

**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
<b>Total Marks</b>	<b>-</b>	<b>50</b>

**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****18 Lectures****Unit I**

**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.)

**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.

**Flip Flops:** RS Flip Flop, D Flip Flop, J K Flip Flop, Positive and Negative triggered flip flop, JK Master Slave Flip Flop.

**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<sup>2</sup>L, CMOS.

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

**UNIT III**

**18 lectures**

**D/A and A/D Converter:** D/A converters: Binary Weighted Resistor method, R-2R Ladder method, A/D Converters: Counter Method, Dual Ramp method, Successive Approximation Method.

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

**UNIT IV**

**18 lectures**

**Introduction to Microprocessor:** Pin Out diagram of Microprocessor INTEL 8085, Microprocessor 8085 Architecture –Bus Organization Addressing modes, Memory organization, General purpose Registers, Stack Pointer and Program Counter. Status flags.

**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**

**Interfacing and Interfacing Devices:** Introduction to Interfacing with microprocessor 8085, Interfacing with ROM, Interfacing with RAM ,Input/ Output Interfacing Internal Architecture and pin out diagram of the 8155/8156 and 8355/8755 multipurpose programmable Devices.

**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
2. Digital Electronics and Microcomputer: R. K. Gaur

3. Fundamentals of Microprocessors and Microcomputers: B. Ram
4. Microprocessor Architecture, Programming and Applications: R. S. Gaonkar

**B. Sc. III SEMESTER: 2012-13 Onwards****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
<b>Total marks</b>	<b>: 50</b>

**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.
3. Study of R-S Flip-Flop.
4. Study of J-K Flip-Flop.
5. Study of Half and Full adder.
6. Study of Digital to Analog converter.
7. write a Program in Assembly language for microprocessor 8085:
 

(I) Addition	(III) Multiplication
(II) Subtraction	(IV) Division
8. Write a program in Assembly language for Microprocessor 8085:
 

(I) Largest No. finding	(II) Smallest No. finding
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9. Write a program in Assembly language for Microprocessor 8085:
 

(I) Data Block Transfer	(II) Data Block Interchange
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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.

**Operational Amplifier:** Block diagram of Ideal Operational amplifier, Equivalent circuit of an Op-Amp, symbol, Integrated circuits, Pin –out configuration of IC 741. Inverting and Non Inverting Amplifiers.

**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**

**Applications of Op- Amp:** Adder, Subtractor, Integrator, Differentiator and Comparator Instrumentation Amplifier: Working and derivation of end formula. **Active Filters:** Elementary idea of Active Filters, Butterworth, Chebyshev & Cauer response, First order Low pass, High pass & Band pass Butterworth filters: working and frequency response.

**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****18 lectures**

**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****18 lectures**

**Measuring Instruments:** Q Meter – Basic Circuits: measuring method in series and parallel connections, Electronic Voltmeter, DC Voltmeter, AC Voltmeter, Digital Voltmeter – Integrating type DVM, Staircase Ramp DVM, Sample and Hold circuits.

**Multimeters:** Analog Multimeter- Voltage, Current and Resistance measurement, Digital Multimeter, Voltage, Current and Resistance measurement, Comparison between Analog and Digital Multimeter, Elements of Electronic Counter, Universal Counter, Measurement modes- Frequency, Time interval and Period measurement.

**UNIT V****18 lectures**

**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**

1. Electrical & Electronic Measurement of instrumentation: A.K. Sawhney
2. Electronic Instrumentation & Measurement: Helfrick and Cooper
3. Electronic Devices & Circuits: Y.N. Bapat
4. Operational Amplifier and Linear Cricket: R. Gaykabad
5. Handbook of Biomedical Instrumentation : R. S. Khandpur (Tata McGraw Hill)



**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