No	Information of every subject	
1	Unit name:	Renewable Energy Resources
2	Code:	ME- 61020
3	Classification:	Engineering subject
4	Credit value:	2.5
5	Semester/ Year Offered:	1/2
6	Pre-requisite:	Understand Basic Fluid and Heat Transfer
7	Mode of delivery:	Lecture, Practical
8	Practical	20%
	Mid-term/ final Examination	70%
	Viva	5%
	Tutorial	5%
9	Academic staff teaching unit:	
10	Course Outcome of Unit : a. To understand the fundamentals and main characteristics of renewable energy sources and their differences compared to fossil fuels; b. To solve the extent of environmental impact and resource depletion of each of the major non-renewable and renewable sources of energy; c. To identify the challenges and problems associated with the use of various energy sources, including fossil fuels, with regard to future supply and the environment; d. To apply this knowledge to suggest the preferred combination of sustainable solutions/actions to minimize the emission of greenhouse gases and increase sustainability of the energy system in specific areas/regions.	
11	Synopsis of Uniit: These energy sources created mainly by the sun shinning on the earth are converted into different forms, such as solar radiation to wind or water based energy which is distributed over the Earth and atmosphere , the Earth's geothermal heat, and plants in the form of biomass.	

12	Topics Semester I **1: Solar Radiation** Introduction to components of radiation, geometry of the Earth and Sun, collector, and the solar beam and Effects of the Earth's atmosphere. **2: Solar Water Heating** Introduction to Solar Water Heating, Calculation of heat balance, Uncovered solar water heater, Progress analysis of solar water heaters, selective surfaces, and evacuated collectors. **3:Buildings and other solar thermal applications** Air heaters, energy-efficient buildings, solar **4:Photovoltaic generation** Introduction to p-n junction, currents and circuit characteristics. **5:Hydropower** Principles, impulse and reaction turbine and hydroelectric systems. **6: Power from the wind** Turbine types and terms, Linear momentum and basic theory, blade theory, power extraction by a turbine and Electricity Generation. **7: Biomass and biofuels** Biofuel classification, biomass production for energy farming, Direct combustion for heat, Pyrolysis, Fermentation, Anaerobic digestion for biogas and Social and environmental aspects. **8: Geothermal energy** Introduction to geophysics, Dry rock and hot aquifer analysis and Social and environmental aspects.
13	Main references: **Renewable Energy Resources,2nd Edition,** **John Twidell & Tony Weir**
14	Additional Reference : Evaluation of the Built Environment for Sustainability , V.Bentivegna, P.S. Brandon and P. Lombardi