GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

FUNDAMENTALS OF ELECTRONICS ENGINEERING

Course Code: GR15A1019   L:3 T:1 P:0 C:4
I Year II Semester

Prerequisites
- Fundamentals of Modern Physics
- Fundamentals of Electrical Networks

Course Objectives
- To provide clear explanation of the working principles of important electronic devices
- To show how each device is used in appropriate circuits
- To demonstrate how such circuits are designed

Course Outcomes
- Ability to get familiar knowledge on several Semiconductor Devices.
- Ability to analyze the working operation of each device in a circuit.
- Ability to compare the performance of devices in various applications.

Unit-I
Semiconductors and pn Junction Diode: Semiconductor Physics: n and p type semiconductors, Mass Action Law, Continuity Equation, Hall Effect, Fermi level in intrinsic and extrinsic semiconductors, Open- circuited p-n junction, Energy band diagram of PN diode, forward bias and reverse bias, Current components in p-n diode, Law of junction, Diode equation, Volt-ampere characteristics of p-n diode, Temperature dependence of V-I characteristic, Transition and Diffusion capacitances, Breakdown Mechanisms in Semiconductor Diodes (Avalanche and Zener breakdown), Zener diode characteristics,

Unit-II
Diode Applications, Special Diodes: Half wave rectifier, ripple factor, full wave rectifier, Harmonic components in a rectifier circuit, Inductor filter, Capacitor filter, L- section filter, Π- section filter, and comparison of various filter circuits in terms of ripple factors, Simple circuit of a regulator using zener diode, Series and Shunt voltage regulators

Special Diodes: Characteristics of Tunnel Diode, Varactor Diode, LED, LCD.

Unit-III
Bipolar Junction Transistor: Junction transistor, Transistor current components, Transistor as an amplifier, Transistor construction, Detailed study of currents in a transistor, Input and Output characteristics of transistor in Common Base, Common Emitter, and Common collector configurations, Relation between Alpha and Beta and Gamma, typical transistor junction voltage values,

Junction Field Effect Transistors (JFET): JFET characteristics (n and p channels), Small signal model of JFET, MOSFET characteristics (Enhancement and depletion mode), Introduction to SCR and UJT.

Unit-IV
Biasing and stabilization : BJT biasing, DC equivalent model, criteria for fixing operating point, Fixed bias, Collector to base bias, Self bias techniques for stabilization, Stabilization factors, Compensation techniques, Compensation against variation in VBE and Ico, Thermal run away, Thermal stability.

Unit-V
Amplifiers: Small signal low frequency transistor amplifier circuits: h-parameter representation of a transistor, Analysis of single stage transistor amplifier using h-parameters: voltage gain, current gain, Input impedance and Output impedance. Comparison of transistor configurations in terms of Ai, Ri, Av, Ro.

Teaching Methodologies
- Power Point presentations
- Tutorial Sheets
- Assignments
- Lab experiments with Multisim software

Text Books
1. David A. Bell; Electronic Devices and Circuits, Oxford University Press, 5th edition, 2008.
2. R.L. Boylestad and Louis Nashelsky; Electronic Devices and Circuits, Pearson/Prentice Hall, 9th Edition, 2006.

Reference Books
1. T.F. Bogart Jr J.S.Beasley and G.Rico; Electronic Devices and Circuits – Pearson Education, 6th edition, 2004.