



## **AOPH502: RENEWABLE ENERGY**

**Credits: 3**

**Contact Lecture Hours: 72**

**Scope:** The course creates awareness among students about energy management and sustainable energy technologies.

### **Module I**

#### **Energy Sources (23hrs)**

Force, Energy, and Power-Energy conservation-Fundamental forms of energy: Kinetic energy, Gravitational energy, Electrical energy and Nuclear energy-Energy conversion, efficiencies and capacity factors- Present day energy use, Petroleum, Natural gas, and Coal - Fossil fuels and climate change-Advantages and disadvantages of conventional electricity generation- Renewable energy sources-Advantages and disadvantages of renewable energy- India's current fuel usage-Status and potential of renewable energy.

#### **Solar thermal energy**

Solar water heater-Nature and availability of solar radiation-Magic of glass-Active solar heating-Passive solar heating-Solar thermal engines and Electricity generation-Concentrating solar collectors-Economics, Potential and Environmental Impact

#### **Solar Photovoltaic**

The PV effect: Basic principles- PV systems for remote power-Grid connected PV systems – Costs of energy from P V - Environmental impact and safety- PV integration, resources and future prospects

Text Books for study:

1. Renewable energy-Power for a sustainable future, Godfrey Boyle (Oxford university press)
2. Non-Conventional Energy Resources, D.S Chauhan, S.K Srivastava (New age international Publishers)

### **Module II**

#### **Bioenergy and Wind Energy (21hrs)**

Introduction to Bioenergy-Biomass as a solar energy store-Biomass as a fuel-primary biomass energy sources-secondary biomass sources-Physical processing of biomass-Thermochemical processing-Biochemical processing-Environmental benefits and impacts-Economics



Introduction to wind energy-Energy and power in the wind-wind turbines-Power and energy from wind turbines-Environmental impact – Economics-Wind energy potential

Text Book for study:

1. Renewable energy-Power for a sustainable future, Godfrey Boyle (Oxford university press)

### **Module III**

#### **Integration, management and storage of renewable energy (23hrs)**

Storage of intermittently generated renewable energy- Electrical storage: Batteries and Accumulators, Superconducting electromagnetic energy storage - Fuel cell - Mechanical storage - Storage as thermal energy

Integration of renewable energy-Integrating electricity from renewables-The variability problem- Hydrogen as a fuel-promoting renewables

The value of energy management - Principles of energy management- Energy auditing-Basic components of energy audit

Text Books for study:

1. Renewable energy resources, John Twidell & Weir
2. Renewable energy-Power for a sustainable future, Godfrey Boyle (Oxford university press)
3. Renewable energy sources, Tasneem Abbasi, S.A. Abbasi (PHI Learning Private Limited)
4. Energy Management Handbook, Wayne C. Turner (The Fairmont Press)

#### **Project work- 5 (hrs) (credit-1)**

Solar still, Solar cooker, biogas plant prototype etc.

#### **Reference books**

1. Solar energy, H.P Garg (Tata McGraw-Hill)
2. Renewable Energy Technologies: Practical Guide for Beginners, Solanki (PHI Learning)
3. Renewable Energy Sources and Emerging Technologies, Ranjan Rakesh, Kothari D. P., Singal K. C. (PHI Learning)
4. Solar Energy: Principles of Thermal Collection and Storage, S. P. Sukhatme J. K. Nayak (Tata McGraw-Hill)