3/4 B.Tech. SIXTH SEMESTER

ME6T6D ALTERNATIVE SOURCES OF ENERGY Credits: 4

Lecture:- 4 periods/week **Internal assessment: 30marks**
Practice: -- **Semester end examination: 70 marks**

Objectives:

1. Explain various sources of non-conventional energy resources

Learning outcomes:

At the end of course the students will be able to:

1. Explain the fundamental principles, classification of collectors, methods of storage and application of solar Energy
2. Describe the basic concepts of Wind Energy
3. Analyze the Biomass Energy concept
4. Discuss the fundamentals of Geothermal Energy
5. Reproduce the fundamentals of Ocean Energy, tidal and wave energies
6. Identify need of conversion of energy from one form to another

Pre-Requisite

Basic Thermodynamics

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 titled 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 drying, photovoltaic energy conversion.

UNIT-IV

WIND ENERGY:

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

UNIT-V

BIO-MASS:

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

UNIT-VI

GEOTHERMAL ENERGY:

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

UNIT-VII

OCEAN ENERGY:

OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles.

TIDAL AND WAVE ENERGY:Potential and conversion techniques, mini-hydel power plants, and their economics.

UNIT-VIII

DIRECT ENERGY CONVERSION :

Need for DEC, principles of DEC.Thermo-electric generators, seebeck, peltier and joul Thomson effects, Figure of merit, materials, applications, MHD generators, principles, dissociation and ionization, hall effect, magnetic flux, MHD accelerator, MHD Engine. Fuel cells, principles, faraday's law's, thermodynamic aspects.

Learning resources

Text books:

1. G.N Tiwari and M.K Ghosal – "Renewable energy resources" -Narosa Publishing House-2005
2. G.D. Rai – "Non-Conventional Energy Sources", Khanna publishers - 2009

Reference books:

1. Twidell & Weir- "Renewable Energy Sources" ,Taylor & Francis Group-2006
2. Frank Krieth & John F Kreider, "Principles of Solar Energy" - McGraw-Hill-1981
3. Ashok V Desai /Wiley Eastern ,"Non-Conventional Energy" , New International (P) Limited-2003.
4. K Mittal "Non-Conventional Energy Systems" ,Wheeler Publishing-1997.
5. Ramesh & Kumar, "Renewable Energy Technologies", Narosa Publicationing House-2007-08