

# **ADD-ON COURSE IN RENEWABLE ENERGY**

## **Unit I - BASIC CONCEPTS OF ENERGY RESOURCES**

**(6hrs)**

Introduction to Renewable Energy- Definition. Renewable Energy sources switching, Difference between Renewable & Non-renewable sources, Main sources – solar, wind, tidal, biomass, geothermal, Applications, Advantages & Disadvantages of Renewable Energy.

Brief descriptions of solar energy, wind energy, tidal energy, wave energy, ocean thermal energy, biomass energy, geothermal energy, and oil shale. Introduction to the Internet of Energy (IOE)

## **Unit II - SUSTAINABLE ENERGY SYSTEM**

**(6hrs)**

Introduction to sustainable energy: Global energy challenges and need for sustainability

Renewable energy sources, Energy conservation principle, Measurement of Industrial energy efficiency, Transportation efficiency and alternative fuels

Environmental impact and Policy regulation, Environmental and social impacts

## **Unit III NON-SUSTAINABLE ENERGY SYSTEM**

**(6hrs)**

Introduction to non-sustainable energy system. Classification of non-sustainable energy sources, significance of fossil fuels and nuclear energy

Fossil fuels and its importance; Coal, Petroleum, Tar sands, Oils, Oil shale, Natural gas; mitigating environmental impacts, and promoting energy security and resilience

Basics of nuclear energy, nuclear forces, isotopes, and radioactivity, Type of radiations and their properties

## **Unit IV CONVENTIONAL ENERGY SOURCES AND ENVIRONMENTAL CONSEQUENCES**

**(6hrs)**

Fossil fuels and air pollution. Overview of biomass as energy source; Biomass availability

Environmental pollution associated with energy generation and consumption process

Radioactive waste management, nuclear accident and their environmental impacts, Public perception and safety concerns

## **Unit V ENERGY ASSESSMENT AND EVALUATION**

**(6hrs)**

Introduction to Energy audit assessment and survey

Types of audits- walk-through- audit, preliminary energy audit, and detailed energy audit

Retro-commissioning, industrial energy assessment and Renewable energy assessment

## **References:**

1. Renewable Energy: Power for a Sustainable Future, Godfrey Boyle, Oxford University Press, 2019.
2. Solar Energy Engineering: Processes and Systems, Soteris Kalogirou, Academic Press, 2021.

3. Biomass for Renewable Energy, Fuels, and Chemicals edited by Donald L. Klass, Academic Press, 2022.
4. Geothermal Power Plants: Principles, Applications, Case Studies, and Environmental Impact Ronald DiPippo, Butterworth-Heinemann, 2020.
5. Fuel Cell Technology: Principles, Design, and Operation Nigel Sammes, Wiley, 2021.
6. Sustainable Energy: Choosing Among Options Jefferson W. Tester, Elisabeth M. Drake, Michael J. Driscoll, Michael W. Golay, William A. Peters, and William D. Nordhaus, MIT Press, 2022.
7. Environmental Science and Engineering P. N. Palanisamy, S. M. Yasaswy, and D. Srikanth, McGraw Hill, 2020.
8. Environmental Impact Assessment: Theory and Practice, Peter Morris and Riki Therivel, Cambridge University Press, 2020.
9. Energy Auditing and Energy Management Handbook, Ali Hasanbeigi, Lynn Price, Elina Lin, and Hongyou Lu, Academic Press, 2021.
10. Handbook of Energy Audits, Albert Thumann, William J. Younger, and Terry Niehus, Fairmont Press, 2022.