

EE417 RENEWABLE ENERGY SOURCES

Course Description & Objectives:

To understand the differences between conventional and non conventional energy sources. To understand the methodology for conducting Energy Audit. To understand Various solar energy systems and their applications. It also introduces the Wind Power, Biomass energy, Tidal energy and ocean energy as alternative energy sources.

Course Outcomes:

- I To Understand the main sources of energy and their primary applications in India, and the world.
- I To Illustrate the basic electrical concepts and system components.
- I To Convert units of energy—to quantify energy demands and make comparisons among energy uses, resources, and technologies.
- I To Collect and organize information on renewable energy technologies as a basis for further analysis and evaluation.

UNIT I - Conventional Sources of Energy :

Energy - Conventional, renewable, non-conventional and alternate sources of energy - Energy supply system in India. Coal and Coal technologies - Petroleum and natural gas - nuclear fuels and power plants - Hydro sources and power plants - Energy strategies - energy conservation - energy audit - cost of energy.

UNIT II - Solar Power :

Application of Solar Energy - Various solar energy systems and their applications, radiations, solar spectra-latitude and longitude, Declination angle, solar window, cosine law, seasonal variations, daily variation, hour angle, calculation of angle of incidence, angstroms equation and constants, solar radiation data, daily global radiation calculations.

UNIT III - Wind Power :

Wind energy - energy chains, application - historical background, merits and limitations, nature of wind, planetary and local day / night winds, wind energy quantum, variables and units used in calculations, wind power density P_w ,

Power calculations, power in wind, power by turbine, efficiency, kinetic energy, incoming velocity V_i , exit velocity V_e , Power, torque thrust calculations, velocity at different heights, site selection, Favourable wind speed range, wind energy wind velocity duration, energy pattern factor.

UNIT IV - Biomass Energy :

Biomass energy resources : Photosynthesis and origin of biomass energy, biomass energy resources, cultivated biomass resources, waste to biomass resources, Terms and definitions, Incineration, wood and wood waste, Harvesting super trees and energy forests, phyrolysis, Thermo chemical biomass conversion to energy, gasification, Anaerobic digestion, Fermentation, Gaseous fuel from biomass.

UNIT V - Ocean & Tidal Energy :

Ocean and Tidal energy conversion, Energy sources in ocean - Ocean tidal, wave and thermal energy, Ocean saline gradient concept, ocean currents, ocean chemical energy, ocean energy conversion routes, electrical and non electrical routes, Bipolar, mono polar HVDC cable transmission Advantages and merits of ocean energy technologies, limitation, preconditions for commercial installation. Tides - spring tide, neap tide, daily and monthly variation, Tidal range, Tidal Power, Types of tidal power plants, single basin & double basin schemes, main requirements in tidal power plants, energy storage, prospects of tidal power, economic factors.

TEXT BOOK:

1. Rao. S. & Pamlekar Dr.B.B. "Energy Technology" 2nd ed., Khanna Publishers, 1997.

REFERENCE BOOKS:

1. Rai G.D., "Non – Conventional Energy Sources", 20th ed., Khanna Publishers, 2007.
2. Freris L. L., "Wind Energy Conversion", 1st ed., Prentice Hall (UK) Ltd., 1990.