

B.Sc. - I SEMESTER: 2011 Onwards

SUBJECT: ELECTRONICS

BASICS OF SEMICONDUCTORS & DEVICES

Max. Marks: 70

Unit I

18 Lectures

PASSIVE COMPONENTS- Resistors – Symbol, colour coding, resistor tolerance, Power rating, Types of resistors. Capacitors – Symbol, Colour coding, Tolerance, Voltage rating, Types of capacitors.

Inductors - Symbol, Types of Inductors, Idea of values available in the market, Idea of Chokes, Practical Significance of above Components.

Transformers - Principle, Turns ratio, Voltage ratio, Current ratio, transformer efficiency, Types of Cores: Air, Iron and ferrite cores, Types of Transformers.

PCB: Introduction to Insulating materials & their types. PCB - Types of PCB, Layout Techniques, Cables and Connectors for PCB.

Unit II

18 Lectures

RESONANCE CIRCUITS AND NETWORK THEOREMS- Phasor Representation of Voltage and Current, Basic Idea of the Impedance of LCR Circuits, Series and Parallel Resonance, Quality Factor, Integration and Differentiation using RC circuits. Network Theorems – Network definition, loop and nodal analysis, Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power transfer theorem, Reciprocity Theorem.

Unit III

18 Lectures

SEMICONDUCTOR PHYSICS - Basic idea of crystal structure and energy bands, Difference between Conductor, Semiconductor and Insulator, Carrier concentration at normal equilibrium in an intrinsic semiconductor, Law of Mass Action. Donors and acceptors, physical picture of electrons and holes as majority carriers. Fermi level for intrinsic and extrinsic semiconductors, dependence of Fermi level on donor and acceptor concentration, Idea of drift and diffusion.

Unit IV**18 Lectures**

PN JUNCTION – Formation of depletion region and Potential barrier, PN junction as a Diode, Forward & Reverse Bias, The resistance of P-N junction diode and its variation with biasing, Static and dynamic resistance of a diode, Current-Voltage characteristics, Derivation of potential barrier. Definition of transition capacitance, Capacitance voltage relationship for an abrupt p-n junction diode, Avalanche breakdown and Zener effect, Zener diode The basic idea and working of a varactor diode, Solar cell, LED, Schottky diode, Tunnel diode.

Unit V**18 Lectures**

TRANSISTOR– PNP and NPN transistor, Transistor Action, Definition of alpha, Beta & Gamma and their inter relationship, Characteristics curve of bipolar transistors, Interpretation of Active, Cutoff and saturation regions, Determination of A.C. & D.C. load lines, Operating Point for CB, CE and CC configurations. Hybrid models of a CE, CB & CC transistor circuit and their equivalent circuits. Basic idea of Junction Capacitance. Transistor biasing, bias stability factor, stabilization against change in beta, I_{co} and V_{be} for fixed bias, collector to base bias and self bias.

Books for Study:

1. Sahdev S. K., *Electronic Principle*, Dhanpat Rai & Sons
2. Gupta and Kumar, *Hand Book of Electronics*, Pragati Prakashan
3. Padmanabhan, *Electronic Components*, Laxmi Publications.
4. Boylestad, *Electronic Devices & Circuit Theory*, Prentice Hall of India Pvt. Ltd.
5. Millman Halkias, *Electronic Devices & Circuits*, Tata Mc Graw Hill Pub.
6. Malvino A. P., *Electronic Principles*, Tata Mc Graw Hill Pub.
7. Mottershed Allen, *Electronic Devices & Circuits: An Introduction*, Prentice Hall of India Pvt. Ltd.

Reference Books:

1. Mehta V. K., *Principles of Electronics*, S. Chand & Co.
2. Thereja B. L., *Fundamentals of Electricals and Electronics Technology* S. Chand & Co.
3. Mehta V. K., *Principles of Electronics*, S. Chand & Co.
4. Joshi Madhuri, *Electronic Components*, Wheelers Publishing & Co.

B. Sc. I Semester: 2011 Onwards

SUBJECT: ELECTRONICS

PRACTICALS

A student is required to do atleast 6 experiments in one semester. The scheme of practical examination will be as follows:

1. One experiment of three hours duration.

2. Marks:

Experiment - 30

Sessional - 10

Viva - 10

Total Marks - 50

List of Practicals

1. Testing & Identification of different Components(Resistance, Capacitors, Inductors, Cables).
2. Measurement of frequency and voltage of sine, square and triangular waves using CRO and function generator.
3. Study of charging & Discharging of an Electrolyte Capacitor and Calculate the Time Constant.
4. Study of forward bias characteristics of PN junction diode.
5. Study of reverse bias characteristics of Zener diode.
6. Study of Thevenin's Theorem for two mesh network.
7. Designing of PCB for a given electronic circuit.
8. Study of series and parallel resonance.

(Or any other experiment of similar standard.)

B.Sc. - II SEMESTER: 2011 Onwards

SUBJECT: ELECTRONICS

ELECTRONIC CIRCUITS AND FUNDAMENTALS OF DIGITAL ELECTRONICS

Max. Marks: 70

Unit I **18 Lectures**
RECTIFIERS AND POWER SUPPLY- Half wave, Full wave and Bridge rectifiers, Ripple factor and Power conversion efficiency for the half wave and full wave rectifiers, Filter – Need for filter in Power Supply, Series inductor, shunt capacitor, L section, Pi section, T section filters. Power Supply – Block diagram of simple power supply, Regulated Power Supply, Line & Load regulation, Characteristics of Power Supply, Zener diode as a voltage regulator, Three terminal IC Power supply (IC 78XX & 79XX).

Unit II **18 Lectures**
FIELD EFFECT TRANSISTORS- The construction and working of JFET, The idea of channel width, Field dependent mobility showing current dependence of voltage, Physical explanation of different regions of I.V. curves, Various parameters of JFET. MOS Devices, Basic Structure and energy level diagram, The basic construction of MOSFET and its working, Physical explanation of the curves enhancement and depletion modes, MOSFET parameters.

Unit III **18 Lectures**
AMPLIFIERS- Feedback in amplifiers, Advantage of negative feedback in amplifiers, Voltage and current feedback circuits, Amplifiers - Different Terms used in Amplifiers, such as Signal, Source, Input, Output, Voltage and Current Gain, Power Gain, Decibel, Input and Output Impedance. Classification According to the frequency Response. Class A, Class B and Class C amplifiers, Power amplifiers, Analysis and design considerations of Push pull amplifiers. RC Coupled Amplifier - Gain for high, mid and low frequency range, Calculation of half power points, Band width and figure of merit.

Unit IV **18 Lectures**
APPLICATIONS OF DIODES AND TRANSISTORS- Idea of positive, negative, biased and combination clipping circuits, Clamping circuits. Multivibrators: Astable, Monostable and Bistable- Circuit, Working and Applications.

Oscillators - Barkhausen criterion for self sustained oscillations, Working of Hartley, Colpitt, Phase shift and Wein bridge oscillators.

Unit V

18 Lectures

BASICS OF DIGITAL ELECTRONICS- Binary numbers, Binary to Decimal conversion, Decimal to Binary conversion, Binary additions, Binary subtraction, 1's Complements, 2's Complements, Binary multiplication and division, Octal and Hexadecimal numbers, Inter-conversions of various number systems, BCD code and Grey code. Boolean laws, De'Morgan's Theorem- statement and proof, Karnaugh Map Simplification.

Books for Study:

1. Sahdev S. K., *A Text Book of Electronic Principles*, Dhanpat Rai & Sons
2. Gupta & Kumar, *Handbook of Electronics*, Pragati Prakashan
3. Gaur R. K., *Digital Electronics & Microprocessor*, Dhanpat Rai & Sons.
4. Mehta V. K., *Principles of Electronics*, S. Chand & Co.
5. Boylestad, *Electronic Devices & Circuits*, Prentice Hall of India Pvt. Ltd.
6. Motershed Allen, *Electronics Principles*, Prentice Hall of India Pvt. Ltd.

Reference Books:

1. Mithal G. K., *Electronic Devices & Circuits*, G.K. Publishers Pvt. Ltd.
2. Navneeth, *Digital & Analogue Technique*, Kitab Mahal

B. Sc. II Semester: 2011 Onwards

SUBJECT: ELECTRONICS

PRACTICALS

A student is required to do atleast 6 experiments in one semester. The scheme of practical examination will be as follows:

Scheme of Examination:

1. One experiment of three hours duration.

2. Marks:

Experiment 30

Sessional 10

Viva 10

Total Marks 50

List of Practicals

1. Study of Half and Full wave rectifiers.

2. Study of Regulated Power Supply using Zener Diode.

3. Study of Output Characteristics Curve of Bipolar Junction Transistor in Common Emitter Configuration

4. Study of RC Coupled Amplifier.

5. Study of Phase Shift Oscillator.

6. Study of Hartley Oscillator.

7. Study of Simple Clipping circuits using PN Junction Diode.

8. Fabrication of PCB using Software developed layout.

9. Study of Regulated Power Supply using IC 78Xx & 79XX series.

(Or any other experiment of similar standard.)