20PE021 - GREEN ENERGY TECHNOLOGY

UNIT - I **L - 9**

SOLAR ENERGY: Solar radiation on the earth surface – extraterrestrial and terrestrial radiation, Solar radiation spectra, Sun-Earth angles, Solar thermal power generation technologies, Parabolic trough, Central receivers, Parabolic dish, Fresnel lens, Solar pond (elementary analysis), Solar pond electric power plant.

UNIT - II **L - 9**

SOLAR PHOTOVOLTAICS: Photovoltaic effect, Working of a solar cell, Open circuit voltage, Short circuit current, Series and shunt resistances, Single diode model of solar cell, Current equation of a solar cell, I-V and P-V characteristics of a PV cell, Cell efficiency, Fill factor, Effect of irradiation and temperature, Solar PV module, Solar PV array, Series and parallel connection of solar cells, Concept of shading on PV module, Ratings of a PV module, Module efficiency, Classification of PV systems – stand-alone system, grid interactive system; Design of PV system (no of modules and batteries) for a residential application.

UNIT - III **L - 9**

WIND ENERGY: Nature of wind, Planetary and local winds, Velocity at different heights, Site selection, Principle of wind energy conversion, Power in wind, Power extracted by wind turbine, Betz limit, Coefficient of power, Power regulation, Classification of wind mills, Lift and drag forces, Aero dynamic coefficient, Angle of attack, Solidity, Tip speed ratio, Energy pattern factor, Wind energy conversion system, Design of wind turbine for water pumping applications.

UNIT - IV **L - 9**

GEOTHERMAL ENERGY: Introduction, Geothermal energy resources, Hot Springs and Geysers, Types of systems using geothermal energy - Direct heat applications; Geothermal power plants - Vapour-dominated or dry steam fields, liquid-dominated or wet steam fields and hot dry rock binary fluid system.

UNIT - V **L - 9**

BIOMASS AND TIDAL ENERGY: Introduction, Photosynthesis and origin of biomass energy, Biomass energy conversion technologies-incineration, pyrolysis, gasification, anaerobic digestion and fermentation; Design of biogas plant.

TIDES: Spring tide, Neap tide, Daily and monthly variation, Tidal range, Modes of tidal power generation, Types of tidal power plants - single basin and double basin schemes.

TEXT BOOKS:

1. G.S.Sawhney, “Non-Conventional Energy Resources”, 1st edition, PHI Learning, 2012.
2. G.D. Rai, “Non Conventional Energy Sources”, 4th edition, Khanna Publishers, 2011.

REFERENCES BOOKS:

1. S.P. Sukhatme and J.K.Nayak., “Solar Energy”, 3rd edition, Tata Mc-Graw Hill Education Private Limited, 2010.
2. Chetan Singh Solanki, “Solar Photovoltaic: Fundamentals, Technologies and Application”, PHI Learning Pvt., Ltd., 2009.
3. Godfrey Boyle, “Renewable Energy, Power for a Sustainable Future”, 1st edition, Oxford University Press, 2012.
4. Rajput R.K., “Non-Conventional Energy Sources and Utilization”, revised edition, S. Chand & Co., 2012.