

BASIC ELECTRONICS ENGINEERING

EX 451

Lecture : 3
Tutorial : 1
Practical : 3/2

Year : I
Part : II

Course Objective:

To understand the language of electronics, elements and their functionality. To understand analog and digital systems and their applications.

1. Basic Circuits Concepts (4 hours)

- 1.1 Passive components: Resistance, Inductance, Capacitance; series, parallel combinations; Kirchhoff's law: voltage, current; linearity
- 1.2 Signal sources: voltage and current sources; nonideal sources; representation under assumption of linearity; controlled sources: VCVS, CCVS, VCCS, CCCS; concept of gain, transconductance, transimpedance.
- 1.3 Superposition theorem; Thevenin's theorem; Norton's theorem
- 1.4 Introduction to filter

2. Diodes (6 hours)

- 2.1 Semiconductor diode characteristics
- 2.2 Modeling the semiconductor diode
- 2.3 Diode circuits: clipper; clamper circuits
- 2.4 Zener diode, LED, Photodiode, varactors diode, Tunnel diodes
- 2.5 DC power supply: rectifier-half wave, full wave (center tapped, bridge), Zener regulated power supply

3. Transistor (8 hours)

- 3.1 BJT configuration and biasing, small and large signal model
- 3.2 T and μ model
- 3.3 Concept of differential amplifier using BJT
- 3.4 BJT switch and logic circuits
- 3.5 Construction and working principle of MOSFET and CMOS
- 3.6 MOSFET as logic circuits

4. The Operational Amplifier and Oscillator (7 hours)

- 4.1 Basic model; virtual ground concept; inverting amplifier; non-inverting amplifier; integrator; differentiator, summing amplifier and their applications
- 4.2 Basic feedback theory; positive and negative feedback; concept of stability; oscillator
- 4.3 Waveform generator using op-amp for Square wave, Triangular wave
Wien bridge oscillator for sinusoidal waveform

5. Communication System (4 hours)

- 5.1 Introduction
- 5.2 Wired and wireless communication system

- 5.3 EMW and propagation, antenna, broadcasting and communication
- 5.4 Internet / intranet
- 5.5 Optical fiber

6. Digital Electronics (11 hours)

- 6.1 Number systems, Binary arithmetic
- 6.2 Logic gates: OR, NOT, AND NOR, NAND, XOR, XNOR gate; Truth tables
- 6.3 Multiplexers; Demux, Encoder, Decoder
- 6.4 Logic function representation
- 6.5 Combinational circuits: SOP, POS form; K-map;
- 6.6 Latch, flip-flop: S-R flip-flop; JK master slave flip-flop; D-flip flop
- 6.7 Sequential circuits: Generic block diagram; shift registers; counters

7. Application of Electronic System (5 hours)

- 7.1 Instrumentation system: Transducer, strain gauge, DMM, Oscilloscope
- 7.2 Regulated power supply
- 7.3 Remote control, character display, clock, counter, measurements, data logging, audio video system

Practical:

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

References:

- 1. Robert Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory" PHI
- 2. Thomas L. Floyd, "Electronic Devices" Pearson Education, Inc., 2007
- 3. A.S. Sedra and K.C. Smith, "Microelectronic Circuits", Oxford University Press, 2006