

EC - 304 Electronic Devices

Unit-I

Semiconductor intrinsic and extrinsic, p-type and n-type, energy band diagrams, majority and minority carrier, charge density in semiconductor, generation and recombination of charges, process of diffusion, diffusion and drift currents, Hall effects and its applications. p-n junction, depletion layer, potential barrier, electric field, forward and reverse biased junction, current components in p-n diode, current equation, V-I characteristics, cut in voltages of Si and Ge diode, transition and diffusion capacitance, power dissipation,.

Unit-II

Diode Applications: p-n junction diode as rectifier, clipper and clamper, The diode as a circuit element, The Load line concept, The Piecewise linear diode model, Clipping circuits, Clipping at two independent levels, Comparators, Sampling Gate, Rectifiers, Other full wave circuits, Capacitor filter additional diodes circuits.

Unit-III

Diodes Family: Characteristics and application of Zener diode, avalanche diode, Varactor diode, Schottky diode, Tunnel Diode, PIN diode, LED, photodiodes, phototransistors,

Unit-IV

Bipolar junction transistor - Construction, basic operation, current components and equations, CB, CE and CC-configuration, input and output characteristics, Early effect, region of operation, active, cutoff and saturation region Ebers-Moll model, , power dissipation in transistor (P_{dmax} rating), Photo transistor, Uni-junction Transistor (UJT) : Principle of operation, characteristics.

Unit-V

FET construction- Construction, n channel and p channel, characteristics, parameters, Equivalent model and voltage gain, Enhancement and depletion MOSFET and its Characteristics, analysis of FET in various configuration.

References:

1. Boylestad and Nashelsky: Electronic Devices and Circuit Theory, Pearson Education
2. Millman and Halkias: Integrated electronics, TMH
3. Graham Bell: Electronic Devices and Circuits, PHI
4. Sendra and Smith: Microelectronics, Oxford Press.
5. Donald A Neamen: Electronic Circuits Analysis and Design, TMH

List of Experiments (Expandable):

All experiments (wherever applicable) should be performed through the following steps.

Step 1: Circuit should be designed/drafted on paper.

Step 2: The designed/drafted circuit should be simulated using Simulation Software

1. V-I characteristics of various Diodes (p-n, Zener, Varactor, Schottky, Tunnel, Photodiode etc)
2. Characteristics of Transistors (BJT and FET)
3. Study of Power electronic devices (Diac, Triac, SCR, Power MOSFET, IGBT etc).