

4 Lect./Week)
(4 hrs. Lab/Week)
(1 Student's presentation /Week)

(Total Credits -7)

Paper 704: Basic Electronics

Unit 1

Semiconductor Basics: Energy band in solids (metal, semiconductor and insulators),. Intrinsic and Extrinsic semiconductors, Diode: p-n junction diode, formation of depletion layer, space charge at a junction. Diode equations and the I-V characteristic. Special Diodes: Zener, Zener diode, LED, Photo-diode, Shottky, Varactor. L, C and PI filters. Diode applications: Rectifiers (Half wave, full wave, bridge), regulators, clippers and clampers.

Unit 2

Metal Semiconductor Junctions: Ohmic & Rectifying Contacts Bipolar Junction Transistors (BJT): PNP and NPN transistors, basic transistor action; input and output characteristics of CB, CE and CC configurations, Biasing and stability, Amplifiers and simple transistor based circuits at low frequency. Uni-junction Transistor (UJT): Construction, working and I-V characteristics of UJT. Thyristor Devices: Basic construction and Characteristics, Introduction to-Silicon Controlled Rectifier(SCR): Characteristics and application circuits.

Unit 3

Field Effect Transistors (FET): Construction of JFET, idea of channel formation, pinch-off voltage, Transfer and output characteristics, design of an Amplifier. MOSFET: MOS Diode, Accumulation, Depletion and Inversion Basic Construction of MOSFET and working, I-V characteristics, enhancement and depletion modes. Complimentary MOS (CMOS). Logic families: Fan-in, Fan out, Noise Margin, Power Dissipation, Figure of merit, Speed power product, Current and Voltage parameters. RTL, DTL, TTL, MOS and CMOS families. Application : Design of OR, AND, NOT, XOR, XNOR operations.

Unit 4

Basic Digital Circuits: Gates and their implementation, Binary number systems and interconversion, Boolean Algebra, Code conversions, encoders, decoders, multiplexer, flip flops, shift registers, memory, Analog to Digital & Digital to Analog conversion Techniques.

Suggested Books:

1. S. M. Sze, Semiconductor Devices: Physics and Technology, John Wiley & Sons (2002)
2. Ben Streetman and S. Banerjee, Solid State Electronic Devices, Pearson Education (2006)
3. Jasprit Singh, Semiconductor Devices: Basic Principles, John Wiley and Sons (2001)
4. Kanaan Kano, Semiconductor Devices, Pearson Education (2004)
5. Robert F. Pierret, Semiconductor Device Fundamentals, Pearson Education (2006)
6. Dennis Le Croisette, Transistors, Pearson Education (1989)
7. M. Mano, Digital Design, PHI.

PRACTICALS:

- 1 (a). To study the I-V Characteristics of a pn junction diode
- 1 (b). To study the I-V Characteristics of a Zener diode and design of a voltage regulator.
- 2 (a). To study the I-V Characteristics of the Common Emitter configuration of BJT
- 2 (b). To study the I-V Characteristics of the Common Base configuration of BJT
- 2 (c). To study the I-V Characteristics of the Common Collector configuration of BJT-
3. Design of Half wave, full wave, bridge rectifier and measure ripple factor using pi filter.
4. Design of clipper and clamper circuits using diodes.

5. Design a CE based transistor amplifier.
- 6 (a). To study the I-V Characteristics of the UJT.
- 6 (b). To design a relaxation oscillator using UJT.
6. To study the I-V Characteristics of the SCR.
- 7 (a). To study the I-V Characteristics of the Common Source FET configuration.
- 7 (b). To study the I-V Characteristics of the Common Gate FET configuration.
- 7 (c). To study the I-V Characteristics of the Common Drain FET configuration.
8. Design of basic gates using DTL/TTL Logic.
9. Study of basic gates and evaluation of their truth tables.
10. Design of various combinational circuits.
- 11 (a). Study of Flip Flops, Registers & Memory Chips,.
- 12 . Design of ADC & DAC.