EEOE1 **RENEWABLE ENERGY SOURCES**

COURSE OBJECTIVES:

1. To understand the depletion rate of conventional energy resources and importance of renewable energy sources.
2. To evaluate the technical and economic viability of various non-conventional energy sources.
3. To explain the fundamental principles of energy conversion for solar, wind, ocean and geothermal resources.
4. To demonstrate the biochemical processes of biogas production and the engineering design of anaerobic digesters.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. Illustrate the national scene of energy production, utilization, consumption and energy storage systems.
2. Describe about the basics of solar energy, generation of electricity from solar energy & Photovoltaic.
3. Evaluate wind resource potential and examine the performance of various wind turbines and wind generators.
4. Understand the mechanics of energy extraction from Ocean Thermal (OTEC), Wave, Geothermal, and Biomass resources.

UNIT I *Text Book - 1* [CO:1] **(9)**

Principle of Renewable Energy: Comparison of Renewable and Conventional energy sources - Ultimate energy sources - natural energy currents on earth - primary supply to end use - Spaghetti & Pie diagrams - Energy planning - Energy Efficiency and Management.

UNIT II *Text Book - 2* [CO:2] **(12)**

Solar Radiation: Extra terrestrial solar radiation - terrestrial solar radiation - solar thermal conversion-Solar Thermal Central Receiver system - Photovoltaic energy conversion - solar cell.(only theoretical analysis)

UNIT III *Text Book - 2* [CO:3] **(12)**

Wind energy: Planetary and local winds - Vertical axis and Horizontal axis wind mills - principles of wind power - maximum power - actual power - wind turbine operation. (only theoretical analysis)

UNIT IV *Text Book - 2* [CO:4] **(12)**

Energy from Oceans: Ocean temperature differences - principles of OTEC plant operations - wave energy - devices for energy extraction - tides - Simple single pool tidal system.

Geothermal Energy: Origin and types - Bio fuels - classification â€“ Direct combustion for heat and electricity generator - anaerobic digestion for biogas - biogas digester - power generation. (only theoretical analysis)

LEARNING RESOURCES:

TEXT BOOK(s):

1. John Twidell & Toney Weir, Renewable Energy Sources, E & FN Spon Publications, 4th Edition, 2022.

2. Rai G. D., Non-Conventional Energy Sources, Khanna Publishers, 6th Edition, 2025.

REFERENCE BOOK(s):

1. El-Wakil M. M., Power Plant Technology, McGraw-Hill Publications, 1st Edition, Reprint 2024.
2. Abbasi S. A. and Abbasi N., Renewable Energy Sources: Their Impact on Global Warming and Pollution, PHI Learning Pvt. Ltd., 2022.

WEB RESOURCES:

1. https://www.eia.gov/energyexplained/renewable-sources/
2. https://www.justenergy.com/blog/7-types-of-renewable-energy-the-future-of-energy/
3. https://www.studentenergy.org/topics/renewable-energy