

**1/4 B.Tech. SCOND SEMESTER
ELECTRONIC DEVICES AND CIRCUIT**

Required

CS 2T3

Lecture: 4 periods/week

Tutorial: 1 period /week

Credits: 4

Internal assessment: 30 marks

Semester end examination: 70 marks

Course context and Overview: This Lab provides the students to get an electrical model for various semiconductor devices. Students can find and plot V_I characteristics of all semiconductor devices. Student learns the practical applications of the devices. They can learn and implement the concept of the feedback and frequency response of the small signal amplifier

Prerequisites: Basic Electronics

Objectives:

1. To study in detail about construction of several electronic devices.
2. To analyse the characteristics of various electronic devices and circuits.
3. To get familiarize in biasing and stabilization concepts.

Learning Outcomes:

The student will be able to

1. Understand the semiconductor physics of the intrinsic, p and n materials.
2. Understand amplifier circuits, oscillators and filter circuits employing BJT, FET devices.
3. Understand the function and operation of diodes, transistors and amplifiers.

UNIT – I

Semi Conductors:

Conductors, Semiconductors, Silicon Crystals, Intrinsic Semiconductors, Two Types of flow, Doping a Semi Conductor, Two types of Extrinsic Semi Conductors, The Unbiased Diode, Forward Bias, Reverse Bias, Breakdown, Energy Levels, The Energy Hill, Barrier Potential and Temperature, Reverse – Biased Diode.

Diode Theory: Basic Ideas, The ideal Diode, Second and Third Approximations, Calculation of Bulk Resistance, DC Resistance of a Diode, Load lines and Surface – Mount Diodes.

UNIT – II

Diode Circuits:

Half-Wave Rectifier, Transformer, Full-Wave Rectifier, Bridge Rectifier, Choke-Input Filter, Capacitor-Input Filter, Peak Inverse Voltage and Surge Current, Other Power-Supply Topics, Trouble Shooting, Clippers and Limiters, Clampers and Voltage Multipliers. Special-Purpose Diodes: Zener Diode, Zener Regulator, Light – Emitting Diode(LED), Photodiode, Tunnel Diode and PIN Diodes.

UNIT- III

Bipolar Junction Transistors:

Unbiased and Biased Transistor, Transistor currents, Common Emitter Connection, Base Current, Collector Curves, Transistor Approximations. Transistor fundamentals: Variations in current Gain, Load Line, Operating Point, Recognizing Saturation, Transistor Switch, Emitter Bias, LED Drivers, The Effect of Small Changes.

UNIT – IV

Transistor Biasing:

Voltage – Divider Bias, Accurate VDB Analysis, VDB Load Line and Q Point, Two – Supply Emitter Bias, Other Types of Bias, PNP Transistors. AC Models: Base – Biased Amplifier, Emitter – Biased Amplifier, Small Signal Operation, AC Beta, AC Resistance of the Emitter Diode.

UNIT – V

Amplifiers:

Voltage Gain, Loading Effect of Input Impedance, Multistage Amplifier, Swamped Amplifier, Two – Stage Feedback, CC Amplifier, Output Impedance, Cascading CE and CC, Darlington Connections, Voltage Regulation and Common – Base Amplifier.

UNIT – VI

JFETS:

Basic Ideas, Drain Curves, Transconductance curve, Biasing in the Ohmic Region and in the Active Region, Transconductance, JFET Amplifier, JFET Analog Switch, Other JFET Applications.

UNIT – VII

MOSFETs: The Depletion–Mode MOSFET, D-MOSFET Curves, Depletion–Mode MOSFET Amplifiers, Enhancement – Mode MOSFET, Ohmic Region, Digital Switching, CMOS, E-MOSFET Amplifiers **Thyristors:** The Four-Layer Diode, Silicon Controlled Rectifier.

UNIT – VIII

Frequency Response of Amplifiers:

Frequency Response of an Amplifier, Decibel Power Gain, Decibel Voltage Gain, Impedance Matching, Decibels above a Reference.

Learning Resources

Text Book:

1. Electronic Principles, Albert Malvino and David J Bates, 7th Edition, Tata McGraw – Hill.

References:

1. Electronic Devices and Circuit Theory, Robert L. Boylestad and Louis Nashelsky, 10th Edition(2010), Pearson/PHI
2. Integrated Electronics, Jacob Millman, Christos C. Halkias & Chetan Parikh, 2nd Edition(2011), Tata McGraw – Hill.

