Anekant Education Society's

TULJARAM CHATURCHAND COLLEGE OF ARTS, SCIENCE AND COMMERCE COLLEGE, BARAMATI

Autonomous status

Affiliated to Savitribai Phule Pune University, Pune

Department of Physics

S.Y.B.Sc CC**-22**: **Renewable Energy Resources Certificate Course** **(2 Credits)**

Course Objectives:

The objective of the courses is to develop in-depth knowledge for the following:

1**.**Various renewable energy resources available at a location and assessments of its potential, using tools and techniques.

2.Solar energy radiation, its interactions, measurement and estimation

3. Site selection for wind turbines, wind systems, measurements and instruments

4. Explore the environmental implications of renewable energy, including sustainability, life cycle analysis, and ecological effects.

5. Develop skills for planning and executing renewable energy projects, including feasibility studies and project management.

6. Enhance critical thinking and problem-solving skills related to real-world challenges in renewable energy implementation.

Course Outcomes

1**.** Able to understand the renewable energy sources available at present.

2**.** Able to understand the solar energy operation and its characteristics.

3**.** To educate the wind energy operation and its types.

4. Students will be able to apply fundamental concepts of renewable energy to real-world scenarios and case studies.

5. Students will demonstrate proficiency in understanding and evaluating the technologies used in renewable energy systems.

6. Students will analyze emerging trends and innovations in renewable energy, evaluating their potential impacts on the industry.

7. Students will integrate knowledge from multiple disciplines to understand the broader implications of renewable energy.

8. Students will employ critical thinking and problem-solving skills to address challenges in the deployment and management of renewable energy systems.

Topics and Learning Points

Theory **(12 Lecture)**

Solar Energy **(3 Lecture)**

Energy resources and forms of energy, Energy from sun, Solar constant, solar thermal collectors, solar pond, Solar boiler, Principle of Photovoltaic cell, IV characteristics of solar cell, large solar PV system, Solar PV power system for space station

Energy Storage System **(3 Lecture)**

Battery: Introduction, Battery Energy Storage Systems, Lead Acid Battery Cells, Nickel-Cadmium Battery, Li-ion Battery, Advanced Batteries.

Fuel Cell: Introduction, Advantages of Fuel cell power sources, Principle and operation of Fuel Cell, Classification and Types of Fuel Cells

Biomass energy **(3 Lecture)**

Introduction, Biomass for urban waste and rural waste to biogas energy, Agricultural waste and agricultural energy crops, fruit farms, anaerobic fermentation process in biogas plants, Principal of marine bioenergy resources

Wind Energy **(2 Lecture)**

Introduction, Wind turbine &its type, Wind to electrical energy conversion alternatives Wind map of India, Wind electrical energy stations in India.

Energy Audit **(1 lecture)**

Introduction, Types of energy audits, Walk through energy audit, Case Study, Audit report, Intermediate & Compressive Energy audit, Procedure of energy auditing

Practicals **(18 Lectures)**

1. Study of solar cell characteristics
2. PV- IV characteristics of solar cell
3. Performance evaluation of box type Solar Cooker
4. Recording the amount of sunlight receives throughout a day using Sunshine recorder
5. Utilizing the latent heat absorbed by the condensing water steam using Solar Still
6. Measure the solar radiation flux density using Pyrometer

Case Study: 1. Solar PV Panel
2. Biogas production from kitchen waste

Methodology: Lectures supplemented with case studies that may include visits.