**L T P M C**

**EE415 – NEW AND RENEWABLE ENERGY SOURCES 4 1 0 100 4**

**UNIT-I**

**Renewable Energy Technologies:**

Basic principles of Energy conversion: Heat Energy Conversion Principles – Mechanical Energy Principles – Solar Radiation Conversion: Photovoltaic Conversion – Photo Electro Chemical Conversion – Solar Thermal Conversion – Fuel Cells – Basic Principles of Hydrogen – Oxygen fuel cell – factory effecting the Power output – Maximum Power output Bio Energy Conversion Process – Combustion and composting of Bio- Mass – Production of heat by bio-mass – Bio-logical Conversion into gaseous into liquid bio-fuels.

**UNIT-II**

**Introduction to Solar Cells:**

P-N Junction Under illumination: solar cell – generation of photo voltage – light generated current – I-V equation of solar cell – solar cell characteristics. Upper limits of cell parameters – short circuit current – open circuit voltage - Fill factor - efficiency –losses in solar cells – model of solar cell – effect of series –shunt Resistance on efficiency – effect solar radiation on efficiency -effect of temperature on efficiency – basic design aspects of solar cells.

**UNIT-III**

**Thin film solar cell technologies**:

Generic advantages of twin film technologies - materials for thin film technologies – thin film de position techniques – Common features thin film technologies.

**Solar Photo Voltaic modules:**

Solar PV modules from solar cells – series and parallel connection of cells – mismatch in series and parallel connection. Design and structure of PV modules: number of solar cells in a module – wattage of modules – fabrication of PV modules. PV module power output- I-V equation of P.V modules – ratings of P.V modules- I-V and Power curves of module. DC – DC convertors used in Solar systems – maximum power point tracking algorithms.

**UNIT-IV:**

**WIND ENERGY SYSTEMS:**

**Generation schemes with variable speed turbines:** classification of schemes – operating area –Induction Generators-Doubly fed Induction generators-Equivalent circuits-Reactive power and harmonics-Double output system with VSI-Variable voltage, variable frequency generation-circuit model and steady state operation and characteristics- effect of wind generator on the network. Wind speed measurements-Wind speed statistics-site and turbine selection.

**TEXT BOOKS:**  
1. Renewable Energy by Bent Sorensen, Academic Press, 4th edition.

2. Solar Photovoltaic fundamentals, Technology and applications, Chetan Singh Solanki, PHI

Publications, 2nd edition

3. Wind Electrical Systems by S. N Bhadra, D. Kastha and S Banerjee, Oxford press publications

**REFERENCE BOOKS:**  
1. Power plant technology by EL-Wakil, Mc Graw-Hill  
2. Non-Conventional Energy Sources by G.D.Rai, Khanna Pub.

3. Renewable Energy Sources by John Twidell & Toney Weir : E&F.N. Spon

4. Renewable Energy Sources: Their impact on global warming and pollution by Abbasi & Abbasi

–PHI