EC260	Semiconductor Devices	3-0-0-6

Syllabus:

Brief discussion of quantum theory of solids: energy bands, electrical conduction in solids, formation of Fermi-Dirac probability function using the concepts of statistical mechanics and k-space diagram.

Semiconductors in equilibrium: charge carrier profile in intrinsic and extrinsic semiconductor, behavior of Fermi energy level with varying temperature and doping concentration.

Carrier transport in semiconductors: drift current and diffusion current, Hall Effect. Semiconductors in non-equilibrium condition: carrier generation and recombination, continuity equation, ambipolar transport.

P-N junction: under zero applied bias and reverse bias, comparative study of abrupt junction and linearly graded junction, qualitative and quantitative discussion of p-n junction current, small signal model of p-n junction, junction breakdown and Tunnel diode.

Behavior of metal semiconductor junction: Schottky barrier diode, metal-semiconductor ohmic contact.

Bipolar transistor: basic principles of operation, carrier distribution under different modes of operation, non-ideal effects, frequency limitations. Fundamentals of MOSFET, capacitance-voltage characteristics, current voltage relationship, frequency limitations.

Text:

1. Donald A. Neamen, Semiconductor Physics and Devices, Tata McGraw Hill, 3rd Edition, 2007

References :

1. Ben G. Streetman, Solid State Electronic Devices, PHI, 5th Edition, 2001.
2. J. Singh, Semiconductor Devices - Basic Principles; John Wiley & Sons Inc., 2001.
3. Simon M. Sze, Kwok K. Ng, Physics of Semiconductor Devices, Wiley, 3rd Edition, 2006/7.