.
	4th	4.5. Anaerobic digestion
	5th	Tutorial
	1st	4.6. Types of biogas digester.
	2nd	4.7. Wood gassifier.
9th	3rd	4.8. Pyrolysis,.
	4th	4.9. Applications: Bio gas, Bio diesel
	5th	(Tutorial) **5. Other Energy Sources** 5.1. Tidal Energy: Energy from the tides, Barrage and Non Barrage Tidal power systems.

10th	1st	5.1. Tidal Energy: Energy from the tides, Barrage and Non Barrage Tidal power systems.(contd.)
	2nd	5.2. Ocean Thermal Energy Conversion (OTEC).
	3rd	5.2. Ocean Thermal Energy Conversion (OTEC)(contd.)
	4th	5.3. Geothermal Energy – Classification.
	5th	Tutorial
11th	1st	5.3. Geothermal Energy – Classification(contd.)
	2nd	5.4. Hybrid Energy Systems.
	3rd	5.4. Hybrid Energy Systems.(contd.)
	4th	5.5. Need for Hybrid Systems.
	5th	Tutorial
12th	1st	5.6. Diesel-PV, Wind-PV, Microhydel-PV.
	2nd	5.6. Diesel-PV, Wind-PV, Microhydel-PV(contd.)
	3rd	5.7. Electric and hybrid electric vehicles.
	4th	5.7. Electric and hybrid electric vehicles(contd.)
	5th	Tutorial

Principal

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