

### **Course Structure**

**Course Code :** SM7307

**Course Title :** Renewable Energy Resources

**Credit Hours :** 3

### **Course Description**

- Introduction to Solar Sun, Sun solar resource estimation, Introduction to natural solar thermal, Wind Energy Natural Resource, Wind power, Wind farms and estimation of annual energy generation, Introduction to Hydropower, hydro dams, Wave spectrum, Energy and energy flux, Introduction to Biomass and Bio-energy, Introduction to Energy Storage.

### **Course Objectives**

The student should become acquainted with:

- Extensive knowledge on natural renewable energy resources including potential, energy harvesting, availability, storing, applications, relevant economical, environmental and social impacts. This will lead to a better understanding of renewable energy systems and enriching the graduates professional activities based on a learning environment in which they will demonstrate their capacity for independent study and ability to collaborate with others in team settings and reflection.

### **Course Topics**

- Introduction to Solar Sun: Spectrum of Sun radiation, Global distribution of Solar insolation, seasonal variation of Sun radiation.
- Sun solar resource estimation (tilt angle), Measurements and components of sun insolation (total, normal, diffusion), Typical cases of Sun Atlas radiation.
- Introduction to natural solar thermal
- Wind Energy Natural Resource: Overview of the wind power industry and relevant economical issues, Wind speed and wind energy distribution, Wind measurements.
- Wind power, Energy conversion wind turbines,
- Wind farms and estimation of annual energy generation, typical cases of wind Atlas
- Introduction to Hydropower: Economical and environmental issues of hydropower, Principles of gravitational energy dams, Basics of Hydro-energy conversion.
- Overview on some typical hydro dams, Environmental impact and CO2 budget.
- Introduction to Tidal energy and Wave energy: Tidal power, Sea and Ocean response, Overview of Tidal power plant, Principles and environmental impact of tidal power plants.
- Energy and energy flux, Wind forcing,
- Wave spectrum, Introduction to wave energy conversion.
- Introduction to Biomass and Bio-energy: Overview of Biomass energy, Economical and environmental issues, Major sources of biomass (agriculture wastes, residues, ...etc).
- Potential and principles of Biomass energy conversion.
- Current bottlenecks for bio-energy deployment.
- Introduction to Energy Storage: Storage philosophy, Thermal storage, Hydro-storage.
- Electrical storage, Introduction to CO2 hunting storage.

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### **References**

- -Renewable Energy Resources 3rd Edition (published by Routledge, 2015) by John Twidell and Tony Weir
- Introduction to Renewable Energy (Energy and the Environment) 2nd Edition by Abbas Ghassemi, Published by: CRC press, 2015