

# Renewable Energy and Energy Harvesting

## Course Outcomes

- Basic understanding of alternative sources of energy.
- Conceptual understanding and importance of solar cell , characterization
- Understating the energy harvesting and its applications using wind and piezoelectric materialCO-4:  
Understating the electromagnetic energy harvesting and its applications

## Unit I

### Fossil fuels and Alternate Sources of energy:

Fossil fuels and Nuclear Energy, their limitation, need of renewable energy, non-conventional energy sources. An overview of developments in Offshore Wind Energy, Tidal Energy, Wave energy systems, Ocean Thermal Energy Conversion, solar energy, biomass, biochemical conversion, biogas generation, geothermal energy tidal energy, Hydroelectricity.

## Unit II

### Solar energy:

Solar energy, its importance, storage of solar energy, solar pond, non-convective solar pond, applications of solar pond and solar energy, solar water heater, flat plate collector, solar distillation, solar cooker, solar green houses, solar cell, absorption air conditioning. Need and characteristics of photovoltaic (PV) systems, PV models and equivalent circuits, and sun tracking systems.

## Unit III

### Wind Energy harvesting:

Fundamentals of Wind energy, Wind Turbines and different electrical machines in wind turbines, Power electronic interfaces, and grid interconnection topologies.

**Piezoelectric Energy harvesting:** Introduction, Physics and characteristics of piezoelectric effect, materials and mathematical description of piezoelectricity, Piezoelectric parameters and modeling piezoelectric generators, Piezoelectric energy harvesting applications, Human power.

## Unit IV

### Electromagnetic Energy Harvesting:

Linear generators, physics mathematical models, recent applications 42 Carbon captured technologies, cell, batteries, power consumption Environmental issues and Renewable sources of energy, sustainability.

### Reference Books:

- ✓ *Non-conventional energy sources - G.D Rai - Khanna Publishers, New Delhi*
- ✓ *Solar energy - M P Agarwal - S Chand and Co. Ltd.*
- ✓ *Solar energy - Suhas P Sukhative Tata McGraw - Hill Publishing Company Ltd.*
- ✓ *Godfrey Boyle, "Renewable Energy, Power for a sustainable future", 2004, OxfordUniversity Press, in association with The Open University.*
- ✓ *Dr. P Jayakumar, Solar Energy: Resource Assesment Handbook, 2009*
- ✓ *J.Balfour, M.Shaw and S. Jarosek, Photovoltaics, Lawrence J Goodrich (USA).*
- ✓ [http://en.wikipedia.org/wiki/Renewable\\_energy](http://en.wikipedia.org/wiki/Renewable_energy)