

## 4/4 B.Tech. SECOND SEMESTER

EE8T1 NON-CONVENTIONAL SOURCES OF ENERGY Credits: 4

Lecture: 4 periods/week  
Tutorial: 1 period /week

Internal assessment: 30 marks  
Semester end examination: 70 marks

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### Objectives:

It introduces solar energy its radiation, collection, storage and application. It also introduces the Wind energy, Biomass energy, Geothermal energy and ocean energy as alternative energy sources.

### Learning outcomes:

1. Upon completion of study of the course, students should be able to understand the principles of solar energy and solar energy collection.
2. Upon completion of study of the course, student should be able to understand the applications of solar energy such as solar heating, solar distillation and photo voltaic energy.
3. Upon completion of study of this subject, student should be able to understand principles of Bio-conversion, Fuel cells and MHD power generation.

### Unit I Principles Of Solar Radiation

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.

### Unit II Solar Energy Collection

Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

### Unit III Solar Energy Storage And Applications

Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and dryin.

### UNIT IV Photovoltaic Energy Conversion

Solar cell technology, construction of – single crystalline, poly Crystalline, Amorphous silicon Cells, performance of solar cell- power from solar Module- Types of solar PV systems- PV Array testing for Faults – charge controller – PV system design.

### Unit V Wind Energy

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

### Unit VI Bio-Mass

Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C.Engine operation and economic aspects.

### Unit VII Geothermal Energy

Resources, types of wells, methods of harnessing the energy, potential in India.

OCEAN ENERGY: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques.

**Unit-VIII Energy Conversion**

Principles DEC, MHD generators ,principles, MHD power generation systems. Fuel cells, principles,selection 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 /G.D. Rai,Dhanapati Rai publications.
2. Renewable Energy resources,Tiwari and Ghosal, Narosa.
3. Science and Technology of Photo Voltaics by Jayarama Reddy, BS publications

**Reference books:**

1. Renewable energy Technologies by Ramesh & Kumar, Narosa.
2. Non-Conventional Energy by Ashok V Desai,Wiley Eastern.
3. Non-Conventional Energy Systems by K Mittal ,Wheeler