II Year I Semester	**L**	**T**	**P**	**C**
Code: 20EC3001	**3**	**0**	**0**	**3**

20EC3001: ELECTRONIC DEVICES AND CIRCUITS

Course Objectives:

1. To introduce the basics of BJT, FET, MOSFET and other transistors.
2. To learn the biasing and stabilization concepts of BJT and FET.
3. To discuss the working, analysis and design of transistor amplifier circuits at low frequencies.
4. To describe the working, analysis and design of transistor amplifier circuits at high frequencies.
5. To identify the topologies of feedback amplifier circuits and design and analysis of oscillators.

UNIT–I: 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, Transistor switching times, Punch/Reach through, Ebers-Moll Model, FET – Construction and operation of N- and P-channel FETs, characteristic parameters and I_{DSS}, MOSFET – Enhancement and Depletion type, Photo Transistor, UJT

UNIT–II: 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–III: Small Signal Low Frequency 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.

UNIT–IV: High Frequency Transistor Amplifier models

BJT: Transistor at high frequencies, Hybrid-π common emitter transistor model, Hybrid-π conductance, Hybrid-π capacitances, validity of hybrid π model, determination of high-frequency parameters in terms of low-frequency parameters, CE short circuit current gain, current gain with resistive load, cut-off frequencies, frequency response and gain bandwidth product.

FET: Analysis of common Source and common drain Amplifier circuits at high frequencies.

UNIT–V: Feedback Amplifiers & Oscillators

Feedback principle and concept, Characteristics of negative feedback amplifiers, Types of Negative feedback amplifiers, generalized analysis of Negative feedback amplifiers, Oscillator

principle, condition for oscillations, types of oscillators, RC-phase shift and Wein bridge oscillators with BJT and FET and their analysis, Generalized analysis of LC Oscillators, Hartley and Colpitt's oscillators with BJT and their analysis, Crystal Oscillator Frequency and amplitude stability of oscillators.

Course Outcomes:

A student who successfully fulfils this course requirement will be able to:

S.No	Course Outcome	BTL
1.	Understand the construction, working and characteristics of BJT, FET, MOSFET and other transistors	L2
2.	Know the need of transistor biasing, various biasing techniques for BJT and FET, and stabilization concepts with necessary expressions.	L2
3.	Analyse small sign allow frequency transistor amplifier circuits using BJT and FET in different configurations.	L4
4.	Derive the expressions for conductance and capacitances of the small signal high frequency transistor amplifier using BJT and FET.	L4
5.	Identify and analyse the topology of negative feedback amplifiers and construct different type of oscillators.	L4

Correlation of COs with POs& PSOs:

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

Text Books:

1. Electronic Devices and Circuits – Millman &Halkias, TataMc-GrawHill,Second Edition, 2007.
2. Electronic Devices and Circuits – S. Salivahanan, N. Suresh Kumar, A, Vallavaraj, Tata Mc-Graw Hill, Third Edition.
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.