

**EE701PC: POWER ELECTRONIC APPLICATIONS TO RENEWABLE ENERGY SYSTEMS****IV Year B.Tech. EEE I-Sem**

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**Prerequisite:** Power Electronics, Renewable Energy Sources**Course Objectives:**

- To impart knowledge on different types of renewable energy systems.
- To analyze the operation of electrical generators used for the wind energy conversion Systems.
- To know the operation of power converters and PV systems operation.

**Course Outcomes:** At the end of this course, students will be able to:

- Proficiently demonstrate various renewable energy technologies utilized for electrical power generation.
- Analyze the operating principles of different types of wind generators and identify suitable converters (AC-DC, DC-DC, AC-AC) for renewable energy systems.
- Interpret and analyze various wind and photovoltaic (PV) systems, including stand-alone, grid-connected, and hybrid configurations, showcasing a comprehensive understanding of renewable energy applications.

**UNIT- I:**

Solar cell characteristics and their measurement, PV Module, PV array, Partial shading of a solar cell and a module, the diode, Power conditioning unit, maximum power point tracker, Implementation of Perturb and Observe Method, Incremental Conductance Method, Battery charger/discharge controller.

**UNIT- II:**

Centralized Inverters, String Inverters, Multi-string Inverters, Module Integrated Inverter/Micro-inverters, Inverter Topology, Model of Inverter, Sizing Batteries and Inverters for a Solar PV System.

Types of PV Systems: Grid-Connected Solar PV System, Stand-Alone Solar PV System.

**UNIT- III:**

Introduction to wind: Characteristics, Wind Turbine, Fixed and Variable-Speed Wind Turbines, Components of WECS, Description of Components, Types of Wind Turbine Generators, Economics of Wind Energy Conversion Systems, Linking Wind Turbines onto the Grid, Power Converter Topologies for Wind Turbine Generators.

**UNIT- IV:**

Modeling of Permanent Magnet Synchronous Generators, Doubly Fed Induction Generators, Squirrel cage Induction Generators wind turbine, Control of Power converters for WECS.

**UNIT - V:**

Hybrid Energy Systems, Need for Hybrid Energy Systems, Range and types of Hybrid systems, Hybrid Solar PV/Wind Energy System, Architecture of Solar-Wind Hybrid System and Grid connected issues.

**TEXTBOOKS:**

1. S. N. Bhadra, D. Kastha, S. Banerjee, "Wind Electrical Systems", Oxford University Press, 2005.
2. S. N. Bhadra, D. Kastha, & S. Banerjee "Wind Electrical Systems", Oxford University Press, 2009.
3. Rashid. M. H, "Power Electronics Hand book", Academic Press, 2001.

**REFERENCE BOOKS:**

1. Rai. G. D, "Non-conventional energy sources", Khanna Publishers, 1993.
2. Rai. G.D," Solar energy utilization", Khanna Publishes, 1993.
3. Gray, L. Johnson, "Wind energy system", Prentice Hall of India, 1995.
4. B.H.Khan "Non-conventional Energy sources", Mc Graw-hill, 2<sup>nd</sup> Edition, 2009