

II B.Tech - II Semester
(20EC4701) BASIC ELECTRONIC DEVICES AND CIRCUITS
(Minors)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	4

Pre-Requisites: Physics

Course Objectives:

- To learn the basic concepts of semiconductor physics and diode characteristics
- To discuss the characteristics and working principle of various special diodes
- To acquire knowledge about the working principle and operation of BJT and FET and their characteristics.
- To explain the purpose of transistor biasing and its significance.
- To analyze BJT and FET transistor amplifiers and compare different configurations.

UNIT–I: Semiconductor Basics & Junction Diode:

Semiconductor Basics: Atomic Structure, Semiconductors, conductors and Insulators, Conduction in Semiconductors, Intrinsic and Extrinsic Semiconductors, N-Type and P-Type Semiconductors, Fermi level in intrinsic and extrinsic Semiconductors

Junction Diode: energy band diagram of PN junction Diode, Biased PN junction, current components in PN junction Diode, diode current equation, V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Diode capacitance.

UNIT–II: Special Diodes:

Breakdown Mechanisms – Zener Breakdown and Avalanche Breakdown, Zener Diode V-I Characteristics, Zener diode as voltage regulator. Construction, Operation, Characteristics and applications of Varactor Diode, The Tunnel Diode, The Schottky diode, Light Emitting Diode, The PIN diode, LCD, The Laser Diode, Silicon Controlled Rectifier, DIAC, TRIAC

UNIT–III: Transistors:

Bipolar Junction Transistor: Types, Symbols and Operation, Transistor Current Components, Transistor Equation, Relation among α , β , and γ , Transistor as an Amplifier, Transistor Configurations and Characteristics – CB, CE and CC, Early effect, Transistor as a switch, Punch/Reach through.

Field Effect Transistor: Construction and operation of N- and P-channel FETs, characteristic parameters and I_{DSS} , MOSFET – Enhancement and Depletion type.

UNIT–IV: Biasing and Stabilization:

BJT Biasing: Need for Biasing, Operating Point, Load Line Analysis – DC and AC Load Lines, Stability factors S , S' and S'' , Biasing methods – Fixed bias, Collector-to-base bias and Self bias, Bias Compensation – Thermistor, Sensistor, Diode Compensation, Thermal Runaway, Thermal Stability, heat sinks.

FET Biasing: Fixed method, self-bias method and voltage divider method, Comparison of BJT and FET, Comparison between JFET and MOSFET

UNIT–V: Transistor Amplifier models:

BJT: Two port network, Transistor hybrid model, determination of h-parameters, conversion of h-parameters, generalized analysis of transistor amplifier model using h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis, comparison of transistor amplifiers.

FET: Generalized analysis of small signal model of FET, Analysis of CG, CS and CD amplifiers, comparison of FET amplifiers.

Course Outcomes:

After successful completion of the course, the students can be able to

S.No	Course Outcome	BTL
1.	Understand the basic concepts of semiconductor physics and diode characteristics	L2
2.	Explain the construction, working and applications of various special type of diodes	L2
3.	Discuss the characteristics and configurations of different types of Transistors	L2
4.	Analyse various biasing techniques for BJT and FET and stabilization concepts with necessary expressions.	L4
5.	Design transistor amplifier circuits using BJT and FET in different configurations.	L5

Correlation of COs with POs& PSOs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	-	-	-	-	-	-	-	-	-	2	-
CO2	2	1	-	-	-	-	-	-	-	-	-	-	3	-
CO3	2	1	-	-	-	-	-	-	-	-	-	-	2	-
CO4	3	2	2	-	-	-	-	-	-	-	-	-	2	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-	3	-

Text Books:

1. Electronic Devices and Circuits – Millman & Halkias, TMH, Second Ed., 2007.
2. Electronic Devices and Circuits – S. Salivahanan, N. Suresh Kumar, A, Vllavaraj, 3rd Ed., TMH.
3. Electronic Devices and Circuits Theory – Robert L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, Tenth Edition, 2009.

Reference Books:

1. Electronic Circuit Analysis and Design – Donald A. Neaman, McGraw Hill.
2. Integrated Electronics–Millman & Halkias, Tata Mc-Graw Hill, Second Edition, 2009.
3. Electronic Devices and Circuits–K.Lal Kishore, BS Publications, Fourth Edition, 2016.