

GREEN ENERGY RESOURCES & TECHNOLOGY

Module-I :

Solar photovoltaics: Introduction, Solar cell characteristics, Losses in solar cells, Modeling of solar cell, Solar PV modules, Bypass diode in PV module, Design of PV module, PV module power output, I-V curve of PV module, BOS of PV module, Batteries for solar PV, Battery charge controllers, DC-DC converters, DC-AC converters, MPPT, Different algorithm for MPPT, Types of PV system, Performance analysis of solar cell, Working of solar cell power plant.

Module-II :

Wind energy: Wind energy conversion, power \sim speed and torque \sim speed characteristics of wind turbines, wind turbine control systems; conversion to electrical power: induction and synchronous generators, grid connected and self excited induction generator operation, constant voltage and constant frequency generation with power electronic control, single and double output systems, reactive power compensation;

Ocean Energy: Ocean energy resources-ocean energy routes - Principles of ocean thermal energy conversion systems- ocean thermal power plants- Principles of ocean wave energy conversion and tidal energy conversion.

Module-III :

Biomass Energy: Introduction, Biomass conversion technology, Biogas, Composition of Biogas, Properties of Biogas, Biogas production reaction, Factor affecting biogas production, Biogas plant site selection, Biogas plants, Types of Biogas plants, Biogas purification, Biogas storage, Biogas dispensing, Advantages and disadvantages of Biogas, Emission from Biogas engines, Digester Filling and Biogas plant operation, Biogas digester sizing.

Module-IV :

Hybrid Power Systems: Introduction, Need for hybrid systems, Range of hybrid systems, Types of Hybrid systems, Diesel-PV system, Wind-PV system, Micro hydel-PV system, Biomass-PV system, Electric vehicles, Hybrid electric vehicles.

Energy Conservation, Management and Economics: Impact of renewable energy on environment, Principle and strategies of energy conservation, energy management, energy audit, energy planning, Total energy system concept, Power tariff, Cost of electricity production from renewable.

Text/Reference Books:

1. S. N. Bhadra, D. Kastha, S. Banerjee, *Wind Electrical Systems*: Oxford Univ. Press, 2005.
2. S. S. Thipse, *Non Conventional and Renewable Energy Sources*, Narosa Publishing House, 2014.
3. S.A. Abbasi, N. Abbasi, *Renewable Energy Sources and Their Environmental Impact*: Prentice Hall of India, 2004.
4. S.P. Sukhatme - *Solar Energy: Principles of thermal Collection and Storage*, TMH, New Delhi
5. Duffic and Beckman - *Solar Engineering of Thermal Processes*, John Wiley
6. *Green Management and Green Technologies: Exploring the Causal Relationship* by Jazmin Seijas Nogarida, 2008.
7. *Green Marketing and Management: A global Perspective* by John F. Whaik, 2005