

I B.Tech I Sem

15AEC01-ELECTRONIC DEVICES AND CIRCUITS

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Course Objectives: To give understanding on semiconductor physics of the intrinsic, p and n materials, characteristics of the p-n junction diode, diode's application in electronic circuits, Characteristics of BJT, FET, MOSFET, characteristics of special purpose electronic devices. To familiarize students with dc biasing circuits of BJT, FET and analyzing basic transistor amplifier circuits.

Course Outcomes:

Upon completion of the course, students will:

- Analyze the operating principles of major electronic devices, its characteristics and applications.
- Design and analyze the DC bias circuitry of BJT and FET.
- Design and analyze basic transistor amplifier circuits using BJT and FET.

UNIT-I

Semiconductors: Intrinsic and extrinsic semiconductors, mobility and conductivity, Fermi level and carrier concentration of semiconductors, Drift and diffusion currents, continuity equation, Hall Effect.

PN junction diode: Band structure of PN Junction, Quantitative Theory of PN Diode, Volt – Amp Characteristics, Temperature Dependence, Transition and Diffusion Capacitance of PN Junction, Illustrative problems.

UNIT-II

Rectifiers: Half-wave, Full-wave and Bridge Rectifiers with and without Filters, Ripple Factor and Regulation Characteristics.

Special Diodes: Zener and Avalanche Breakdowns, Tunnel Diode, LED, Schottky Barrier Diode, Varactor Diode, Photo Diode, SCR.

UNIT-III

Bipolar Junction Transistors: Transistor construction, BJT Operation, Transistor as an Amplifier, Common Emitter, Common Base and Common Collector Configurations, Limits of Operation, BJT Specifications.

Junction Field Effect Transistor (JFET): The Junction Field Effect Transistor (Construction, Principle of Operation) - Pinch-Off Voltage – Volt-Ampere Characteristics, FET as Voltage Variable Resistor, Comparison between BJT and FET, MOSFET- Basic Concepts, Construction, modes (depletion & enhancement), symbol, principle of operation, characteristics.

UNIT-IV

Biasing And Stabilisation: Operating Point, DC and AC Load Lines, Importance of Biasing, Fixed Bias, Collector to Base Bias, Self Bias, Bias Stability, Stabilization against Variations in

I_{CO} , V_{BE} and β , Bias Compensation Using Diodes and Transistors, Thermal Runaway, Condition for Thermal Stability in CE configuration, Illustrative problems.

UNIT- V

Small Signal Analysis Of Amplifiers: BJT Modeling using h-parameters, Determination of h-Parameters from Transistor Characteristics, Measurement of h-Parameters, Analysis of CE, CB and CC configurations using h-Parameters, Comparison of CB, CE and CC configurations, Simplified Hybrid Model, Illustrative problems.

Text Books:

1. Electronics Devices and Circuits, J.Millman and Christos. C. Halkias, 3rd edition, Tata McGraw Hill, 2006.
2. Electronics Devices and Circuits Theory, David A. Bell, 5th Edition, Oxford University press., 2008.

References:

1. Electronics Devices and Circuits Theory, R.L.Boylestad,Louis Nashelsky and K.Lal Kishore, 12th edition, 2006, Pearson, 2006.
2. Electronic Devices and Circuits, K. Lal Kishore, 3rd Edition, BSP, 2008.
3. Electronic Devices and Circuits, N.Salivahanan, and N.Suresh Kumar, 3rd Edition, TMH, 2012
4. Microelectronic Circuits, S.Sedra and K.C.Smith, 5th Edition, Oxford University Press.

