

GUJARAT TECHNOLOGICAL UNIVERSITY
M.E.in Energy Engineering
Semester: I

Subject Name: **Renewable Energy Systems (Inter Disciplinary Elective - I)**
Subject Code: **713907**

Sr. No	Course content
1	Solar Energy: Sun as Source of Energy, Availability of Solar Energy, Nature of Solar Energy, Solar Energy & Environment. Various Methods of using solar energy –Photothermal, Photovoltaic, Photosynthesis, Present & Future Scope of Solar
2	Bio-mass: Biomass: Generation and utilization, Properties of biomass, Agriculture Crop & Forestry residues used as fuels. Biochemical and Thermo-chemical Conversion, Combustion, Gasification, Biomass gasifiers and types etc. Applications of Gasifiers to thermal power and Engines, Biomass as a decentralized power generation source for villages. Concept of Bio-energy, Photosynthesis process, Bio-fuels, Biomass resources Bio based chemicals and materials. Thermo-chemical Conversion, Pyrolysis, Combustion, Gasification, Liquefaction.
3	Biomethanation: Importance of biogas technology, Different Types of Biogas Plants. Aerobic and anaerobic bioconversion processes, various substrates used to produce Biogas (cow dung, human and other agricultural waste, municipal waste etc.); Individual and community biogas operated engines and their use. Removal of CO ₂ and H ₂ O, Application of Biogas.
4	Wind Energy: Wind Energy, Basics & Power Analysis, Wind resource assessment, Power Conversion Technologies and applications, Wind Power estimation techniques, Principles of Aerodynamics of wind turbine blade, various aspects of wind turbine design. Wind Turbine Generators, Induction, Synchronous machine, constant V & F and variable V & F generations, Reactive power compensation. Site Selection, Concept of wind farm & project cycle, Cost economics & viability of wind farm.
5	Geothermal, Tide and Wave Energy: Availability of Geothermal Energy-size and Distribution, Recovery of Geothermal Energy, Various Types of Systems to use Geothermal Energy, Direct heat applications, Power Generation using Geothermal Heat, Sustainability of Geothermal Source, Status of Geothermal Technology, Economics of Geothermal Energy.

Reference Books:

1. Biomass Renewable Energy by D.O.hall and R.P. Overreed (John Wiley and Sons, New york, 1987)
2. Biomass as Fuel by L.P.White (Academic press1981)
3. Biomass Gasification Principles and Technology, Energy technology review No. 67, T.B. Read (Noyes Data Corp. , 1981)
4. Wind Turbine Technology: Fundamental concepts of wind turbine technology by Spera D.A. (ASME Press, NY, 1994)
5. Renewable Sources of Energy and Conversion Systems by N.K.Bansal and M K Kleeman
6. Nonconventional Energy Resources by G D Rai
7. Solar Energy Fundamental design modelling and applications by G N Tiwari
8. Nonconventional Energy Resources by S Hassan Saeed and D K Sharma.