

**3/4 B.Tech. SECOND SEMESTER
RENEWABLE ENERGY SOURCES
(FREE ELECTIVE)**

EE6T6FE4**Credits: 3****Lecture: 3 periods/week****Internal assessment: 30 marks****Tutorial: 1 period /week****Semester end examination: 70 marks****Course Objective:**

It introduces basics of solar energy like solar radiation, collection, storage and application. It also introduces the wind energy, biomass energy, geothermal energy and ocean energy as alternative energy sources.

Course Outcomes:

After completing this course, student is able to

1. Apply knowledge of mathematics physics and engineering to the analysis and design of renewable energy systems.
2. Identify, formulate, and solve engineering problems in the area of renewable energy system for clean, reliable and efficient electrical power
3. Design an electric system, or process to meet desired needs within realistic constraint for wind, solar thermal, solar PV, bio mass geothermal and ocean energy systems
4. Get the knowledge on modern issues in electrical power generation.
5. Get the ability to function effectively on multidisciplinary teams.

UNIT I**Principles of Solar Radiation and Solar Energy Collection**

Role and potential of new and renewable source, the solar energy option, environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on tilted surface, instruments for measuring solar radiation and sun shine, solar radiation data. Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

UNIT II**Solar Energy Storage, Applications and Photovoltaic Energy Conversion**

Different methods, sensible, latent heat and stratified storage, solar ponds. Solar applications solar heating/cooling technique, solar distillation and drying.

Solar cell fundamentals, solar cell classification, performance of solar cell- power from solar module.

UNIT III**Wind Energy and Bio-Mass**

Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria.

Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking.

UNIT IV**Energy and Ocean Energy**

Resources, types of wells, methods of harnessing the energy, potential in India. OTEC, principles of utilization, setting of OTEC plants, thermodynamic cycles.

Tidal and wave energy: Potential and conversion techniques.

UNIT V

Energy Conversion

Principles DEC, MHD generators, principles, MHD power generation systems. Fuel cells, principles, of fuels and operating conditions, merits and demerits of different types of fuel cells, mini-hydel power plants and their economics.

Learning Resources

Text Books:

1. Non-Conventional Energy Sources by G.D. Rai, Khanna publishers, 5th edition,2014.
2. Renewable Energy resources, Tiwari and Ghosal, Narosa,2005
3. Science and Technology of Photo Voltaics by Jayarama Reddy, BS publications, 2nd edition,2012

Reference Books:

1. Non-Conventional Energy by Ashok V Desai, New age, 2005.
2. Non-Conventional Energy Sources by B.H.Khan, Tata Mc Graw-hill Publishing Company, 2nd edition,2013.