B.Sc. Part-III
(SYLLABUS- CHEMISTRY, PHYSICS & MATH)

RAJKAMAL SCIENCE & MANAGEMENT COLLEGE

BAHADRABAD (HARIDWAR)

CHEMISTRY SYLLABUS

For

UNDER GRADUATE COURSES (B.Sc. Part-III)
(Annual System)

(Applicable w.e.f. the Session 2019-2020)

Department of Chemistry
Sridev Suman Uttarakhand University
Badshahithaul Tehri-Garhwal - 249001**B.Sc. (THIRD YEAR)**

RAJKAMAL COLLEGE

B.Sc.-III Year CHEMISTRY

There shall be three written papers and a practical examination as follows:

Paper	Paper Code	Cource	Max. Marks	Work Hrs
I	CH-301	Inorganic Chemistry	50	60
II	CH-302	Organic Chemistry	50	60
III	CH-303	Physical Chemistry	50	60
	CH-304	Laboratory Practical	50	60
		Grand Total	200	180

Candidate will be required to pass in Theory and Practical Separately.

B.Sc. – III Inorganic Chemistry (Paper-I)

Unit – I

I. Metal-ligand bonding in Transition Metal Complexes

Limitations of valance bond theory, an elementary idea of crystal field theory, crystal field splitting in octahedral, tetrahedral and square planner complexes, factors affecting the crystal- field parameters.

II. Thermodynamic and Kinetic Aspects of Metal Complexes

A brief outline of thermodynamics stability of metal complexes and factors affecting the stability, stability constants of complexes and their determination, substitution reactions of square planar complexes.

Unit – II

III. Magnetic Properties of Transition Metal Complexes

Types of magnetic behavior, methods of determining magnetic susceptibility, spin- onlyformula, L-S coupling, correlation of μ_s and μ_{eff} values, orbital contribution to magnetic moments, application of magnetic moment data for 3d-metal complexes.

IV. Electronic spectra of Transition Metal Complexes

Types of electronic transitions, selection rules for d-d transitions, spectroscopic ground states, spectrochemical series, Orgel-energy level diagram for d_1 and d_9 states, discussion of the electronic spectrum of $[Ti(H_2O)_6]^{3+}$ complex ion.

Unit – III

V. Organometallic Chemistry

Definition, nomenclature and classification of organometallic compounds, Preparation, properties, bonding and applications of alkyls and aryls of Li, Al, Hg, Sn.

Metal carbonyls: 18 electron rule, preparation, structure and nature of bonding in themononuclear carbonyls.

VI. Silicones and Phosphazenes

Silicones and phosphazenes as examples of inorganic polymers, nature of bonding intriphosphazenes.

Unit – IV

VII. Hard and Soft Acids and Bases (HSAB)

Classification of acids and bases as hard and soft, Pearson's HSAB concept, acid-base strength and hardness and softness, Symbiosis, theoretical basis of hardness and softness, electro negativity and hardness and softness, Drago wayland equation, donor acceptor number.

Unit - V

VIII. Bioinorganic Chemistry

Essential and trace elements in biological processes, metalloporphyrins with special reference to hemoglobin and myoglobin, cooperative effect, Biological role of alkali and alkaline earth metal ions with special reference to Ca^{2+}.

Organic Chemistry Paper-II

Unit – I

I. Spectroscopy

Nuclear magnetic resonance (NMR) spectroscopy, Proton magnetic resonance (^{1}H NMR) spectroscopy, nuclear shielding and deshielding, chemical shift and molecular structure, spin- spin splitting and coupling constants, areas of signals, interpretation of ^{1}H NMR spectra of simple organic molecules such as ethyl bromide, ethanol, acetaldehyde, 1, 1, 2- tribromoethane, ethyl acetate, toluene and acetophenone, Problems pertaining to the structures elucidation of simple organic compounds using UV, IR and ^{1}H NMR spectroscopic, techniques.

Unit – II

II. Organometallic Compounds

Organomagnesium compounds: The Grignard reagents, formation, structure and chemical reactions. Organozinc compounds: formation and chemical reactions. Organolithium compounds: formation and chemical reactions.

III. Organosulphur Compounds

Nomenclature, structural formation, methods of formation and chemical reactions of thiols, thioethers, sulphonic acids, sulphonamides and Sulphaguanidine.

IV. Hetrocyclic Compounds

Introduction: Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and pyridine, Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution, Mechanism of nucleophilic substitution reaction in pyridine derivatives, Comparison of basicity of pyridine, piperidine and pyrrole.

Introduction to condensed five and six membered heterocycles, Preparation and reactions of indole, quinoline and isoquinoline with special reference to Fisher indole synthesis, Skraup synthesis and Bischler-Nepieralski synthesis, Mechanism of electrophilc substitution reactions of indole, quinoline and isoquinoline.

Unit – III

V. Carbohydrates

Classification and nomenclature, Monosaccharides, mechanism of osazone formation, interconversion of glucose and fructose, chain lengthening and chain shortening of aldoses. Configuration of monosaccharides, Erythro and threo diastereomers, Conversion of glucose intro mannose, Formation of glycosides, ethers and esters, Determination of ring size of monosaccharides, Cyclic structure of D (+)-glucose, Mechanism of mutarotation. Structures of ribose and deoxyribose,

An introduction to disaccharides (maltose, sucrose and lactose) and polysaccharides (starch and cellulose) without involving structure determination.

VI. Amino Acids, Peptides, Proteins and Nucleic Acids:

Classification, structure and stereochemistry of amino acids, Acid-base behavior isoelectric point and electrophoresis, Preparation and reactions of O-amino acids, Structure and nomenclature of peptides and proteins, Classification of proteins, peptide structure determination, end group analysis, selective hydrolysis of peptides, classical peptide synthesis, solid-phase peptide synthesis, Structures of peptides and proteins, Levels of protein structure,

Protein denaturation/ renaturation; Nucleic acids : Introduction, constituents of nucleic acids, Ribonucleosides and ribonucleotides, The double helical structure of DNA.

Unit – IV

VII. Fats, Oils and Detergents

Natural fats, edible and industrial oils of vegetable origin, common fatty acids, glycerides, hydrogenation of unsaturated oils, Saponification value, iodine value, acid value, Soaps, synthetic detergents, alkyl and aryl sulphonates.

VIII. Synthetic Polymers

Addition or chain-growth polymerization, Free radical vinyl polymerization, ionic vinyl polymerization, Ziegler-Natta polymerization and vinyl polymers, Condensation or step growth-polymerization, Polyesters, plyamides, phenol formaldehyde resins, urea formaldehyde resins, epoxy resins and polyurethanes, Natural and synthetic rubbers, Elementary idea of organic conducting polymers.

IX. Synthetic Dyes

Colour and constitution (electronic Concept), Classification of dyes, Chemistry and synthesis of Methyl orange, Congo red, Malachite green, crystal violet, phenolphthalein, fluorescein, Alizarin and Indigo.

Unit – V

X. Organic Synthesis via Enolates

Acidity of O-hydrogens, alkylation of diethyl malonate and ethyl acetoacetate, Synthesis of ethyl acetoacetate: The Claisen condensation, Keto-enol tautomerism of ethylacetoacetate. Alkylation of 1, 3-dithianes, Alkylation and acylation of enamines.

Physical Chemistry (Paper-III)

Unit – I

I. **Introducton:**

Black-body radiation, Planck's radiation law, photoelectric effect, heat capacity of solids, Bohr's model of hydrogen atom (without derivation) their solution of overall solution and its defects, Compton effect, de-Broglie's hypothesis, the Heisenberg's uncertainty principle, Hamiltonian Operator.

II. **Elementary Quantum Mechanics:**

Schrödinger wave equation and its importance, physical interpretation of the wave function, postulates of quantum mechanics, particle in a one dimensional box. Schrödinger wave equation for H-atom, separation into three equations (without derivation), quantum numbers and their importance, hydrogen like wave functions, radial wave functions, angular wave functions.

Molecular orbital theory, basic ideas – criteria for forming M.O. from A.O., construction of M.O's by LCAO – H^{2+} ion, calculation of energy levels from wavefunctions, physical picture of bonding and anti-bonding wave functions, concept of **σ, σ*, π , π*** orbitals and their characteristics, Hybrid orbitals – sp, sp^2, sp^3, calculation of coefficients of A.O's used in sp and sp^2 hybrid orbitals and interpretation of geometry.

Introduction to valence bond model of H_2, comparison of M.O. and V.B. models.

Unit – II

III. Physical Properties and Molecular Structure:

Optical activity, polarization – (Clausius – Mossotti equation), orientation of dipoles in an electric field, dipole moment, induced dipole moment, measurement of dipole moment- temperature method and refractivity method, dipole moment and structure of molecules, magnetic properties-paramagnetism, diamagnetism and ferromagnetic, Magnetic susceptibility, its measurements and its importance.

Unit – III

IV. Spectroscopy:

Introduction: Electromagnetic radiation, regions of the spectrum, basic features of different spectrophotometers, statement of the born-oppenheimer approximation, degrees of freedom.

Rotational Spectrum: Diatomic Molecules: Energy levels of a rigid rotor (semi-classical principles), selection rules, spectral intensity, distribution using population distribution (Maxwell-Boltzmann distribution) determination of bond length, qualitative description of non-rigid rotor, isotope effect.

Vibrational Spectrum: Infrared Spectrum: Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum, intensity, determination of force constant and qualitative relation of force constant and bond energies, effect of a harmonic motion and isotope on the spectrum, idea of vibrational frequencies of different functional groups.

Raman Spectrum: Concept of polarizability, pure rotational and pure vibrational Raman spectra of diatomic molecules, selection rules.

Electronic Spectrum: Concept of potential energy curves for bonding and anti-bonding molecular orbitals, qualitative description of selection rules and Franck-Condon principle. Qualitative description of **σ ,π** and T M.O. their energy levels and the respective transition.

Unit – IV:

V. Photochemistry:

Interaction of radiation with matter, difference between thermal and photochemical processes, Laws of photochemistry: Grothus – Drapper law, Stark – Einstein law, Jablonski diagram depicting various processes occurring in the excited state, qualitative description of fluorescence, phosphorescence, non-radiative processes (internal conversion, intersystem crossing), quantum yield, photosensitized reactions – energy transfer processes (simple examples), Kinetics of Photo chemical reaction.

Unit – V

VI. Solutions, Dilute Solutions and Colligative Properties:

Ideal and non-ideal solutions, methods of expressing concentrations of solutions, activity and activity coefficient. Dilute solution, colligative properties, Raoult's law, relative lowering of vapour pressure, molecular weight determination. Osmosis, laws of osmotic pressure, its measurement and determination of molecular weight from osmotic pressure. Elevation of boiling point and depression of freezing, Thermodynamic derivation of relation between molecular weight and elevation in boiling point and depression in freezing point. Experimental methods for determining various colligative properties.

Abnormal molar mass, Van't Hoff factor, Colligative properties of degree of dissociation and association of solutes.

B.Sc. – III Year (LABORATORY PRACTICAL) 180 hrs. (12 hrs./week)

Atleast three practicals from each specialization should be carried out.

Inorganic Chemistry:

I. Synthesis and Analysis:

(a) Preparation of sodium trioxalato ferrate (III), $Na_3[Fe(C_2O_4)_3]$ and determination of its composition by permagnometry.

(b) Preparation of Ni-DMG complex, $[Ni(DMG)_2]$

(c) Preparation of copper tetra ammine complex. $[(Cu(NH_3)_4]SO_4$.

(d) Preparation of cis-and trans-*bis*-oxalatodiaqua chromate (III) ion.

II. Instrumentation:

Colorimetry- (a) Job's method (b) Mole-ratio method Adulteration – Food stuffs.
Effluent analysis, water analysis
Solvent Extraction- Separation and estimation of Mg(II) and Fe(II) Ion
Exchange Method- Separation and estimation of Mg(II) and Zn(II)

Organic Chemistry:

III. Laboratory Techniques- Steam Distillation

Naphthalene from its suspension in water
Clove oil from cloves
Separation of o-and p-nitro phenols

IV. Column Chromatography-

Separation of fluorescein and methylene blue
Separation of leaf pigments from spinach leaves
Resolution of racemic mixture of (+) mandelic acid

V. Qualitative Analysis-

Analysis of an organic mixture containing two solid components using water, $NaHCO_3$, NaOH for separation and preparation of suitable derivatives

VI. Synthesis of Organic Compounds-

(a) Acetylation of salicylic acid, aniline, glucose and hydroquinone, Benzoylation of aniline and phenol

(b) Aliphatic electrophlic substitution

Preparation of iodoform from ethanol and acetone

(c) Aromatic electrophilic substitution

Nitration:

Preparation of m-dinitrobenzene
Preparation of p-nitroacetanilide

Halogenation

Preparation of p-bromoacetanilide
Preparation of 2, 4, 6-tribromophenol

(d) Diazotization/coupling

Preparation of methyl orange and methyl red

(e) Oxidation

Preparation of benzoic acid from toluene

(f) Reduction

Preparation of aniline from nitrobenzene
Preparation of m-nitroaniline from m-dinitrobenzene

VII. Stereo chemical Study of Organic Compounds via Models

R and S configuration of optical isomers
E, Z configuration of geometrical isomers

Coformational analysis of cyclohexanes and substituted cyclohexanes

Physical Chemistry:

VIII. Electrochemistry:

1. To determine the strength of the given acid conductometrically using standard alkali solution.
2. To determine the solubility and solubility of a sparingly soluble electrolyte conducometrically.
3. To study the saponification of ethyl acetate condutometrically.
4. To determine the ionization constant of a weak acid condutometrically.
5. To titrate potentiometrically the given ferrous ammonium sulphate solution using $KMnO_4/K_2Cr_2O_7$ as titrant and calculate the redox potential of Fe^{2+}/Fe^{3+} system on the hydrogen scale.

IX. Refractrometry, Polarimetry:

1. To verify law of refraction of mixtures (e.g. of glycerol and water) using Abbe's refractometer.
2. To determine the specific rotation of a given optically active compound.
3. To determine stoichiometry and stability constant of complexes.

X. Molecular Weight Determination:

1. Determination of molecular weight of a non-volatile solute by Rast method/ Beckmann freezing point method.
2. Determination of the apparent degree of dissociation of an electrolyte (e.g. NaCl) in aqueous solution at different concentrations by ebullioscopy.

Colorimetry:

1. To verify Beer – Lambert Law for $KMnO_4/K_2Cr_2O_7$ and determining the concentration of the given solution of the substance from absorption measurement.

RAJKAMAL SCIENCE & MANAGEMENT COLLEGE

BAHADRABAD (HARIDWAR)

MATHEMATICS SYLLABUS

For

UNDER GRADUATE COURSES (B.Sc. Part-III)
(Annual System)

(*Applicable w.e.f. the Session 2019-2020)*

Department of Mathematics

Sridev Suman Uttarakhand University Badshahithaul Tehri-Garhwal - 249001

B.Sc. IIIrd Year MATHEMATICS SYLLABUS

S.NO	PAPER	PAPER CODE	MAXIMUM MARKS
1	Linear Algebra & Linear Programming Problems	BM301	65
2	Complex Analysis	BM302	65
3	Numerical Analysis	BM303	70

PAPER-1 **SUBJECT CODE: BM-301**

COURSE TITLE: Linear Algebra &LPP

NOTE: The question paper consists of three sections A, B and C. Section A will consists 15 objective type questions (all compulsory), each of marks 1. Section B will consist 10 short answered questions in which 5 to be answered, each of marks 4. Section C will consist of 8 long answered questions in which 5 to be answered each of marks 6.

I. Vector spaces, Subspaces, Algebra of subspaces, Quotient spaces, Linear combinations of vectors. Linear span, Linear independence Basis and dimensions. Dimensions of subspaces. Linear transformations. Matrix representations of linear transformations. Algebra of linear transformations.

II. Dual spaces, Dual basis, double dual, Characteristics polynomials Eigen values and Eigen vectors.Isomorphism, Isomorphism theorems .Invertibility and isomorphism. Change of coordinate matrix.

III. Linear programming problems, Graphical approach for solving some LPP.Convex sets, Supporting and separating hyper planes.

IV. Theory of simplex methods, Optimality and unboundness. The simplex algorithm.Simplex method in tabular formats. Introductions to artificial variables.

V. Two –phase method, Big-M method and their comparison. Duality formulations of dual problems. Primal –dual relationships, Economic interpretation of the dual.

BOOKS RECOMMENDED:

1. Stephen H.Friedberg Arnold J.Insel.I Lawrence I Spence .Linear Algebra 4th Ed.Prentice-Hall of Pvt.Ltd. New Delhi 2004
2. David C.lay,Linear Algebra and its Applications ,3rd Ed. Pearson EducationAsia,Indian Reprint 2007
3. S.Lang,Introduction to Linear Algebra 2ndEd.Springer,2005
4. E.S. Hillier and G.J.Lieberman, Introduction to Operations. Research 8thEd.LataMeGrawHill, Singapore 2004.
5. Handy, A.Faha Operations Research .An Introduction 8th Ed.Prentice Hall India 2006

PAPER-II **SUBJECTCODE: BM-302**

COURSE TITLE: Complex Analysis

I. Complex numbers and basic properties, Geometric representation of complex numbers, trigonometrically and hyperbolic complex functions. Analytical, Cauchy-Riemann Equations, Harmonic functions.

II. Conformal Mapping: Geometric representation s, transformations, Theorem son Conformal mapping, Magnification, The circle, Inverse point w.r.t a circle. Some elementary transformations, Bilinear transformation, some special Bilinear transformation, Fixed point and Normal form of a Bilinear transformation

III. Complex Integration: Cauchy's Integral Theorem, Cauchy's Fundamental theorem of integration, Cauchy's Integral formula. Cauchy's Integral formula for the derivation of Analytical functions, Morera's theorem.

IV. Cauchy's Inequality, Taylor's theorem, Laurent's series, Liouville's theorem.

V. Zeros and singularities of Analytical functions.

BOOKS RECOMMENDED:

1. James Ward Brown and Ruel V.Churchill,Complex Variables and Applications 8th Ed.Mc Graw-Hill InternationalEditions.2009
2. GC Sharma &MJain Complex Analysis Y.K.Publishers. Mark J ablowitz A.S Fokas

PAPER-III **SUBJECT CODE: BM-303**

COURSE TITLE: Numerical Analysis

I. Finite difference: Difference Operator, Factorial notation Interpolation with equal interval.

II. Interpolation with unequal intervals, Divided difference, Central differences, Sterling and Bessel formula (application only)

III. Numerical differentiation and Integration, Simpson's 1/3 and 3/8 rule, Weddle's rule, Trapezoidal rule and their accuracy

IV. Numerical solutions of algebraic and transcendental equation, iterative bisections, Regular- Falsi, NewtonRaphson, Graelle method.

V. Numerical solutions of differential solutions of differential solutions, Picard's Euler, Modified Euler, Runge-kutta method.

BOOKS RECOMMENDED:

1. B.Bradie, A friendly Introduction to Numerical Analysis, Pearson Education India2007.
2. M.K.Jain,S.R.K lyengar andR.K.Jain .Numerical Methods for Scientific and Engineering Computations, 5th Ed.Mew age International Publisher India2007

RAJKAMAL SCIENCE & MANAGEMENT COLLEGE

BAHADRABAD (HARIDWAR)

PHYSICS SYLLABUS

For

UNDER GRADUATE COURSES (B.Sc. Part-III)
(Annual System)

(*Applicable w.e.f. the Session 2019-2020)*

Department of Physics

Sridev Suman Uttarakhand University Badshahithaul
Tehri-Garhwal – 249001

PHYSICS

PAPER-I: QUANTUM MECHANICS

UNIT I:

Origin of Quantum theory, Failure of Classical Physics to explain the phenomena such as Black body spectrum, Photoelectric effect, Characteristics and Einstein's explanation, Planck's quantum hypothesis, Planck's constant and light as a collection of photons; Compton scattering.

UNIT II:

De Broglie hypothesis of matter waves and De Broglie wavelength; Davisson-Germer experiment, Position measurement- gamma ray microscope thought experiment; Wave-particle duality, Heisenberg uncertainty principle- impossibility of a particle following a trajectory; Estimating minimum energy of a confined particle using uncertainty principle; Energy-time uncertainty principle. Two slit interference experiment with photons, atoms and particles;

UNIT III:

Schrodinger's equation (Time independent and Time dependent), Postulates of Quantum Mechanics, Properties of Wave Function, Physical interpretation of Wave Function, Probability and probability current densities in three dimensions; Conditions for Physical acceptability of Wave Functions, Normalization, Eigenvalues and Eigenfunctions, Operator, position, momentum and Energy operators; Expectation values, Wave Function of a Free Particle.

UNIT IV:

General discussion of bound states in an arbitrary potential- continuity of wave function, boundary condition and emergence of discrete energy levels; Applications of Schrodinger's equation to particle in one dimensional box, Transmission across a potential barrier, Potential well of finite and infinite depths, Potential step, Quantum Mechanics of one dimensional simple harmonic oscillator-energy levels and energy eigenfunctions.

UNIT V:

Application of Schrodinger's equation to particle in three dimensional box, Quantum theory of hydrogen-like atoms: time independent Schrodinger equation in spherical polar coordinates; separation of variables for the second order partial differential

equation; angular momentum operator and quantum numbers; Radial wavefunctions from Frobenius method; Orbital angular momentum quantum numbers l and m; s, p, d,.. shells (idea only)

Reference Books:

- A Text book of Quantum Mechanics, P. M. Mathews & K. Venkatesan, 2nd Ed., 2010, McGraw Hill
- Quantum Mechanics, Robert Eisberg and Robert Resnick, 2ndEdn., 2002, Wiley.
- Quantum Mechanics, Leonard I. Schiff, 3rdEdn. 2010, Tata McGraw Hill.
- Quantum Mechanics, G. Aruldhas, 2ndEdn. 2002, PHI Learning of India.
- Quantum Mechanics, Bruce Cameron Reed, 2008, Jones and Bartlett Learning.
- Quantum Mechanics for Scientists & Engineers, D.A.B. Miller, 2008, Cambridge University Press

PAPER-II: MODERN PHYSICS

UNIT I:

Thomson model, Rutherford model, Bohr model and spectra of hydrogen atoms, Shortcomings of these models, Bohr-Sommerfeld's model, Stern-Gerlach Experiment, Bohr magneton, Larmor's precession, Vector atom model, Spatial quantization and electron spin.

UNIT II:

Optical spectra and spectral notations, L-S and J-J coupling, selection rules and intensity rules, Explanation of fine structure of sodium D line, Normal Zeeman effect, X-ray spectra (Characteristic and continuous), Moseley's law.

UNIT III:

Absorption, spontaneous and stimulated emission processes, Metastable states, population inversion and pumping process, Einstein's A and B coefficients, Conditions of lasing action, Idea of Laser and Maser, Examples of Laser (Ruby Laser, He-Ne Laser, Semiconductor laser) and some applications of Lasers.

UNIT IV:

Size and structure of atomic nucleus and its relation with atomic weight; Impossibility of an electron being in the nucleus as a consequence of the uncertainty principle, Nature of nuclear force, Packing fraction and binding energy, NZ graph and semi-empirical mass formula, Liquid drop model and Shell Model.

UNIT V:

Radioactivity: stability of nucleus; Law of radioactive decay; Mean life and half-life; α decay; β decay - energy released, spectrum and Pauli's prediction of neutrino; γ-ray emission.

Fission and Fusion: mass deficit, relativity and generation of energy; Fission - nature of fragments and emission of neutrons. Nuclear reactor: slow neutrons interacting with Uranium 235; Fusion and thermonuclear reactions.

Particle Detectors (Ionization Chamber, proportional and G. M. Counter)

Reference Books:

- Concepts of Modern Physics, Arthur Beiser, 2009, McGraw-Hill.
- Modern Physics, John R. Taylor, Chris D. Zafiratos, Michael A.Dubson,2009, PHI Learning.
- Six Ideas that Shaped Physics: Particle Behave like Waves, Thomas A. Moore, 2003, McGraw Hill.
- Modern Physics, R. A. Serway, C. J. Moses, and C. A. Moyer, 2005, Cengage Learning.
- Modern Physics, Agrawal and Agrawal, Pragati Prakashan.
- Basic Nuclear Physics, B. N. Srivastava, Pragati Prakashan.
- Nuclear Physics, D. C. Tayal, Himalaya Publishing.
- Lasers and Non Linear Optics, B. B. Laud.

PAPER-III: BASIC ELECTRONICS

UNIT I: Semiconductor Diodes

Intrinsic and extrinsic semiconductors, p and n type semiconductors, Semiconductor Diodes, Barrier Formation in PN Junction Diode, Qualitative Idea of Current Flow Mechanism in Forward and Reverse Biased Diode, PN junction and its characteristics, Static and Dynamic Resistance, Zener diode, Principle and structure of Opto-electronic devices (1) LEDs (2) Photodiode (3) Solar Cell.

UNIT II: Power Supply

Half-wave Rectifiers, Centre-tapped and Bridge Full-wave Rectifiers, Calculation of Ripple Factor and Rectification Efficiency, Basic idea about capacitor, inductor filters, Clippers and clamping circuits, Voltage multiplier (Doubler and Tripler), Regulated

Power supply, Zener Diode as a Voltage Regulator.

UNIT III: Transistor Amplifiers

Bipolar Junction transistors: n-p-n and p-n-p Transistors, Characteristics of CB, CE and CC Configurations, Current gains α and β, Relations between α and β, Load Line analysis of Transistors, DC Load line and Q-point, Active, Cutoff, and Saturation Regions, Transistor biasing circuits for CE Amplifier, Current, Voltage and Power Gains, Class A, B, and C Amplifiers, Field effect Transistor, UJT.

UNIT IV: Oscillators

Negative and positive feedback, Barkhausen's Criterion for Self-sustained Oscillations, Determination of Frequency (no mathematical derivation) of RC Oscillator (Wein bridge and phase-shift oscillator) and LC oscillator (Collector tuned and Colpit oscillator), Crystal Oscillator, Multivibrator (Mono, astable and bistable)

UNIT V: Digital Circuits

Difference between Analog and Digital Circuits. Binary Numbers, Decimal to Binary and Binary to Decimal Conversion, AND, OR and NOT Gates (Realization using Diodes and Transistor), NAND and NOR Gates as Universal Gates, XOR and XNOR Gates.
De Morgan's Theorems, Boolean Laws, Simplification of Logic Circuit using Boolean Algebra, Fundamental Products, Minterms and Maxterms, Conversion of a Truth Table into an Equivalent Logic Circuit by (1) Sum of Products Method and (2) Karnaugh Map. Binary Addition. Binary Subtraction using 2's Complement Method), Half Adders and Full Adders and Subtractors, 4-bit binary Adder-Subtractor.

Reference Books:

- Integrated Electronics, J. Millman and C.C. Halkias, 1991, Tata Mc-Graw Hill.
- Electronic devices and circuits, S. Salivahanan and N.Suresh Kumar, 2012, Tata Mc-Graw Hill.
- Microelectronic Circuits, M.H. Rashid, 2ndEdn.,2011, Cengage Learning.
- Digital Principles & Applications, A. P. Malvino, D. P. Leach & Saha, 7th Ed.,2011, Tata McGraw Hill
- Fundamentals of Digital Circuits, A. Anand Kumar, 2nd Edition, 2009, PHI Learning Pvt. Ltd.
- Principle of Electronics, V. K. Mehta.
- Hand Book of Electronics, Gupta and Kumar
- Basic electronics and linear circuits, N. N. Bhargava, D. C. Kulshrestha and S. C. Gupta

PRACTICAL LIST

(Any Sixteen Experiments as per facilities in the Institution)

1. Frank-Hertz Experiment.
2. Determination of 'h' Planck's constant by Photoelectric effect.
3. Spectrum of Hydrogen and Rydberg constant.
4. Speed of light by Lecher's wires.
5. 'e/m' by Thomson method.
6. 'e/m' by Magnetron method.
7. 'e/m' by Helical method.
8. Measurement of Magnetic field strength.
9. Child Langmuir Law.
10. Identification and checking of electronic components; resistors, diodes, capacitor, transistors.
11. To verify truth table of AND, OR, NOT, NAND and XOR gates.
12. To verify De Morgan's Theorem.
13. To construct half adder and full adder.
14. To construct half subtractor and full subtractor.
15. To study I-V characteristics of p-n junction diode in forward and reverse bias.
16. To study I-V characteristics of Zener diode.
17. To study I-V characteristics of light emitting diode (LED).
18. To study half-wave rectifier with and without filter.
19. To study full-wave rectifier with and without filter.
20. To study p-n-p transistor in CE configuration.
21. To study n-p-n transistor in CE configuration.
22. To study JFET characteristics.
23. To design a CE amplifier of a given gain (mid-gain) using voltage divider bias.
24. To design a Wien Bridge Oscillator.
25. Study of regulated power supply.
26. To study characteristics of photo cell.
27. To measure (a) Voltage, and (b) Frequency of a periodic waveform using a CRO to minimize a given logic circuit.
28. To determine energy band gap of a semiconductor.
29. To study MOSFET characteristics.
30. To study UJT characteristics.

Reference Books:

- Basic Electronics: A text lab manual, P. B. Zbar, A. P. Malvino, M. A. Miller, 1994, Mc-Graw Hill.

- Electronics: Fundamentals and Applications, J. D. Ryder, 2004, Prentice Hall.
- Electronic Principle, Albert Malvino, 2008, Tata Mc-Graw Hill.