

**Learning Objectives:**

- To familiarize with renewable energy resources.
- To Study conversation of Solar energy in deferent form in detail.
- To discuss Basics of the Wind energy in detail.
- To introduce Biomass energy and biogas technology.

**Course Outcome (CO)**

CO1 Upon successful completion, students will have the knowledge of renewable energy resources.

CO2 Will have a good understanding on conversation of Solar energy in deferent form

CO3 Will have a good understanding of Basics of the Wind energy

CO4 Scientific knowledge about biomass energy and biogas technology.

Unit I Renewable energy resources: Forms of Energy, Conservation of Energy, Nature of solar radiation, Spectral distribution of extra-terrestrial radiation, Estimation of extra-terrestrial solar radiation, Radiation on horizontal and tilted surfaces.

Conversion of Solar Energy in different forms: Various ways to convert solar energy into different forms. Solar active and passive systems, Types of solar passive systems, design aspects of solar passive systems.

Basic principle of solar photovoltaic (SPV) conversion, Block diagram of general SPV conversion system and their characteristics, different configurations, Applications (such as street light, water pumps, Radio/TV, Small capacity power generation). [13 hrs]

Unit II Basics of the Wind energy: Wind Energy Origin and classification of winds, basic principle of wind energy conversion, Extraction of maximum power from wind and its dependence on various parameters. Wind Mills, types of wind mills, Vertical axis and Horizontal axis wind mills-their performance, Merits and Demerits, Limitations of wind energy conversions. [13hrs]

Unit III Biomass energy and biogas technology: Nature of Biomass as a fuel, Properties of biomass, Biomass energy conversion processes, agriculture crop and forestry residues used as fuels, Physical, chemical and biological conversion of biomass into useful form of energy; Gasification, types of gasification Importance of biogas technology, Aerobic and anaerobic bioconversion process, Factors affecting Bio-digestion, Types of biogas plants, Applications of biogas.

Biofuels: Types of biofuels, Production processes, Biofuel applications, Ethanol as a biofuel. [13 hrs]

**References**

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