

GUJARAT TECHNOLOGICAL UNIVERSITY

Power Electronics

M.E. Semester: II

Subject Name: **Renewable Energy systems (Major Elective –III)**

Sr. No.	Course Content
1.	Solar Energy-Introduction to Solar Energy: Solar radiation, availability, measurement and estimation, Solar thermal conversion devices and storage, solar cells and photovoltaic conversion – PV systems – MPPT. Applications of PV Systems – solar energy collectors and storages.
2.	Wind Energy-Introduction – Basic principles of wind energy conversion – wind data and energy estimation – site selection consideration – basic components of wind energy conversion system – Types of wind machines – basic components of wind electric conversion systems. Schemes for electric generations – generator control, load control, energy storage – applications of wind energy – Inter connected systems.
3.	Geothermal energy-Introduction, estimation of geothermal power, nature of geothermal fields, geothermal sources, inter connection of geothermal fossil systems, prime movers for geo thermal energy conversion. Application of geothermal energy. Energy from biomass: Introduction, Biomass conversion technologies, photosynthesis, classification of biogas plants. Biomass Energy conversion, Energy from waste.
4.	Energy from the Ocean: Ocean Thermal Electric Conversion (OTEC) systems like open cycle, closed cycle, Hybrid cycle, prospects of OTEC in India. Energy from tides, basic principle of tidal power, single basin and double basin tidal power plants, advantages, limitation and scope of tidal energy. Wave energy and power from wave, wave energy conversion devices, advantages and disadvantages of wave energy.
5.	Chemical Energy Sources-Introduction – fuel cells – design and principles of operation of a fuel cell – classification of fuel cells. Types of fuel cells – conversion efficiency of fuel cells. Types of electrodes, work output and emf of fuel cell, Applications of fuel cells. Hydrogen energy: Introduction – hydrogen production – electrolysis, thermo chemical methods, Westinghouse Electrochemical thermal sulphur cycle. Fossil fuel methods. Hydrogen storage, Utilization of hydrogen gas.

Reference Books:

1. SP Sukatme, "Solar Energy – Principles of thermal collection and storage, second edition, Tata McGraw Hill, 1991.
2. J.A. Duffie and W.A. Beckman, "Solar Engineering of Thermal Processes", Second Edition, John Wiley, New York, 1991.
3. D.Y. Goswami, F. Kreith and J.F. Kreider, "Principles of Solar Engineering, Taylor and Francis, Philadelphia, 2000.
4. D.D. Hall and R.P. Grover, "Bio-Mass Regenerable Energy, John Wiley, Newyork, 1987.