EOPC2002 ANALOG AND DIGITAL ELECTRONICS CIRCUIT (3-0-0)

Course objectives: This course will enable students to

- Understand Bipolar Junction Transistors and Metal Oxide Semiconductors.
- Analysis of DC biasing of Semiconductor Circuits using BJT and MOSFET.
- Understand Input and Output characteristics of Single Stage Amplifier (both BJT and MOSFET).
- Apprehend characteristics of Feedback and Power amplifier.
- Introduce the concept of digital and binary systems
- inculcate concepts of K-MAP to simplify a Boolean expression
- Facilitate students in designing combinational and sequential logic circuits.

MODULE 1: **[8hrs]**

Biasing of BJT:DC Analysis, DC Load line, Operating Point, Fixed bias, Emitter bias, Voltage-divider bias, DC bias with voltage feedback, Bias stabilization.

Small Signals Modelling of BJT and their analysis: The r_e transistor model, Hybrid equivalent model, small signal analysis of CE, CC, CB amplifier. Emitter Follower; Cascade Amplifier, Darlington connectionsand Current Mirror Circuit.

MODULE 2: **[8 hrs]**

Biasing of FET and MOSFET: Fixed bias configuration, Self-bias configuration, Voltage divider bias and design.

Small Signal operation and models of FET and MOSFETs: Small signal equivalent models, Single-stage MOSFET Amplifiers: Common-Source (CS) amplifiers, Common-Source amplifiers with a source resistance, Common-Gate (CG) amplifiers, Common-Drain (CD) or Source follower amplifiers and cascaded system.

MODULE 3: **[4 hrs]**

Oscillators and power amplifiers: Positive feedback circuit as Oscillator, Barkhausen's criteria for oscillation, Oscillators (Wien Bridge Oscillator, R-C phase shift oscillator and Crystal Oscillator).

Classification of Power Amplifiers, Power dissipation and power conversion efficiency of Class A, Class B amplifiers, Push-pull amplifier.

MODULE 4: **[5 hrs]**

Minimization of Boolean Functions: Canonical logic forms, sum of product & product of sums, Karnaugh maps (two, three and four variable), Don't-care Conditions, Quine-McCluskey technique.

Combinational Circuits: Binary multiplier, Magnitude Comparator, decoder, encoder, priority encoder, Multiplexers, De-multiplexers, Paritygenerators and Checkers, Code converters.

MODULE 5: **[5 hrs]**

Sequential circuits: Latches and Flip-flops (SR, D, JK, T), Master-salve flip-flop, flip-flop conversions, Design and analysis of synchronous binary counterand ripple counters.

Registers: Types of Registers, Serial In - Serial Out, Serial In - Parallel out, Parallel In - Serial Out, Parallel In - Parallel Out.

COURSE OUTCOME: After completion of course, student should be able to

CO1: Understand the characteristics and configurations of single stage BJT and MOSFET amplifiers.

CO2: Design amplifier circuits using BJT, FET and study the low and high frequency response of BJT, FET amplifiers.

CO3: Analyse various power amplifiers and to gain knowledge on various oscillator circuits.

CO4: Understand various types of number systems and their conversions

CO5: Identify the importance of canonical forms in the minimization of Boolean functions in digital circuits.

CO6: Design and implement variety of logical devices using combinational circuits and Sequential circuits.

TEXT BOOKS

1. Microelectronic Circuits – Sedra& Smith, International Student Edition, 5th edition
2. Electronic Devices and Circuit Theory – Robert L.Boylestad and LowisNashelsky, Pearson education, New Delhi 10th edition
3. Digital Logic and Computer Design- M Morris Mano, 10th Edition, Pearson, 2008.

REFERENCE BOOKS

1. Millman's Integrated Electronics –Jacob Millman and Christos Halkias, Chetan D Parikh, Mcgraw Hill
2. Electronic Devices – Floyd, Pearson Education
3. Digital Fundamentals (8th Edition)-Floyd and Jain, Pearson Education Limited.