

Basic Electronics Engineering

Course Objectives:

- 1.To understand the language of electronics, elements and their functionality
- 2.Basic understanding of analog systems and their applications
- 3.Basic understanding of digital systems and their applications

1.Basic Circuits Concepts(4 hours)

- a.Passive components: Resistance, Inductance, Capacitance; series, parallel combinations; Kirchhoff's law: Voltage, Current; Linearity
- b.Signal sources: Voltage and Current sources; Non-ideal sources; Representation under assumption of Linearity; controlled sources: VCVS, CCVS, VCCS, CCCS; concept of Gain, Transconductance, Transimpedance
- c.Superposition theorem, Thevenin's theorem, Norton's theorem
- d.Introduction to Filter

2. Diodes(7 hours)

- a.Semiconductor Diode Characteristics
- b.Modeling the Semiconductor Diode
- c.Diode circuits: Clipper; Clamper circuits
- d.Zener diode, LED, Photodiode, Varactors diode, Tunnel diodes
- e.DC power supply: Rectifier; Half wave, Full wave(center-tapped, bridge), Zener-regulated power supply

3. Transistor(4 hours)

- a.BJT configuration and biasing, small and large signal model
- b.T and μ model
- c.Concept of Differential amplifier using BJT
- d.BJT switch and Logic circuits
- e.Construction and working principle of MOSFET and CMOS
- f.MOSFET as logic circuits

4. The Operational Amplifier and Oscillator(7 hours)

- a.Basic model; Virtual ground concept; Inverting Amplifier, Non-inverting Amplifier, Integrator, Differentiator, Summing Amplifier and their applications
- b.Basic feedback theory; positive and negative feedback; concept of stability; Oscillator
- c.Waveform generator using Op-Amp for Square Wave, Triangular Wave, Wien Bridge Oscillator for sinusoidal waveform

5. Communication System(4 hours)

- a.Introduction
- b.Wired and Wireless Communication system
- c.EMW and propagation, Antenna, Broadcasting and Communication
- d.Internet/Intranet
- e.Optical fiber

6. Digital Electronics(11 hours)

- a. Number systems, Binary arithmetic
- b. Logic gates: OR, NOT, AND, NOR, NAND, XOR, XNOR gate; Truth tables
- c. Multiplexers, Demux, Encoder, Decoder
- d. Logic Function Representation
- e. Combinational circuits: SOP, POS form; K-map
- f. Latch, flip-flop: S-R flip-flop; JK flip-flop, Master-Slave flip-flop; D-flip flop
- g. Sequential circuits: Generic block diagram; Shift registers; Counters

7. Application of Electronic System(5 hours)

- a. Instrumentation system: Transducer, Strain Gauge, DMM, Oscilloscope
- b. Regulated power supply
- c. Remote control, Character Display, Clock, Counter, Measurements, Data Logging, Audio-Video system

Practical:

Familiarization with passive components, function generator and oscilloscope

- 1. Diode characteristics, rectifiers, Zener diodes
- 2. Bipolar junction transistor characteristics and single stage amplifier
- 3. Voltage amplifiers using op-amp, Comparators, Schmitt
- 4. Wave generators using op-amp
- 5. Combinational and sequential circuits

References:

Robert Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory" PHI; 8th Edition.200

- 1. Thomas L. Floyd, "Electronic Devices" 8th Edition, Pearson Education, Inc., 2007
- 2. A.S. Sedra and K.C. Smith, "Microelectronic Circuits", 6th Edition, Oxford University Press, 2006