

Course Objective:

- To explain concept of various forms of renewable energy
- To outline division aspects and utilization of renewable energy sources for both domestic and industrial applications
- To analyse the environmental and cost economics of using renewable energy sources compared to fossil fuels.

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.

SOLAR ENERGY STORAGE AND APPLICATIONS :

Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications solar heating technique, solar distillation and drying, photovoltaic energy conversion.

UNIT-III

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

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.Engineoperation and economic aspects.

UNIT-IV

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, mini-hydel power plants, and their economics.

UNIT-V

DIRECT ENERGY CONVERSION: Need for DEC, Carnot cycle, limitations, principles of DEC. Thermo-electric generators, Seebeck, Peltier and Joule Thomson effects, Figure of merit, materials, applications, MHD generators, principles, dissociation and ionization, hall effect, magnetic flux, MHD accelerator, MHD Engine, power generation systems, electron gas dynamic conversion, economic aspects. Fuel cells, principles, faraday's law's, thermodynamic aspects, selection of fuels and operating conditions.


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Course Outcome:

At the end of the course the student will

- Have knowledge about various renewable energy sources
- Be able to choose the appropriate renewable energy as an alternate for conventional power in any application.

TEXT BOOKS:

1. Renewable energy resources, Tiwari and Ghosal, Narosa.
2. Non-Conventional Energy Sources ,G.D. Rai

REFERENCES :

1. Renewable Energy Sources, Twidell & Weir
2. Solar Energy, Sukhatme
3. Solar Power Engineering, B.S. Magal Frank Kreith & J.F. Kreith.
4. Principles of Solar Energy, Frank Kreith & John F Kreider.
5. Non-Conventional Energy, Ashok V Desai, Wiley Eastern
6. Non-Conventional Energy Systems, K Mittal, Wheeler.


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