# EE371: RENEWABLE ENERGY TECHNOLOGIES
# CREDITS = 3 (L=3, T=0, P=0)

**Course objective:**

The subject aims to provide the student with:

1. The knowledge of upcoming renewable energy technology that allows the student to have a solid theoretical knowledge and be able in the future to design and development of various energy technologies.
2. The skill to identify, formulate and solve fields problem in a multi-disciplinary frame individually or as a member of a group.

**Teaching and assessment scheme:**

| Teaching Scheme | | | Credit | Marks Distribution | | | | Total Marks |
|---|---|---|---|---|---|---|---|---|
| L | T | P | C | Theory Marks | | Practical Marks | | |
| 3 | 0 | 2 | 5 | ESE | CE | ESE | CE | 150 |
| | | | | 70 | 30 | 30 | 20 | |

**Course contents:**

| Unit No. | Topics | Teaching Hours. |
|---|---|---|
| 1 | **Introduction:**<br><br>Renewable Sources of Energy, Grid-Supplied Electricity, Distributed Generation-Renewable. Various non-conventional energy resources; Introduction, availability, classification, relative merits and demerits. Energy Policy and Regulations, CDM prospects (carbon credits). | 06 |
| 2 | **Solar Energy:**<br><br>Introduction ,Photo voltaic power generation, spectral distribution of energy in solar radiation, solar cell Configurations, voltage developed by solar cell, Solar Cell Efficiency and losses , practical solar cell performance, commercial photo voltaic systems, specifications for PV systems, Applications , Design of roof top solar PV system .Introduction and Application of Solar thermal Energy. | 06 |
| 3 | **Wind Energy:**<br>Introduction, Site selection criterion, Classification of wind power plants, wind characteristics, performance and limitations of energy conversion systems. Power from wind, properties of air and wind, types of wind Turbines, operating characteristics, New Developments. | 08 |

| | | |
|---|---|---|
| 4 | **Geothermal Energy:**<br>Introduction ,Resources of geothermal energy, Types of Geo thermal Energy ,Environmental Consideration, Power generation methods, Hybrid systems | 07 |
| 5 | **Wave and Tidal Wave energy:**<br>Introduction, Mechanism and wave motion, Properties of waves and power content, vertex motion of waves, Device applications. Types of ocean thermal energy conversion systems, Application of OTEC systems, Examples. | 07 |
| 6 | **Biomass Energy Conversion:**<br>Introduction, Technologies available for thermal and power generation applications, Bio-fuels and decentralized energy systems (Co—operative Rural power plant, Biogas generation, Waste minimization and utilization. | 08 |
| 7 | **Advanced Technologies:**<br>Introduction of Green Building Concepts, $CO_2$ Sequestration, Electric Vehicle, Fuel Cells, Hydrogen Energy, Building material selection ,Designing of building ,Heat transfer concepts ,Green building rating systems etc. | 08 |
| 8 | Introduction to latest software for renewable energy system. | 03 |
| | **TOTAL** | **53** |

**Reference Books:**


1. G.D Rai, "*Non-conventional energy sources",* Khanna Publishers.
2. Chetan Singh Solanki, *"Solar Photovoltaic Technology and Systems:A Manual for Technicians, Trainers and Engineers",* PHI Publisher, 2013.
3. S.P. Sukhatme, "*Solar Energy - Principles of thermal collection and storage*", TMH, 2008.
4. Dr.R.K Singal, "Non-Conventional Energy Resources", S.K Kataria & Sons.
5. Thomas Ackermann, "*Wind Power in Power System*", John Willey &Sons, 2005.
6. Felix A. Farret, M. Godoy Simoes, "*Integration of Alternative Sources of Energy*", John Wiley & Sons, 2006.
7. Remus Teodorescu, Marco Liserre and Pedro Rodríguez, "*Grid Converters For Photovoltaic and Wind Power Systems*", John Wiley & Sons, 2011.


**COURSE OUTCOMES (COS):**

After learning this course the students will be able to:

CO1. Understand Energy technologies

CO2. Revisit Energy system

CO3. Ability to solve the problems in different Renewable energy fields.

CO4. Understand Energy generation and Problem using field case studies.

CO5. Learn Applications and Understanding about the Design and analysis techniques.

CO6. Find out possible extensions in the theory and applications.