B.Sc. - I SEMESTER: 2011 Onwards
SUBJECT: ELECTRONICS
BASICS OF SEMICONDUCTORS & DEVICES
Max. Marks: 70

Unit I
18 Lectures

Unit II
18 Lectures

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, Ic and Vbe, 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

Reference Books:
1. Mehta V. K., Principles of Electronics, S. Chand & Co.
3. Mehta V. K., Principles of Electronics, S. Chand & Co.
A student is required to do at least 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

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**  

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:**

2. Gupta & Kumar, *Handbook of Electronics*, Pragati Prakashan

**Reference Books:**

2. Navneeth, *Digital & Analogue Technique*, Kitab Mahal

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**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.
Electronics

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


5. Study of Phase Shift Oscillator.


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

8. Fabrication of PCB using Software developed layout.


(Or any other experiment of similar standard.)

B. Sc. III SEMESTER
(2012-13 Onwards)

SUBJECT: ELECTRONICS
DIGITAL ELECTRONICS & MICROPROCESSOR

Max. Marks: 85

UNIT I
18 lectures

Logic Gates: Basic Logic Gates - Symbols and truth tables of AND, OR, NOT, NAND, NOR, EX-OR and EX-NOR logic gates, Positive and Negative logic, Transistorized Circuits of Basic Logic gates.

Arithmetic Circuits: Half Adder and Full adder, Boolean Laws, De’Morgan’s Theorems, Karnaugh Map Simplifications.


UNIT II
18 lectures

Logic Families: Classification of logic families, Definition of fan-in, fan-out, noise immunity, Propagation delay time, Various Logic Families-RTL, DTL, TTL, ECL, I^2L, CMOS.

Counter and Registers: Ripple counter, synchronous Counter, up- Down Counter, Decade Counter, Data Register, Shift Registers-Types and Uses.

UNIT III
18 lectures


Memories: Volatile and Non volatile memories, Read only memory (ROM), PROM, EPROM, Random Access Memory.

UNIT IV
18 lectures


Instruction Set of Microprocessor 8085: Types of Instructions, Data transfer, Arithmetic, Logical, Branching & Looping, Stack, I/O & machine control instructions. Programming – Basic Straight line programming (Addition, Subtraction, Multiplication and Division).

UNIT V
18 lectures


Personal Computers: Introduction to Personal Computer, Classification and Architecture (Block Diagram only), Input and Output Devices.

Reference Books:
1. Digital Principles and Applications: Malvino and Leach
3. Fundamentals of Microprocessors and Microcomputers: B. Ram
SUBJECT: ELECTRONICS

Note: At least 4 experiments should be done. Any other experiments of similar standard may also be incorporated.

The scheme of examination will as follows:
1. One experiment of three hours duration.
2. Marks Distribution:
   - Experiment : 30
   - Sessionals : 10
   - Viva-Voce : 10
   - Total marks : 50

List of Experiments
1. Verification of truth table of Basic logic Gates AND, OR, NOT, NAND, NOR, XOR using diodes transistor
2. Verification of truth table of Basic logic Gates AND, OR, NOT, NAND, NOR, XOR using ICs 74XX.
5. Study of Half and Full adder.
7. write a Program in Assembly language for microprocessor 8085:
   (I) Addition
   (II) Subtraction
   (III) Multiplication
   (IV) Division
8. Write a program in Assembly language for Microprocessor 8085:
   (I) Largest No. finding
   (II) Smallest No. finding
9. Write a program in Assembly language for Microprocessor 8085:
   (I) Data Block Transfer
   (II) Data Block Interchange
10. Verification of De’Morgan’s Theorems using logic gates.
11. Realization of Boolean Circuits

B.Sc. IV SEMESTER
(2012-13 Onwards)

SUBJECT: ELECTRONICS
OPERATIONAL AMPLIFIER AND INSTRUMENTATION

Max. Marks: 85

UNIT I
18 lectures

Difference Amplifier: Emitter coupled differential amplifier and its different configurations, DC and AC analysis, Voltage Gain, Input and Output Impedance of difference amplifier.


Parameters of Op Amp: Input offset voltage, Input Bias current, Differential Input resistance, Common Mode Rejection Ratio (CMRR), Slew rate, Large signal voltage gain, Output Resistance.

UNIT II
18 lectures


Signal Generators: Sweep Frequency generator, Pulse and Square wave generator, Astable Multivibrator using transistors, IC 555 timer for square and triangular wave generator, Block diagram of Function generator, IC 8038 as complete function generator.
UNIT III

Cathode Ray Oscilloscope: Block diagram of a CRO, Basic operation, Electrostatic focusing, Electrostatic deflection, Screen for CRT, Horizontal deflection system, Vertical deflection system Lissajous Figures, Frequency and Phase measurement using CRO.

Liquid Crystal Displays: Liquid Crystal, Modes of Operation, Operation of twisted nematic LCD, Operating characteristics of LCD, Liquid Crystal Materials, typical construction of LCD, advantages of LCD.

UNIT- IV


UNIT V

Biomedical Instrumentation: ECG Fundamentals- Electrodes, Block Diagram of ECG machine, ECG Leads, Direct Writing Recorder, Inkjet recorder, Multi channel ECG Machines, Cardiac Monitor, Cardiac Monitor Using Digital Memory, Bedside Patient Monitoring System. Instantaneous Heart rate Meters.

X-Ray Machine: Production of X-rays, X-ray machine, High Voltage Generation, High Frequency Generators, High Tension Cable

Reference Books

2. Electronic Instrumentation & Measurement: Helfrick and Cooper
3. Electronic Devices & Circuits: Y.N. Bapat
4. Operational Amplifier and Linear Cricket: R. Gaykabad
B.SC. IV SEMESTER

ELECTRONICS

Note: Atleast 4 experiments should be done. Any other experiments of similar standard may also be incorporated.

The scheme of examination will be as follows:

1. One experiment of three hours duration.
2. Marks:
   - Experiment : 30
   - Sessional : 10
   - Viva-voce : 10
   - Total Marks : 50

LIST OF EXPERIMENTS

1. Study of Operational Amplifier in Inverting and Non Inverting mode.
2. Study of Operational Amplifier as an Adder.
3. Study of Operational Amplifier as Integrator and differentiator
4. Study of the first order Low pass & High pass Butterworth Active Filters.
5. Study of Astable Multivibrator using Transistor.
6. Study of Compression of two frequency signal using CRO.
7. Study of 555 Timer as Triangular wave generator.
8. Study of 555 Timer as Square wave generator.
9. Study of Zener Diode as a voltage regulator.
10. Study of IC 78xx series as a voltage regulator.
11. Circuit designing by using Multisim software