SS828 PHYSICS OF SOLAR CELLS 4-0-0-4

Module I(10hrs)

Introduction to Semi conductors: Basic Concepts, Electronic States in Semiconductors-Band structure, Density of States, electron and hole currents, Electron distribution function, Fermi Dirac Statistics, Boltzmann approximation, Types of semiconductors-intrinsic , extrinsic, Semiconductor under bias, Drift and Diffusion currents

Module II (12hrs)

Generation and recombination of charge carriers: Semiconductor transport equations. Types of Generation and Recombination, Formulation of transport problem, Origin of photovoltaic actions, metal semiconductor junction, Semiconductor –semiconductor junctions, Electro chemical junction, Junctions in organic materials.

Module III (12hrs)

Analysis of the P-N-Junctions: Formation of p-n Junctions, Depletion approximation, Calculation of carrier and current densities, General solution for current density, p-n junction under dark and under illumination, effect on junction characteristics, Other device structures.

Module IV (10 hrs)

Photovoltaic cell and power generation, Characteristic of the Photovoltaic Cell. The Solar Resource and types of solar energy converters, Work available from a photo voltaic device, requirements of an ideal photoconverter

Module V (12)

Principles of a solar cell design, material and design issues, Silicon material properties, and its solar cell design, III-V semiconductor material properties, Semiconductor solar cell design(GaAs), Thin film solar cells, requirements for suitable materials, Hetero junctions in thin film solar cell design, Managing light in solar cells(qualitative): Light confinement, photon recycling

TEXT BOOKS / REFERENCES:

1. Physics of Solar cells-Jenny Nelson, Imperial College Press(2006)
2. Solid State Physics-Structure and properties of materials-M.A.Wahab(Narosa)
3. Solid State Physics-N.W.Aschroft and N.D.Mermain.
4. Optical properties of thin films—O.S Heavens (Dover)