## **LESSON PLAN FOR RENEWABLE ENERGY SYSTEMS[Th4]**

Subject: RENEWABLE Classes per week:5  Week  Class day  No. of weeks: 15  No. of weeks: 15  1st  1st  1st  1st  1. Introduction to Renewable energy: 1.1. Environmental consequences of fossil fuel use. 2nd  1.2. Importance of renewable sources of energy. 3rd  1.3. Sustainable Design and development. 4th  1.4. Types of RE sources. 5th  1.5. Limitations of RE sources. 1st  2nd  2nd  2nd  2nd  2nd  2nd  2nd  2n	Discipline: Electrical Engineering	Semester:6th	Name of the Teaching Faculty: Mr. Sarat Kumar Sahoo (Sr. Lect. In ETC)
week         Class day         Theory           1st         1. Introduction to Renewable energy:	•	classes per	Semester from date: 16/01/2024 To date: 26/04/2024
Standard   1. Introduction to Renewable energy: 1.1. Environmental consequences of fossil fuel use. 1.2. Importance of renewable sources of fossil fuel use. 1.3. Sustainable Design and development. 4th 1.4. Types of RE sources. 5th 1.5. Limitations of RE sources. 1st 1.6. Present Indian and international energy scenario of conventional and RE sources 2nd 2nd Tutorial 3rd 2. Solar Energy: 4th 2.1. Solar photovoltaic system-Operating principle. 5th 2.2. Photovoltaic cell concepts 2.2. Indian power point tracking (MPPT). 2.1. Cell, module, array, Series and parallel connections. Maximum power point tracking (MPPT). (Sontal) 1. Solar photovoltaic system-Operating principle. 1. Solar power point tracking (MPPT). (Sontal) 1. Solar power			No. of weeks: 15
Standard   1. Introduction to Renewable energy:   1.1. Environmental consequences of fossil fuel use.	week	Class day	Theory
1.1. Environmental consequences of fossil fuel use.   2nd   1.2. Importance of renewable sources of energy.   4th   1.4. Types of RE sources     5th   1.5. Limitations of RE sources     1st   1.6. Present Indian and international energy scenario of conventional and RE sources     2nd   2nd   Tutorial     3rd   2. Solar Energy;     4th   2.1. Solar Energy;     4th   2.1. Solar photovoltaic system-Operating principle.     5th   2.2. Photovoltaic cell concepts     2st   2.2.1. Cell, module, array, Series and parallel connections. Maximum power point tracking (MPPT).     3rd   2.2.1. Cell, module, array, Series and parallel connections. Maximum power point tracking (MPPT).     4th   2.3. Classification of energy Sources.     5th   2.3. Classification of energy Sources.     5th   2.3. Classification of energy Sources     2nd   2.4. Extra-terrestrial and terrestrial Radiation.     2nd   2.5. Azimuth angle   2enith angle, Hour angle, Irradiance, Solar constant.     5th   2.5. Azimuth angle     2nd   3nd   Irradiance     4th   Solar constant.     4th   Solar constant.     3rd   Irradiance     4th   Solar constant.     4th   Solar constant.     5th   2.6. Solar collectors, Types and performance characteristics,     2nd   3nd   Irradiance     4th   Solar constant.     3rd   Irradiance     4th   Solar constant.     4th   Solar constant.     5th   Tutorial     3th   Solar constant.     3th   Solar constant.     4th   Solar constant.     5th   Tutorial     3th   Solar constant.     4th   Solar constant.     5th   So		1st	
1st   3rd	1st		——————————————————————————————————————
4th 1.4. Types of RE sources 5th 1.5. Limitations of RE sources. 1st 1.6. Present Indian and international energy scenario of conventional and RE sources 2nd 2nd Tutorial 3rd 2. Solar Energy: 4th 2.1. Solar photovoltaic system-Operating principle. 5th 2.2. Photovoltaic cell concepts 2.1 st 2.2.1. Cell, module, array, Series and parallel connections. Maximum power point tracking (MPPT). 3rd 2nd 2.2.1. Cell, module, array, Series and parallel connections. Maximum power point tracking (MPPT). 3rd Tutorial 4th 2.3. Classification of energy Sources. 5th 2.3. Classification of energy Sources. 5th 2.3. Classification of energy Sources. 4th 2.4. Extra-terrestrial and terrestrial Radiation. 2nd 2.4. Extra-terrestrial and terrestrial Radiation. 2nd 2.4. Extra-terrestrial and terrestrial Radiation. 2nd 2.5. Azimuth angle, Zenith angle, Hour angle, Irradiance, Solar constant. 5th 2.5. Azimuth angle 2sth 2sth angle 2nd Hour angle 3rd Irradiance 4th Solar constant.(contd.) 5th 2.6. Solar collectors, Types and performance characteristics, 1st 2.7. Applications: Photovoltaic - battery charger 4th Solar cooker, Solar Pond. 5th Tutorial 3rd water pumping. 4th solar cooker, Solar Pond. 5th Tutorial 3.3. Wind Energy: 2nd 3.1. Introduction to Wind energy. 3rd 3rd 3.2. Wind energy conversion. 4th 3.3. Types of wind turbines 5th 3.3. Types of wind turbines 5th 3.4. Aerodynamics of wind rotors.		2nd	1.2. Importance of renewable sources of energy.
4th     1.4. Types of RE sources       5th     1.5. Limitations of RE sources.       1st     1.6. Present Indian and international energy scenario of conventional and RE sources       2nd     Tutorial       3rd     2. Solar Energy:       4th     2.1. Solar photovoltaic system-Operating principle.       5th     2.2. Photovoltaic cell concepts       1st     2.2.1. Cell, module, array, Series and parallel connections. Maximum power point tracking (MPPT).       3rd     Tutorial       4th     2.3. Classification of energy Sources, Series and parallel connections. Maximum power point tracking (MPPT). (contd.)       3rd     Tutorial       4th     2.3. Classification of energy Sources, Contd.)       4th     2.3. Classification of energy Sources, Contd.)       4th     2.4. Extra-terrestrial and terrestrial Radiation.       2nd     2.4. Extra-terrestrial and terrestrial Radiation.       4th     2.5. Azimuth angle, Zenith angle, Hour angle, Irradiance, Solar constant.       5th     2.5. Azimuth angle       2nd     Hour angle       3rd     Irradiance       4th     Solar constant. (contd.)       5th     2.6. Solar collectors, Types and performance characteristics,       6th     2nd     domestic lighting, street lighting,       3rd     water pumping.       4th     solar cooker, S		3rd	1.3. Sustainable Design and development.
2nd		4th	1.4. Types of RE sources
RE sources		5th	
RE sources		1st	1.6. Present Indian and international energy scenario of conventional and
3rd   2. Solar Energy:   4th   2.1. Solar photovoltaic system-Operating principle.   5th   2.2. Photovoltaic cell concepts   5th   2.2. Photovoltaic cell concepts   1st   2.2.1. Cell, module, array, Series and parallel connections. Maximum power point tracking (MPPT).   3rd   2.2.1. Cell, module, array, Series and parallel connections. Maximum power point tracking (MPPT). (contd.)   3rd   Tutorial   4th   2.3. Classification of energy Sources.   5th   2.3. Classification of energy Sources(contd.)   1st   2.4. Extra-terrestrial and terrestrial Radiation.   2nd   2.4. Extra-terrestrial and terrestrial Radiation.   2nd   2.4. Extra-terrestrial and terrestrial Radiation.   2nd   2.5. Azimuth angle, Zenith angle, Hour angle, Irradiance, Solar constant.   5th   2.5. Azimuth angle   2nd   Hour angle   1st   Zenith angle   2nd   Hour angle   3rd   Irradiance   4th   Solar constant. (contd.)   5th   2.6. Solar collectors, Types and performance characteristics,   1st   2.7. Applications: Photovoltaic - battery charger   4th   solar cooker, Solar Pond.   4th   solar cooker, Solar Pond.   5th   Tutorial   1st   3. Wind Energy:   2nd   3.1. Introduction to Wind energy.   3rd   3.2. Wind energy conversion.   4th   3.3. Types of wind turbines   5th   3.3. Types of wind turbines   5th   3.3. Types of wind turbines   5th   3.4. Aerodynamics of wind rotors.   3rd   3.5. Wind turbine control systems; conversion to electrical power:			<del>-</del> ,
4th     2.1. Solar photovoltaic system-Operating principle.       5th     2.2. Photovoltaic cell concepts       1st     2.2.1. Cell, module, array, Series and parallel connections. Maximum power point tracking (MPPT).       3rd     2.2.1. Cell, module, array, Series and parallel connections. Maximum power point tracking (MPPT).(contd.)       3rd     Tutorial       4th     2.3. Classification of energy Sources.       5th     2.3. Classification of energy Sources(contd.)       1st     2.4. Extra-terrestrial and terrestrial Radiation.       2nd     2.4. Extra-terrestrial and terrestrial Radiation.(contd.)       3rd     Tutorial       4th     2.5. Azimuth angle, Zenith angle, Hour angle, Irradiance, Solar constant.       5th     2.5. Azimuth angle       1st     Zenith angle       2nd     Hour angle       3rd     Irradiance       4th     Solar constant.(contd.)       5th     2.6. Solar collectors, Types and performance characteristics,       1st     2.7. Applications: Photovoltaic - battery charger       6th     3rd     domestic lighting, street lighting,       3rd     water pumping,       4th     solar cooker, Solar Pond.       5th     Tutorial       3rd     3.1. Introduction to Wind energy.       3rd     3.2. Wind energy conversion.       4th     3.3	2nd	2nd	Tutorial
5th     2.2. Photovoltaic cell concepts       1st     2.2.1. Cell, module, array, Series and parallel connections. Maximum power point tracking (MPPT).       3rd     2.2.1. Cell, module, array, Series and parallel connections. Maximum power point tracking (MPPT).(contd.)       3rd     Tutorial       4th     2.3. Classification of energy Sources.       5th     2.3. Classification of energy Sources(contd.)       1st     2.4. Extra-terrestrial and terrestrial Radiation.       2nd     2.4. Extra-terrestrial and terrestrial Radiation. (contd.)       3rd     Tutorial       4th     2.5. Azimuth angle, Zenith angle, Hour angle, Irradiance, Solar constant.       5th     2.5. Azimuth angle       1st     Zenith angle       2nd     Hour angle       3rd     Irradiance       4th     Solar constant. (contd.)       5th     2.6. Solar collectors, Types and performance characteristics,       4th     Solar constant. (contd.)       5th     2.6. Solar collectors, Types and performance characteristics,       6th     2nd     domestic lighting, street lighting,       3rd     water pumping,       4th     solar cooker, Solar Pond.       5th     Tutorial       3th     3.1. Introduction to Wind energy.       7th     3rd     3.2. Wind energy conversion.       4th <td< td=""><td>3rd</td><td>2. Solar Energy:</td></td<>		3rd	2. Solar Energy:
5th     2.2. Photovoltaic cell concepts       1st     2.2.1. Cell, module, array, Series and parallel connections. Maximum power point tracking (MPPT).       3rd     2.2.1. Cell, module, array, Series and parallel connections. Maximum power point tracking (MPPT).(contd.)       3rd     Tutorial       4th     2.3. Classification of energy Sources.       5th     2.3. Classification of energy Sources(contd.)       1st     2.4. Extra-terrestrial and terrestrial Radiation.       2nd     2.4. Extra-terrestrial and terrestrial Radiation. (contd.)       3rd     Tutorial       4th     2.5. Azimuth angle, Zenith angle, Hour angle, Irradiance, Solar constant.       5th     2.5. Azimuth angle       1st     Zenith angle       2nd     Hour angle       3rd     Irradiance       4th     Solar constant. (contd.)       5th     2.6. Solar collectors, Types and performance characteristics,       4th     Solar constant. (contd.)       5th     2.6. Solar collectors, Types and performance characteristics,       6th     2nd     domestic lighting, street lighting,       3rd     water pumping,       4th     solar cooker, Solar Pond.       5th     Tutorial       3th     3.1. Introduction to Wind energy.       7th     3rd     3.2. Wind energy conversion.       4th <td< td=""><td></td><td>4th</td><td>2.1. Solar photovoltaic system-Operating principle.</td></td<>		4th	2.1. Solar photovoltaic system-Operating principle.
Power point tracking (MPPT).   2.2.1. Cell, module, array, Series and parallel connections. Maximum power point tracking (MPPT). (contd.)   3rd		5th	
3rd     2.2.1. Cell, module, array, Series and parallel connections. Maximum power point tracking (MPPT).(contd.)       3rd     Tutorial       4th     2.3. Classification of energy Sources.       5th     2.3. Classification of energy Sources(contd.)       4th     2.4. Extra-terrestrial and terrestrial Radiation.       2nd     2.4. Extra-terrestrial and terrestrial Radiation. (contd.)       3rd     Tutorial       4th     2.5. Azimuth angle, Jenith angle, Hour angle, Irradiance, Solar constant.       5th     2.5. Azimuth angle       2nd     Hour angle       3rd     Irradiance       4th     Solar constant.(contd.)       5th     2.6. Solar collectors, Types and performance characteristics,       3th     2.7. Applications: Photovoltaic - battery charger       6th     2nd     domestic lighting, street lighting,       3rd     water pumping,       4th     solar cooker, Solar Pond.       5th     Tutorial       1st     3. Wind Energy:       2nd     3.1. Introduction to Wind energy.       7th     3rd     3.2. Wind energy conversion.       4th     3.3. Types of wind turbines       5th     3.3. Types of wind turbines (contd.)       1st     Tutorial       2nd     3.4. Aerodynamics of wind rotors.       8th     3.5. Wind t		1st	2.2.1. Cell, module, array, Series and parallel connections. Maximum
power point tracking (MPPT).(contd.)  3rd Tutorial 4th 2.3. Classification of energy Sources. 5th 2.3. Classification of energy Sources(contd.)  1st 2.4. Extra-terrestrial and terrestrial Radiation. 2nd 2.4. Extra-terrestrial and terrestrial Radiation. 2nd 2.4. Extra-terrestrial and terrestrial Radiation.(contd.)  3rd Tutorial 4th 2.5. Azimuth angle, Zenith angle, Hour angle, Irradiance, Solar constant. 5th 2.5. Azimuth angle  2nd Hour angle  2nd Hour angle  3rd Irradiance  4th Solar constant.(contd.) 5th 2.6. Solar collectors, Types and performance characteristics, 1st 2.7. Applications: Photovoltaic - battery charger  6th 2nd domestic lighting, street lighting, 3rd water pumping, 4th solar cooker, Solar Pond. 5th Tutorial  1st 3. Wind Energy: 2nd 3.1. Introduction to Wind energy.  7th 3rd 3.2. Wind energy conversion. 4th 3.3. Types of wind turbines 5th 3.3. Types of wind turbines 5th 3.3. Types of wind turbines 5th 3.4. Aerodynamics of wind rotors.  8th 3rd 3rd urbine control systems; conversion to electrical power:			power point tracking (MPPT).
power point tracking (MPPT).(contd.)  3rd Tutorial 4th 2.3. Classification of energy Sources. 5th 2.3. Classification of energy Sources(contd.)  1st 2.4. Extra-terrestrial and terrestrial Radiation. 2nd 2.4. Extra-terrestrial and terrestrial Radiation. 2nd 2.4. Extra-terrestrial and terrestrial Radiation.(contd.)  3rd Tutorial 4th 2.5. Azimuth angle, Zenith angle, Hour angle, Irradiance, Solar constant. 5th 2.5. Azimuth angle  2nd Hour angle  2nd Hour angle  3rd Irradiance  4th Solar constant.(contd.) 5th 2.6. Solar collectors, Types and performance characteristics, 1st 2.7. Applications: Photovoltaic - battery charger  6th 2nd domestic lighting, street lighting, 3rd water pumping, 4th solar cooker, Solar Pond. 5th Tutorial  1st 3. Wind Energy: 2nd 3.1. Introduction to Wind energy.  7th 3rd 3.2. Wind energy conversion. 4th 3.3. Types of wind turbines 5th 3.3. Types of wind turbines 5th 3.3. Types of wind turbines 5th 3.4. Aerodynamics of wind rotors.  8th 3rd 3rd urbine control systems; conversion to electrical power:	3rd	2nd	2.2.1. Cell, module, array, Series and parallel connections. Maximum
4th     2.3. Classification of energy Sources.       5th     2.3. Classification of energy Sources(contd.)       1st     2.4. Extra-terrestrial and terrestrial Radiation.       2nd     2.4. Extra-terrestrial and terrestrial Radiation.(contd.)       3rd     Tutorial       4th     2.5. Azimuth angle, Zenith angle, Hour angle, Irradiance, Solar constant.       5th     2.5. Azimuth angle       2nd     Hour angle       3rd     Irradiance       4th     Solar constant.(contd.)       5th     2.6. Solar collectors, Types and performance characteristics,       1st     2.7. Applications: Photovoltaic - battery charger       6th     2nd     domestic lighting, street lighting,       3rd     water pumping,       4th     solar cooker, Solar Pond.       5th     Tutorial       7th     3.1. Introduction to Wind energy.       3rd     3.2. Wind Energy:       2nd     3.1. Introduction to Wind energy.       5th     3.3. Types of wind turbines       5th     3.3. Types of wind turbines       5th     3.3. Types of wind turbines       2nd     3.4. Aerodynamics of wind rotors.       8th     3rd       3th     3.5. Wind turbines control systems; conversion to electrical power:			
Sth 2.3. Classification of energy Sources(contd.)  1st 2.4. Extra-terrestrial and terrestrial Radiation. 2nd 2.4. Extra-terrestrial and terrestrial Radiation. 3rd Tutorial 4th 2.5. Azimuth angle, Zenith angle, Hour angle, Irradiance, Solar constant. 5th 2.5. Azimuth angle  Ist Zenith angle  2nd Hour angle  3rd Irradiance  4th Solar constant.(contd.) 5th 2.6. Solar collectors, Types and performance characteristics,  1st 2.7. Applications: Photovoltaic - battery charger  6th 2nd domestic lighting, street lighting, 3rd water pumping, 4th solar cooker, Solar Pond. 5th Tutorial  7th 3sh 3. Wind Energy: 2nd 3.1. Introduction to Wind energy. 3rd 3.2. Wind energy conversion. 4th 3.3. Types of wind turbines 5th 3.3. Types of wind turbines 5th 3.3. Types of wind turbines 5th Tutorial 2nd 3.4. Aerodynamics of wind rotors.  8th 3rd 3.5. Wind turbine control systems; conversion to electrical power:		3rd	Tutorial
5th2.3. Classification of energy Sources(contd.)1st2.4. Extra-terrestrial and terrestrial Radiation.2nd2.4. Extra-terrestrial and terrestrial Radiation. (contd.)3rdTutorial4th2.5. Azimuth angle, Zenith angle, Hour angle, Irradiance, Solar constant.5th2.5. Azimuth angle2nd Hour angle3rd Irradiance4th Solar constant.(contd.)5th2.6. Solar collectors, Types and performance characteristics,1st2.7. Applications: Photovoltaic - battery charger6th2nddomestic lighting, street lighting,3rdwater pumping,4thsolar cooker, Solar Pond.5thTutorial3. Wind Energy:2nd3.1. Introduction to Wind energy.3rd3.2. Wind energy conversion.4th3.3. Types of wind turbines5th3.3. Types of wind turbines5th3.3. Types of wind turbines5th3.4. Aerodynamics of wind rotors.8th		4th	2.3. Classification of energy Sources.
4th2.nd2.4. Extra-terrestrial and terrestrial Radiation.(contd.)3rdTutorial4th2.5. Azimuth angle, Zenith angle, Hour angle, Irradiance, Solar constant.5th2.5. Azimuth angle5th2.6. Salar constant. (contd.)5th2.6. Solar constant. (contd.)5th2.6. Solar collectors, Types and performance characteristics,4th5olar constant. (contd.)5th2.6. Solar collectors, Types and performance characteristics,2nddomestic lighting, street lighting,3rdwater pumping,4thsolar cooker, Solar Pond.5thTutorial3th3.4 Wind Energy:2nd3.1. Introduction to Wind energy.3rd3.2. Wind energy conversion.4th3.3. Types of wind turbines5th3.3. Types of wind turbines(contd.)1stTutorial2nd3.4. Aerodynamics of wind rotors.8th3rd3.5. Wind turbine control systems; conversion to electrical power:		5th	2.3. Classification of energy Sources(contd.)
4th3rdTutorial4th2.5. Azimuth angle, Zenith angle, Hour angle, Irradiance, Solar constant.5th2.5. Azimuth angle2th1stZenith angle2ndHour angle3rdIrradiance4thSolar constant.(contd.)5th2.6. Solar collectors, Types and performance characteristics,2nddomestic lighting, street lighting,3rdwater pumping,4thsolar cooker, Solar Pond.5thTutorial1st3. Wind Energy:2nd3.1. Introduction to Wind energy.3rd3.2. Wind energy conversion.4th3.3. Types of wind turbines5th3.3. Types of wind turbines(contd.)1stTutorial2nd3.4. Aerodynamics of wind rotors.8th3rd3.5. Wind turbine control systems; conversion to electrical power:	4th	1st	2.4. Extra-terrestrial and terrestrial Radiation.
4th2.5. Azimuth angle, Zenith angle, Hour angle, Irradiance, Solar constant.5th2.5. Azimuth angle1stZenith angle2ndHour angle3rdIrradiance4thSolar constant.(contd.)5th2.6. Solar collectors, Types and performance characteristics,1st2.7. Applications: Photovoltaic - battery charger2nddomestic lighting, street lighting,3rdwater pumping,4thsolar cooker, Solar Pond.5thTutorial2nd3.1. Introduction to Wind energy.2nd3.1. Introduction to Wind energy.3rd3.2. Wind energy conversion.4th3.3. Types of wind turbines5th3.3. Types of wind turbines5th3.3. Types of wind turbines(contd.)1stTutorial2nd3.4. Aerodynamics of wind rotors.8th3rd3.5. Wind turbine control systems; conversion to electrical power:		2nd	2.4. Extra-terrestrial and terrestrial Radiation.(contd.)
5th2.5. Azimuth angle1stZenith angle2ndHour angle3rdIrradiance4thSolar constant.(contd.)5th2.6. Solar collectors, Types and performance characteristics,1st2.7. Applications: Photovoltaic - battery charger6th2nddomestic lighting, street lighting,3rdwater pumping,4thsolar cooker, Solar Pond.5th3. Wind Energy:2nd3.1. Introduction to Wind energy.3rd3.2. Wind energy conversion.4th3.3. Types of wind turbines5th3.3. Types of wind turbines(contd.)1stTutorial2nd3.4. Aerodynamics of wind rotors.8th3rd3.5. Wind turbine control systems; conversion to electrical power:		3rd	Tutorial
Tenith angle5th2ndHour angle3rdIrradiance4thSolar constant.(contd.)5th2.6. Solar collectors, Types and performance characteristics,6th1st2.7. Applications: Photovoltaic - battery charger6th2nddomestic lighting, street lighting,3rdwater pumping,4thsolar cooker, Solar Pond.5thTutorial7th1st3. Wind Energy:2nd3.1. Introduction to Wind energy.3rd3.2. Wind energy conversion.4th3.3. Types of wind turbines5th3.3. Types of wind turbines(contd.)1stTutorial2nd3.4. Aerodynamics of wind rotors.8th3rd3.5. Wind turbine control systems; conversion to electrical power:		4th	2.5. Azimuth angle, Zenith angle, Hour angle, Irradiance, Solar constant.
Sth  2nd Hour angle 3rd Irradiance 4th Solar constant.(contd.) 5th 2.6. Solar collectors, Types and performance characteristics, 1st 2.7. Applications: Photovoltaic - battery charger 2nd domestic lighting, street lighting, 3rd water pumping, 4th solar cooker, Solar Pond. 5th Tutorial  1st 3. Wind Energy: 2nd 3.1. Introduction to Wind energy. 3rd 3.2. Wind energy conversion. 4th 3.3. Types of wind turbines 5th 3.3. Types of wind turbines(contd.)  1st Tutorial 2nd 3.4. Aerodynamics of wind rotors.  8th 3rd 3.5. Wind turbine control systems; conversion to electrical power:		5th	2.5. Azimuth angle
Sth  3rd Irradiance 4th Solar constant.(contd.) 5th 2.6. Solar collectors, Types and performance characteristics, 1st 2.7. Applications: Photovoltaic - battery charger 2nd domestic lighting, street lighting, 3rd water pumping, 4th solar cooker, Solar Pond. 5th Tutorial 1st 3. Wind Energy: 2nd 3.1. Introduction to Wind energy. 3rd 3.2. Wind energy conversion. 4th 3.3. Types of wind turbines 5th 3.3. Types of wind turbines(contd.) 1st Tutorial 2nd 3.4. Aerodynamics of wind rotors. 8th 3rd 3.5. Wind turbine control systems; conversion to electrical power:		1st	Zenith angle
Sth  3rd Irradiance 4th Solar constant.(contd.) 5th 2.6. Solar collectors, Types and performance characteristics, 1st 2.7. Applications: Photovoltaic - battery charger 2nd domestic lighting, street lighting, 3rd water pumping, 4th solar cooker, Solar Pond. 5th Tutorial 1st 3. Wind Energy: 2nd 3.1. Introduction to Wind energy. 3rd 3.2. Wind energy conversion. 4th 3.3. Types of wind turbines 5th 3.3. Types of wind turbines(contd.) 1st Tutorial 2nd 3.4. Aerodynamics of wind rotors. 8th 3rd 3.5. Wind turbine control systems; conversion to electrical power:		2nd	Hourangle
4th Solar constant.(contd.)  5th 2.6. Solar collectors, Types and performance characteristics,  1st 2.7. Applications: Photovoltaic - battery charger  4th 2nd domestic lighting, street lighting,  3rd water pumping,  4th solar cooker, Solar Pond.  5th Tutorial  1st 3. Wind Energy:  2nd 3.1. Introduction to Wind energy.  3rd 3.2. Wind energy conversion.  4th 3.3. Types of wind turbines  5th 3.3. Types of wind turbines(contd.)  1st Tutorial  2nd 3.4. Aerodynamics of wind rotors.  8th 3rd 3rd 3.5. Wind turbine control systems; conversion to electrical power:			
5th 2.6. Solar collectors, Types and performance characteristics,  1st 2.7. Applications: Photovoltaic - battery charger  2nd domestic lighting, street lighting,  3rd water pumping,  4th solar cooker, Solar Pond.  5th Tutorial  1st 3. Wind Energy:  2nd 3.1. Introduction to Wind energy.  3rd 3.2. Wind energy conversion.  4th 3.3. Types of wind turbines  5th 3.3. Types of wind turbines(contd.)  1st Tutorial  2nd 3.4. Aerodynamics of wind rotors.  8th 3rd 3.5. Wind turbine control systems; conversion to electrical power:			
1st 2.7. Applications: Photovoltaic - battery charger 2nd domestic lighting, street lighting, 3rd water pumping, 4th solar cooker, Solar Pond. 5th Tutorial  1st 3. Wind Energy: 2nd 3.1. Introduction to Wind energy.  7th 3rd 3.2. Wind energy conversion. 4th 3.3. Types of wind turbines 5th 3.3. Types of wind turbines 5th 3.3. Types of wind turbines(contd.)  1st Tutorial 2nd 3.4. Aerodynamics of wind rotors.  8th 3rd 3.5. Wind turbine control systems; conversion to electrical power:			
6th  2nd domestic lighting, street lighting, 3rd water pumping, 4th solar cooker, Solar Pond. 5th Tutorial  1st 3. Wind Energy: 2nd 3.1. Introduction to Wind energy.  3rd 3.2. Wind energy conversion. 4th 3.3. Types of wind turbines 5th 3.3. Types of wind turbines(contd.)  1st Tutorial 2nd 3.4. Aerodynamics of wind rotors.  8th 3rd 3.5. Wind turbine control systems; conversion to electrical power:			
3rd water pumping, 4th solar cooker, Solar Pond. 5th Tutorial  1st 3. Wind Energy: 2nd 3.1. Introduction to Wind energy. 3rd 3.2. Wind energy conversion. 4th 3.3. Types of wind turbines 5th 3.3. Types of wind turbines(contd.) 1st Tutorial 2nd 3.4. Aerodynamics of wind rotors. 8th 3rd 3.5. Wind turbine control systems; conversion to electrical power:			, , <u>-</u>
4th solar cooker, Solar Pond.  5th Tutorial  1st 3. Wind Energy: 2nd 3.1. Introduction to Wind energy.  3rd 3.2. Wind energy conversion.  4th 3.3. Types of wind turbines 5th 3.3. Types of wind turbines(contd.)  1st Tutorial 2nd 3.4. Aerodynamics of wind rotors.  8th 3rd 3.5. Wind turbine control systems; conversion to electrical power:			
5thTutorial1st3. Wind Energy:2nd3.1. Introduction to Wind energy.3rd3.2. Wind energy conversion.4th3.3. Types of wind turbines5th3.3. Types of wind turbines(contd.)1stTutorial2nd3.4. Aerodynamics of wind rotors.8th3rd3rd3.5. Wind turbine control systems; conversion to electrical power:			
1st3. Wind Energy:2nd3.1. Introduction to Wind energy.3rd3.2. Wind energy conversion.4th3.3. Types of wind turbines5th3.3. Types of wind turbines(contd.)1stTutorial2nd3.4. Aerodynamics of wind rotors.8th3rd3.5. Wind turbine control systems; conversion to electrical power:			· · · · · · · · · · · · · · · · · · ·
7th 3.1. Introduction to Wind energy. 3rd 3.2. Wind energy conversion. 4th 3.3. Types of wind turbines 5th 3.3. Types of wind turbines(contd.) 1st Tutorial 2nd 3.4. Aerodynamics of wind rotors. 8th 3rd 3.5. Wind turbine control systems; conversion to electrical power:	7th		
7th 3rd 3.2. Wind energy conversion. 4th 3.3. Types of wind turbines 5th 3.3. Types of wind turbines(contd.) 1st Tutorial 2nd 3.4. Aerodynamics of wind rotors. 8th 3rd 3.5. Wind turbine control systems; conversion to electrical power:			
4th 3.3. Types of wind turbines  5th 3.3. Types of wind turbines(contd.)  1st Tutorial  2nd 3.4. Aerodynamics of wind rotors.  8th 3rd 3.5. Wind turbine control systems; conversion to electrical power:			<u> </u>
5th 3.3. Types of wind turbines(contd.)  1st Tutorial 2nd 3.4. Aerodynamics of wind rotors.  8th 3rd 3.5. Wind turbine control systems; conversion to electrical power:			
1st Tutorial 2nd 3.4. Aerodynamics of wind rotors. 8th 3rd 3.5. Wind turbine control systems; conversion to electrical power:			
2nd 3.4. Aerodynamics of wind rotors.  8th 3rd 3.5. Wind turbine control systems; conversion to electrical power:	8th		,,
8th 3rd 3.5. Wind turbine control systems; conversion to electrical power:			
		4th	3.6. Induction and synchronous generators.

	5th	3.7. Grid connected and self-excited induction generator operation
9th	1st	Tutorial
	2nd	3.8. Constant voltage and constant frequency generation with power
		electronic control.
	3rd	3.8. Constant voltage and constant frequency generation with power
		electronic control.
	4th	3.9. Single and double output systems.
	5th	3.10. Characteristics of wind power plant.
	1st	4. Biomass Power:
	2nd	4.1. Energy from Biomass.
10th	3rd	4.2. Biomass as Renewable Energy Source
	4th	Tutorial
	5th	4.3. Types of Biomass Fuels - Solid, Liquid and Gas.
11th	1st	4.3. Types of Biomass Fuels - Solid, Liquid and Gas.(contd.)
	2nd	4.4. Combustion and fermentation.
	3rd	4.5. Anaerobic digestion
	4th	Tutorial
	5th	4.6. Types of biogas digester.
	1st	4.7. Wood gassifier.
	2nd	4.8. Pyrolysis,.
12th	3rd	4.9. Applications: Bio gas, Bio diesel
	4th	(Tutorial)
		5. Other Energy Sources
	5th	5.1. Tidal Energy: Energy from the tides, Barrage and Non Barrage Tidal
		power systems.
13th	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
14th	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
15th	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