L	T	P	C
3	0	0	3

Course Code: EIE110
Semester: II

PRINCIPLES OF ELECTRONICS

Course Objectives:

This course will help the learner to construct amplifiers and oscillators by biasing semiconductor devices and integrated circuits based on its V-I characteristics and feedback mechanisms. It will also help the learner to perform arithmetic operations using Boolean logic reduction.

UNIT - I **10 Periods**

Basics of Semiconductors: Energy band theory, Fermi levels - Conductors, Semiconductors & Insulators: electrical properties, band diagrams. Semiconductors: intrinsic & extrinsic (P&N-type), Energy band diagram, drift & diffusion currents.
Diodes and Diode Circuits: Formation of P-N junction, energy band diagram, built-in-potential, forward and reverse biased P-N junction, V-I characteristics, Zener Diode & its Characteristics. Rectifier circuits: half wave, full wave, Peak Inverse Voltage, DC voltage and current, ripple factor, efficiency, idea of regulation.

UNIT - II **12 Periods**

Bipolar Junction Transistors: Formation of PNP / NPN junctions, Working principle of CE, CB, CC configuration, transistor characteristics: cut-off, active and saturation mode, transistor action and current amplification factors for CB and CE modes. Biasing: Fixed, Emitter feedback and Voltage divider bias.
Field Effect Transistors: Concept of Field Effect Transistors (channel width modulation), JFET Structure and characteristics, MOSFET Structure and characteristics, depletion and enhancement type - CS, CG, CD configurations - CMOS: Basic Principles

UNIT - III **11 Periods**

Feed Back Concepts: Concept (Block diagram), positive and negative feedback, loop gain, open loop gain, feedback factors.
Operational Amplifiers: Introduction to integrated circuits, operational amplifier and its ideal characteristics - Application of operational amplifier - inverting and non-inverting mode of operation, Adders, Subtractors, Constant-gain multiplier, Voltage follower, Comparator, Integrator, Differentiator.

UNIT - IV **12 Periods**

Digital Electronics Fundamentals: Difference between analog and digital signals, Boolean algebra, Basic and Universal Gates, Symbols, Truth tables, logic expressions, Logic simplification using K- map.
Implementation of Digital Circuits: Half and full adder / subtractor, Basics of multiplexers, demultiplexers and flip-flops.

TEXTBOOKS

1. M. Morris Mano and Michael D. Ciletti. *Digital Design: With an Introduction to the Verilog HDL, VHDL and System Verilog*, Pearson education, Sixth Edition, 2018.
2. Jacob Millman, Christos C. Halkias, Satyabrata Jit, *Electronic Devices and Circuits,* McGraw Hill Education, Fourth Edition, 2015.
3. Robert L. Boylestad and Lousis Nashelsky. *Electronic Devices and Circuit Theory*, Pearson Education, Eleventh Edition, 2015.

REFERENCES

1. S. Salivahanan and N. Suresh Kumar, A. Vallavaraj, *Electronic Devices and Circuits,* McGraw Hill Education, Fourth Edition, 2016.
2. Donald A. Neamen, *Electronic Circuits Analysis and Design*, McGraw Hill Education, Third Edition, 2006.
3. R. P. Jain. *Modern Digital Electronics*, Third Edition, Mcgraw Hill Education, 2010.

UNITWISE LEARNING OUTCOMES

Upon successful completion of each unit, the learner will be able to

Unit I	• Explain the formation of diodes • Use various diode for building a DC power source • Analyse the performance of the rectifier circuits
Unit II	• Elaborate the concept of PNP and NPN transistors • Analyse the characteristics of transistors and their operating regions • Provide bias to the transistors for the required operation
Unit III	• Choose the type of feedback for the given application • Apply operational amplifiers to realize various signal processing technique
Unit IV	• Differentiate analog and digital systems • Derive the logical expression for the given application • Design combinational and sequential logic circuits using logic gates

COURSE LEARNING OUTCOMES

Upon successful completion of this course, the learner will be able to

- Design and analyse rectifiers using diodes
- Analyse the characteristics of various transistors and design amplifiers
- Design analog computational circuits using operational amplifiers
- Design digital logic circuits to implement the given Boolean expression and counters

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Course Code:EIE111
Semester: II

PRINCIPLES OF ELECTRONICS LAB

Course Objectives:

This course will help the learner to analyse the characteristic of various diodes and transistors, design analog computational circuits using operational amplifiers, and design digital logic circuits using logic gates

LIST OF EXPERIMENTS

1. Analyse V-I characteristics of PN junction diode
2. Analyse V-I characteristics of Zener diode
3. Design of half-wave and full-wave rectifier circuit using PN junction diode
4. Analysis of BJT characteristics in CE configuration
5. Voltage divider biasing of BJT
6. Analysis of drain and transfer characteristics of FET
7. Design of adder and subtractor using operational amplifiers
8. Design of integrator and differentiator using operational amplifiers
9. Implementation of Boolean expressions using combinational logic circuit
10. Implementation of half and full adder using logic gates
11. Implementation of half and full subtractor using logic gates
12. Construct and check using universal gates the operations of various flip flops

COURSE LEARNING OUTCOMES

Upon successful completion of this course, the learner will be able to

- Bias the given transistor for amplifier applications
- Design circuits to perform analog operations using operational amplifier
- Design logic circuits to realize various logical operations