

Course Title: Renewable Energy Resources (Core Course)

Course Code: RE-800

Objectives: This course aims to provide students with a comprehensive understanding of various renewable energy sources, emphasizing their scientific principles, global significance, and role in addressing climate change. Critical analysis and problem-solving skills will be nurtured to optimize renewable energy technologies while considering environmental, social, and ethical impacts.

Learning Outcomes: On successful completion of the student will be able to:

- Gain a holistic comprehension of various renewable energy sources, their scientific principles, and applications across different sectors.
- Evaluate challenges associated with harnessing each renewable energy source and propose innovative solutions to optimize their efficiency and overcome barriers.
- Assess the environmental impact and socio-economic implications of renewable energy deployment,
- Explore and evaluate emerging trends in renewable energy, focusing on advancements in energy storage, grid integration, and ongoing research areas to stay abreast of industry evolution.

Contents:

Introduction to Renewable Energy Sources: An overview of various renewable energy sources, emphasizing energy conservation, global energy resources, climate change implications, and indigenous renewable resources.

Solar Energy: Covering solar radiation, photovoltaic technology, solar thermal systems, and installation of solar energy systems.

Wind Energy: Wind energy generation, turbine, and wind farm design, addressing challenges in harnessing wind power.

Hydropower: Exploring hydropower systems, , and environmental/social considerations associated with hydropower.

Biomass and Bioenergy: Understanding biomass energy sources, biofuels, biogas, and biomass power generation, focusing on conversion technologies like combustion, gasification, and anaerobic digestion.

Geothermal Energy: Exploring geothermal resources, power plants, direct use applications, scientific principles, and advantages of geothermal energy.

Energy Storage: Introduction to energy storage solutions emphasizing their role in managing renewable energy variability.

Energy Conversion and Efficiency: Discussing energy conversion processes, efficiency improvement techniques.

Sustainability and Environmental Considerations: Examining the environmental impact, life cycle analysis, and best practices for sustainability in renewable energy technologies.

Future Trends and Emerging Technologies: Analyzing the latest developments and emerging trends in the renewable energy sector, including advancements in energy storage, grid integration, and ongoing research areas.

Recommended Books

- Renewable Energy Resources - 4th Edition - John Twidell; Routledge.
- Renewable Energy: Physics, Engineering, Environmental Impacts, Economics and Planning 5th Edition; Bent Sørensen; Elsevier Ltd.
- Fundamentals and Applications of Renewable Energy 1st Edition Mehmet Kanoglu, McGraw Hill
- Statistical Review of World Energy" by British Petroleum