**EC1501 Elements of Electronics Engineering L-T-P: 3-0-0; Cr: 03**

**PREREQUISITE**

* Basics of Circuit Analysis

**COURSE OBJECTIVE**

* This course is intended to familiarize the students with the operational principle, analysis, design, and applications of semiconductor devices like diodes, bipolar junction transistors and field effect transistors.
* Further, it is also intended to introduce the analysis of wide variety of electronic circuits to the students.

**Course Content**

**Unit 1: Semiconductor Diodes (10 Lectures)**

Semiconductor materials: Intrinsic and Extrinsic types; Introduction to the concept of Fermi level; Ideal diode; Terminal characteristics of diode: p-n junction diode under open circuit, Drift and diffusion current along with derivation. Built-in potential (potential barrier) along with derivation, Forward bias and reverse bias conditions. Static and dynamic resistance, Temperature dependence, Breakdown mechanism in diode. Junction capacitance: Photodiode; Light Emitting Diode; Diode applications: Half-wave Rectifiers, Full-wave Rectifiers & Filters, Clipping & Clamping Circuits, Voltage doubler; Zener Diode & its application as voltage regulator.

**Unit 2: Bipolar Junction Transistor (12 Lectures)**

BJT Introduction: PNP and NPN transistor, BJT current components and base width modulation, CB, CE, CC configuration and characteristics, Load line analysis, Operating point; Biasing: Need for biasing, different biasing circuits, Bias stability; BJT as an amplifier: Low frequency small signal model of BJT, CE amplifier with and without feedback, Multi-stage amplifier; BJT as a switch: Cut-off and saturation modes.

**Unit 3: Field Effect Transistor (8 Lectures)**

General characteristics of FET; Comparison between FET & BJT; JFET: Construction, Principle of Operation, Shockley equation. Output and transfer characteristics; Depletion & Enhancement Type MOSFET: Construction, Principle of operation. Output and transfer characteristics; FET Amplifier- FET biasing configurations, Low frequency small signal model of FET, Analysis of FET amplifier without feedback.

**Unit 4: Operational Amplifier (6 Lectures)**

Ideal op-amp; characteristics of ideal and practical op-amp; Practical op-amp circuits: Inverting and non-inverting amplifiers, voltage follower, summer, subtractor, integrator, differentiator, active filters.

**Unit 5: Digital Logic Circuits (3 Lectures)**

Logic gates, Logic circuit implementation using diodes and transistors.

**Unit 6: Measuring Instruments (3 Lectures)**

Function Generator; Cathode Ray Oscilloscope; Digital Storage Oscilloscope; Mulli-meter; Spectrum Analyser.

**TEXTBOOKS**

1. Electronic Devices & Circuit Theory by Boylestad and Nashelsky, Pearson.

2. Microelectronics, Millman and Grabel, TMH.

3. Electronic Principles by Albert Malvino & Davis J. Bates, TMH.

**REFERENCE BOOKS**

1. Electronic Devices-Conventional Current Version by Thomas L. Floyd, Pearson.

2. Microelectronic Circuits: Theory and Applications by Sedra, and Smith, Oxford University.

3. Digital Logic and Computer Design, Morris Mano, Pearson.

**COURSE OUTCOMES**

Upon successful completion of this course, the students should be able to:

COl: Understand the operational principle of diode and develop skills to design rectifier, filter, clipping and clamper circuits using diodes.

C02: Understand the operation of transistors in amplifiers and switching circuits.

C03: Understand the fundamentals of measuring instruments like CRO, multi-meter etc.

C04: Implement logic gates using diodes and transistor.

CO5: Design practical circuits using operational amplifiers.