MANGALORE UNIVERSITY

Department of Physics

MSc Physics

PHE 455: ENERGY STUDIES (Open elective)

(39 Hrs.)

Course outcome

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

CO2 Will have a good understanding of Basics of the Wind energy.

CO3 Scientific knowledge about biomass energy and biogas technology.

Unit I

Renewable energy resources: Energy and Thermodynamics, Forms of Energy, Conservation of Energy, Entropy, Heat capacity, Thermodynamic cycles: Brayton, Carnot Diesel, Otto and Rankin cycle; Fossil fuels, time scale of fossil fuels and solar energy as an option. Solar Energy for Clean Environment Sun as the source of energy and its energy transport to the earth, Extraterrestrial and terrestrial solar radiations, solar spectral irradiance, Measurement techniques of solar radiations, Estimation of average solar radiation **[13 hrs]**

Unit II

Basics of the Wind energy: Wind Energy Origin and classification of winds, Aerodynamics of windmill: Maximum power, and Forces on the Blades and thrust on turbines; Wind data collection and field estimation of wind energy, Site selection, Basic components of wind mill, Types of wind mill, Wind energy farm, Hybrid wind energy systems: The present Indian Scenario. **[13 hrs]**

Unit III

Biomass energy and biogas technology: Nature of Biomass as a fuel, Biomass energy conversion processes, Direct combustion: heat of combustion, combustion with improved Chulha and cyclone furnace; Dry chemical conversion processes: pyrolysis, gasification,

types of gasification Importance of biogas technology, anaerobic decomposition of biodegradable materials, Factors affecting Bio-digestion, Types of biogas plants, Applications of biogas. **[13 hrs]**

References

1. Peter A., 'Advances in energy systems and technology',(Academic Press, USA, 1986).

2. Neville C.R., 'Solar energy conversion: The solar cell', (Elsevier North-Holland, 1978).
3. Dixon A.E. and Leslie J.D., 'Solar energy conversion', (Pergamon Press, New York, 1979) .
4. Ravindranath N.H., 'Biomass, energy and environment', (Oxford University Press, 1995).
5. Cushion E., Whiteman A. and Dieterle G., (World Bank Report, 2009).