

CAREER POINT

UNIVERSITY

KOTA (RAJASTHAN)

School of Basic and Applied Science

Syllabus and Course Scheme
(Annual Scheme)

Bachelor of Science
(Mathematics)

Session – 2021-22

Duration of the Course- Three Years

University Campus: Alaniya, Kota 325 003, Rajasthan Ph: +91-80941-62999

City office: CP Tower (4th Floor), IPIA, Road No-1, Kota (Raj.) -324005 Ph: +91-744-3040045 Fax: +91-744-3040050

Course Scheme of B.Sc. Part-II

Annual Course Scheme of B.Sc. Part-II				
Branch-Mathematics				
S.No.	Paper Code	Paper Name	Marks	
			Min. Marks	Max. Marks
1	CHL021-I	Inorganic Chemistry	18	50
2	CHL021-II	Organic Chemistry	18	50
3	CHL021-III	Physical Chemistry	18	50
4	CHP021	Chemistry Practical	27	75
5	MAL021-I	Real Analysis	27	75
6	MAL021-II	Differential Equations	18	50
7	MAL021-III	Statics and Dynamics	27	75
8	MAPO21	Maths Practical	9	25
9	PHL021-I	Thermal & Statistical Physics	18	50
10	PHL021-II	Electronics	18	50
11	PHL021-III	Relativity & Mathematical Physics	18	50
12	PHPO21	Physics Practical	27	75
				G.T. 675

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Syllabus of B.Sc. Maths Part – II

CHL021-I: Inorganic Chemistry

Unit -I

Chemistry of Elements of first Transition Series: Characteristics properties of d-Block elements. Properties of the elements of the first transition series, their Binary Compounds and complexes. Illustrating relative stability of their oxidation states, Coordination number and geometry.

Unit -II

Chemistry of Elements of Second and Third Transition Series: General characteristics, comparative treatment with their 3d-analogues in respect of ionic Radii, Oxidation States, magnetic, behaviour, Spectral properties, Stereo-chemistry.

Unit -III

Coordination Compounds: Werner's coordination theory and its experimental verification, Effective atomic number concept, Chelates, Nomenclature of coordination Compounds, Isomerism in coordination compounds, valence bond theory of transition metal complexes.

Unit -IV

Chemistry of Lanthanide Elements: Electronic Structure, Oxidation States and ionic radii and lanthanide contraction, Complex formation, Occurrence and isolation, Lanthanide compounds.

Chemistry of Actinides: General features and chemistry of actinides, Chemistry of separation of Np, Pu and Am from U, Similarities between the later Actinides and later lanthanides.

Unit -V

Acids and Bases: Arrhenius, Bronsted -Lowry, the Lux -Flood, Solvent System and lewis concept of Acids and Bases.

Non Aqueous Solvents: Physical properties of solvent, Type of solvents and their general characteristics, Reactions in liquid NH₃ and Liquid SO₂.

Oxidation and Reduction: Use of redox potential data - analysis of redox cycle, redox stability in water, frost, latimer and pourbaix diagrams. Principles involved in the extraction of the elements.

CHL021-II: Organic Chemistry

Unit-I

Absorption laws (Beer - Lambert law) molar absorptivity. presentation and analysis of UV spectra, types of electronic transition, Effect of conjugation. concept of chromophore and auxochrome, bathochromic, Hypsochromic, Hyperchromic and hypochromic shifts. UV spectra of conjugates and enones.

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Infrared (IR) Absorption spectroscopy -Molecular vibrations. Hooks Law, Selection rules, Intensity and Position of IR bands, Measurement of IR spectrum, Finger print region, Characteristic absorptions of various functional groups and interpretation of IR spectra of simple organic compounds.

Unit-II

Alcohols

Classification and Nomenclature Monohydric alcohols – Nomenclature, Method of formation by Ketones, Carboxylic acids and esters, Hydrogen bonding. Acidic Dihydric Alcohols Nomenclature, methods Oxidative-Cleavage [Pb (OAc)₄ and HIO₄] and Trihydric Alcohols

Phenols: Nomenclature, Structure and bonding. Preparation of Phenols, Physical Properties and acidic character. Comparative acidic strengths of alcohols and phenols, Resonance stabilization of phenoxide ion. Reactions of phenols: electrophilic aromatic substitution, acylation and carboxylation. mechanism of fries rearrangement, Claisen rearrangement, gatter-man synthesis. Hauben- Hoesch Reaction, Lederer-manasse reaction and Reimer-tiemann Reaction.

Unit -III

Aldehydes And Ketones Nomenclature and structure of the carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chlorides, synthesis of aldehydes and ketones using 1,3 Dithianes synthesis of ketones from nitriles and from carboxylic acids. Physical properties

Mechanism of Nucleo-philic additions to carbonyl, aldol, perkin and Knoevenagel condensations. Condensation with ammonia and its Derivatives. Wittig reaction, Mannich reaction. Use of acetals as Protecting group. Oxidation of aldehydes, baeyer-villiger oxidation of ketone, cannizzaro's reaction, MPV, Clemmensen, Wolff-kishner, Li AlH₄ reductions, Halogenation of enolizable ketones. An introduction to HHH Unsaturated aldehydes and ketones.

Unit -IV

Ethers And Epoxides: Nomenclature of ethers and methods of formation, physical properties. Chemical reaction, cleavage and autoxidation, ziesel's method of synthesis of epoxides. Acid and Base catalyzed ring opening, Reactions of Grignard and organolithium reagents with epoxides.

Carboxylic Acids: Nomenclature structure and bonding, Physical properties, Acidity of carboxylic acids, Effect of substituents on acid Strength. preparation of carboxylic acids. Reactions of carboxylic acids, Hell-Volhard zelinsky reaction. Synthesis of acid chlorides, Esters and amides. Reductions of carboxylic acids. Mechanism of decarboxylation. Methods of formation and chemical reactions of unsaturated mono carboxylic acids. Dicarboxylic Acids: Methods of Synthesis and effect of heat and dehydrating agents.

Carboxylic Acid Derivatives: Structure and nomenclature of acid chlorides, Esters, Amides and acid-anhydrides. Relative stability and reactivity of acid derivatives. physical properties, Inter conversion of acid derivatives by nucleophilic acyl substitution. Preparation of carboxylic acid derivatives, chemical reactions. mechanism of esterification and hydrolysis (Acidic and Basic)

Unit -V

Organic Compounds of Nitrogen: Preparation of nitro alkanes and nitro arenes. Chemical Reactions of Nitro alkanes. Mechanism of nucleophilic substitution in nitro arenes and their reduction in acidic, neutral and alkaline media. Picric Acid.

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Alkyl and aryl amines: Reactivity, Structure and nomenclature of amines, physical properties. stereo chemistry of amines, Separation of a mixture of primary. secondary and tertiary amines. Structural features, effecting basicity of amines. Amine salts as phase- transfer catalysts. preparation of alkyl and aryl amines (Reduction of nitro compounds, Nitriles) Reductive amination of aldehydic and ketonic compounds. Gabriel-Phthalimide reaction, Hofmann bromamide Reaction. Reactions of amines. Electrophilic Aromatic substitution in arylamines, Reactions of amines with nitrous acid. Synthetic transformations of aryl- diazonium salts, azo coupling.

CHL021-III: Physical Chemistry

Unit -I

Thermodynamics -I: Definition of thermodynamic terms: System, Surroundings etc. Types of systems, Intensive and extensive properties. state and path functions and their differentials. Thermodynamic process, concept of heat and work,

First Law of Thermodynamics: Statement, Definition of internal energy and enthalpy, heat capacity, heat capacities at constant volume and pressure and their relationship. Joule's law, Joule- Thomson coefficient. Calculation of w , q , dU & dH , for the expansion of Ideal gases under adiabatic conditions for reversible process.

Thermo Chemistry: Standard state, standard enthalpy of formation, Hess's law of heat summation and its applications. Heat of reaction at constant pressure and at constant volume. Enthalpy of neutralization. bond dissociation energy and its calculation from thermo-chemical data, Temperature dependence of enthalpy. Kirchoff's equation.

Unit -II

Thermodynamics -II: Second law of Thermodynamics: Need for the Law, different statements of the law. Carnot cycle and its efficiency, Carnot-Theorem. Thermodynamic scale of temperature.

Concept of entropy: Entropy as a state function, entropy as a function of V & T , Entropy as a function of P & T , Entropy change in physical change, Clausius inequality and Entropy as a criteria of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases.

Third Law of Thermodynamics: Nernst heat theorem. Statement and concept of residual entropy, evaluation of absolute entropy from heat capacity data.

Gibbs and Helm-holtz function's: Gibbs function (G) and Helmholtz function (A) as: Thermodynamic quantities. A & G as criteria for Thermodynamic equilibrium and spontaneity, Their advantage over entropy change. variation of G and A with P , V . and T .

Unit- III

Chemical Equilibrium: Equilibrium constant and free energy. Thermodynamic derivation of law of Mass Action. Le chatelier's principle. Reaction Isotherm and reaction isochore-clapeyron equation and clausius- clapeyron equation, applications.

phase Equilibrium: Statement and meaning of the terms: phase, component and degree of freedom, derivation of Gibbs phase rule, phase equilibria of one component system - water, CO_2 and Sulphur systems. phase Equilibria of two component system- solid-liquid equilibria simple eutectic $Bi-Cd$, $Pb-Ag$ systems, desilverization of lead. solid solutions-compound formation with. Congruent melting point ($Mg-Zn$) and incongruent melting point. ($NaCl-H_2O$) System. Freezing mixtures acetone- dry ice.

Liquid-Liquid mixtures - Ideal liquid mixtures Rault's and Henry's law non ideal system- Azeotropes- $HCl-H_2O$ and ethanol- water system. Partially miscible Liquids : phenol-water. Lower and upper consolute temperature. effect of impurity on consolute temperature. Nernst Distribution law - Thermodynamic derivation, applications.

Unit -IV

Electro Chemistry -I: Electrical Transport-conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance, measurement of equivalent conductance, variation of equivalent and specific conductance with dilution, migration of ions and Kohlrausch law, Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes, Ostwald dilution law, its uses and limitations. Debye-Huckel-Onsager's equation for strong electrolytes (Elementary Treatment Only). Transport number, definition and determination by Hittorf's method and moving boundary method.

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Applications of conductivity measurements: Determination of degree of dissociation, determination of K_a of acids, determination of solubility product of a sparingly soluble salt, conductometric titrations.

Unit -V

Electro chemistry -II: Types of reversible electrodes - gas- metal ion, metal- metalion, metal - Insoluble salt-anion and redox electrodes, electrode reactions. Nernst equation, derivation of cell E.M.F. and single electrode potential, standard hydrogen electrode, reference electrodes, electrochemical series and its significance. Electrolyte and galvanic cells - Reversible and irreversible cells, conventional representation of electrochemical cells. E.M.F. of a cell and its measurements. Computation of cell EMF. Calculation of thermodynamic quantities of cell reactions (G , H and K), Polarization, over Potential and hydrogen-over-voltage. Concentration cell with and without transport, liquid-junction potential, application of concentration cells, valency of ions. Solubility product and activity coefficient, potentiometric Titrations. Definition of pH and pK_a Determination of pH Using hydrogen, quinhydrone and glass Electrodes, by potentiometric methods.

Books Suggested:

1. Principles of Physical Chemistry: B. R. Puri Sharma and M. S. Pathania
2. A Text Book of Physical Chemistry: A. S. Negi and S. C. Anand
3. A Text Book of Physical Chemistry: Kundu and Jain

Chemistry Practical

Inorganic Chemistry:

Section-A

Calibration of fractional weights, pipettes and burettes. Preparation of standard solution. Dilution-0.1M to 0.001M solutions.

Section-B

Quantitative Analysis:

Volumetric analysis

- Determination of acetic acid in commercial vinegar using NaOH
- Determination of alkali content in antacid tablet using HCl.
- Estimation of calcium content in chalk as calcium oxalate by permanganometry.
- Estimation of hardness of water by EDTA.
- Estimation of ferrous and ferric by dichromate method.
- Estimation of copper using thiosulphate.

Gravimetric analysis

Analysis of Cu as $CuSCN$ and Ni as Nickel dimethylglyoxime.

Organic Chemistry

Laboratory techniques:

A Thin Layer Chromatography: Determination of R_f values and identification of organic compounds.

- Separation of green leaf pigments (spinach leaves may be used)
- Preparation and separation of 2,4-Dinitrophenyl hydrazones of acetone, 2-butanone, hexan-2 and 3-one using toluene and light petroleum (40:60)
- Separation of a mixture of dyes using cyclohexane and ethyl acetate (8.5:1.5)

B Paper Chromatography-Ascending and Circular: Determination of values and identification of organic compounds.

- Separation of a mixture of phenyl alanine and glycine. Alanine and aspartic acid. leucine and glutamic acid. Spray reagent-Ninhydrin.
- Separation of a mixture of D,L-alanine, glycine and L-leucine using n-butanol: acetic acid:water (4:1:5) Spray reagent-Ninhydrin.
- separation of mono saccharides-a mixture of D-galactose and D-fructose using n-butanol:acetone:water (4:5:1) spray reagent- Aniline hydrogen phthalate. Qualitative Analysis: Identification of an organic compound through the functional group analysis, determination of melting point and preparation of suitable derivatives.

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Physical Chemistry:**Transition temperature:**

- Determination of the transition temperature of the given substance by thermometric / dilatometric method (e.g. $\text{MnCl}_2 \cdot 4\text{H}_2\text{O}$ / $\text{SrBr}_2 \cdot 2\text{H}_2\text{O}$)

Phase Equilibrium

- To study the effect of a solute (e.g. NaCl , succinic acid) on the critical solution temperature of two partially miscible liquids (e.g. phenol-water system)
- To construct the phase diagram of two component (e.g. diphenylbenzophenone) system by cooling curve method.

Thermochemistry:

- To determine the solubilities of benzoic acid at different temperatures and to determine ΔH of the dissolution process.
- To determine the enthalpy of neutralization of a weak acid weak base versus strong acid and strong base and determine the enthalpy of ionisation of the weak acid/weak base.
- To determine the enthalpy of solution of solid calcium chloride and calculate the lattice energy of calcium chloride from its enthalpy data using Born-Haber cycle.

PHL021-I: Thermal and Statistical physics**Unit-I**

General Thermodynamical interaction, Dependence of the number of states of external parameters, General relations in equilibrium, equilibrium conditions ($P=p_1, b=b_1$), infinitesimal quasistatic process, Entropy of an ideal gas, Equilibrium of an isolated system, Equilibrium of a system in contact with reservoir (Gibb's free energy), equilibrium between phases, Clausius-Clapeyron equation, Triple point, Vapour in equilibrium with liquid or solid, equilibrium conditions for a system of fixed volume in contact with heat reservoir (Helmholtz free energy), Equilibrium between phases and condition of chemical equilibrium and equilibrium condition for a system at constant pressure in contact with a heat reservoir (Enthalpy), Maxwell's relations.

Unit-II

Thermal interactions of macroscopic systems, system in contact with a heat reservoir, first law of thermodynamics and infinitesimal general interaction, Concept of temperature and quantitative idea of temperature scale (thermodynamical parameter), Distribution of energy, second law of thermodynamics, Clausius and Kelvin's statements, partition function (Z), mean energy of an ideal gas and mean pressure, Heat engine and efficiency of the engine, Carnot cycle, thermodynamical scale as an absolute scale.

Unit-III

Production of Low Temperatures and Application, Joule Thomson expansion and J.T. coefficients for ideal as well as Van-der Waal's gas, Temperature inversions, Regenerative cooling and cooling by adiabatic expansion and demagnetization, Liquid He, He-I and He-II, superfluidity, quest for absolute zero, Nernst heat theorem.

Unit-IV

Classical Statistics, Phase space, micro and macro states, Thermodynamic probability, Entropy and probability, Partition function (Z), The monatomic ideal gas, The principle of equipartition of energy, most probable, average and rms velocity, Specific heat capacity of diatomic gas, Specific heat capacity of solids.

The Distribution of Molecular Velocities, the energy distribution, Transport phenomenon. mean free path, distribution of free path, coefficients of viscosity, thermal conductivity diffusion.

Unit-V

Quantum Statistics, Black body radiation and failures of classical statistics, Postulates of quantum statistics, Indistinguishability, Wave function and exchange degeneracy, Prior probability, Bose-Einstein's Statistics, Planck's distribution law, Fermi-Dirac statistics, completely degenerate system, Bose-Einstein condensation, Thermionic Emission, specific heat anomaly of metals contact potential and Ortho and Para hydrogen.

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PHL021-II: Electronics

Unit-I

Circuit Analysis, Network-some important definitions, loop and nodal equation, Kirchhofs Laws, driving point and transfer impedances, four terminal network parameters, Open circuit, short circuit and hybrid network theorems, Superposition, Thevenin, Norton, Reciprocity, Compensation and maximum power transfer.

Unit-II

Semiconductors, Intrinsic and extrinsic semiconductors, charge densities in N and P materials, conduction by drift and diffusion of charge, Formation of PN junction, PN diode equation, capacitance effect of diode. Rectification and power Supply, Half-wave and full wave rectifiers, calculation of Ripple factor, efficiency and regulation, bridge rectifier,

Filters: shunt capacitor, L and π filters, Voltage regulation and voltage stabilization, Zener diode, Voltage multiplier circuits

Unit-III

Transistor and Transistor Amplifiers, Notations and volt ampere relations for bipolar junction transistor, CB, CE, CC configurations, characteristic curves and their equivalent circuits, Biasing of transistors, Fixed and emitter bias, bias stability in transistor circuits, concept of load line and operating point, hybrid parameters, Field effect transistor (JFET and MOSFET) and its circuit characteristics, Analysis of transistor amplifiers using hybrid parameters and its frequency response.

Unit-IV

Amplifiers with feedback, Concept of feedback Positive and negative feedback advantage of negative feedback, stabilization of gain by negative feedback, Effect of feedback on output and input resistance, Reduction of nonlinear distortion by negative feedback, frequency response, Voltage and current feedback circuit.

Unit-V

Operational amplifier (OP-AMP), Differential amplifier, DC levels shifter, operational amplifier, input and Output impedances, input offset current, Application of OP-AMP, Unity gain buffer, Adder, Subtractor, Integrator and Differentiator, Comparator, Waveform generator, Voltage regulator using integrated amplifiers.

Digital Circuits: Binary, Hexadecimal and Octal number systems, Binary arithmetic, Logic fundamentals, AND, OR, NOT, NOR., NAND, XOR gates, Boolean theorems, transistor as a switch, circuit realization of logic functions.

PHL021-III: Relativity and mathematical physics

Unit-I

Orthogonal Curvilinear coordinate system, scale factors, expression for gradient, divergence and curl and their applications to Cartesian, cylindrical and spherical polar coordinate systems, Coordinate transformation and Jacobian, Transformation of covariant, contravariant and mixed tensor, Addition, Multiplication and contraction of tensors, Quotient law, pseudo tensor, Metric tensor, transformation of Tensors.

Unit-II

Dirac-Delta Function and its properties, Fourier series, computation of Fourier coefficients, applications to simple periodic functions like square wave, sawtooth wave and rectifier output, Postulates of special theory of relativity and observational evidence, Lorentz transformation and rotation in space time, time like and space like vectors, length contraction, time dilation, worldline, mass-energy relation, energy-momentum relation.

Unit-III

Four vector formulation, energy-momentum four vectors, relativistic equation of motion, Orthogonality of four forces and four velocities, transformation of four wave vector, longitudinal and transverse Doppler's effect, Transformation between laboratory and center of mass systems, four momentum conservation, Kinematics of decay products of an unstable particle and reaction thresholds, pair production, inelastic collision of two particles, Compton effect. Electromagnetic field tensor, transformation of four potentials, four currents,

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electric and magnetic field between two inertial frames of reference, Lorentz force, equation of continuity, conservation of charge, tensor description of Maxwell's equations.

Unit-IV

The second order linear differential equation with variable coefficient and singular points, series solution method and its application in the Bessel's, Hermite's, Legendre's and Laguerre's differential equations, Basic properties like orthogonality, recurrence relations, graphical representation and generating function of Bessel, Hermite, Legendre Laguerre and Associated Legendre functions.

Unit-V

Technique of separation of variables and its application to following boundary value problems:

(i) Laplace equation in three-dimension Cartesian, Coordinate system-line charge between two earthed parallel plates, (ii) wave equation in spherical polar coordinates the vibration of circular membrane, Diffusion equation in two-dimensional Cartesian coordinate system-heat conduction in thin rectangular plate, (iv) Laplace equation in spherical coordinate system-Electric Potential about a spherical surface

Book Suggested:

1. Thermal & Statistical Physics by M.P.Saxena, S.S. Rawat and P.R. Singh College Book House.
2. Electronics by M.P.Saxena, S.S. Rawat and P.R. Singh College Book House. (Medium: Hindi/English)
3. Relativity and Mathematical Physics by M.P.Saxena, S.S. Rawat and P.R. Singh College Book House. (Medium: Hindi/English)

Physics Practical

Section –A

1. Study of dependence of velocity of wave propagation on line parameters using torsional wave apparatus.
2. Study of variation of reflection coefficient with nature of termination using torsional wave apparatus.
3. Using platinum resistance thermometer to find the melting point of a given substance.
4. Using Michelson's interferometer:
Find out the wavelength of a given monochromatic source (sodium light); Determine difference in wave length of D1 and D2 lines.
5. Determine the thermodynamic constant ($r=C_p/C_v$) using Clement's and Desormes methods.
6. Determine Thermal conductivity of a bad conductor by Lee's method.
7. Determination of Ballistic constant of Ballistic galvanometer.
8. Determination of high resistance by method of leakage.
9. Study the variation of total thermal radiation with temperature.

Section-B

1. Plot thermo emf versus temperature and find the neutral temperature.
2. Study of power supply using two diodes/ bridge rectifier using various filter circuits.
3. Study of half wave rectifier using L and pi section filters.
4. Characteristics of given transistor PNP/ NPN (common emitter, common base and common collector configurations).
5. Determination of band gap using a junction diode.
6. Determination of power factor of a given coil using CRO.
7. Study of single stage transistor audio amplifier (variation of gain with frequency)
8. Study of diode as integrator with different voltage wave forms.
9. Determination of e/m of electron by Thomson's method.
10. Determination of velocity of sound using CRO, microphone and speaker by standing wave method.
11. Determination of self inductance of a coil by Anderson's bridge method.
12. Determination of unknown capacity by De'sauty-bridge method and to determine dielectric constant of a liquid.

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MAL021-I: Real Analysis

Unit-I

The set of real numbers as a complete ordered field, incompleteness of \mathbb{Q} , Archimedean and denseness properties of \mathbb{R} , Modulus, Intervals, Definition of a sequence, Theorems on limit of sequence, bounded and monotonic sequences, nested interval theorem, Cauchy's sequence, Cauchy's convergence criterion.

Unit-II

Convergence of series of non-negative terms, their various tests (Comparison; D'Alembert's ratio, Cauchy's nth root, Raabe's, Gauss, Logarithmic, Demorgan and Bertand's, Cauchy's condensation, proof of tests not required) for convergence, Alternating series, Leibnitz's test, Series of arbitrary terms, absolute and conditional convergence, Abel's and Dirichlet's tests.

Unit -III

Equivalent sets. Finite and infinite sets denumerable sets, Countable and uncountable sets. Interior point of a set, open set, limit point of a set, Bolzano-Weierstrass theorem. Closed set. Dense in itself and perfect sets. Cantor's ternary set.

Unit-IV

Definition of limit of a function. Continuity of a function - Cauchy's and Heine's definitions with their equivalence. Types of discontinuities. Properties of continuous functions defined on closed intervals. Uniform continuity. Differentiability, Rolle's theorem, Lagrange's and Cauchy's mean value theorems and their geometrical interpretations. Taylor's theorem with various forms of remainders. Darboux's intermediate value theorem for derivatives.

Unit-V

Darboux sums and their properties. Riemann integral, Integrability of continuous and monotonic functions. Mean value theorems of integral calculus, The fundamental theorem of integral calculus. Improper integrals and their convergence comparison tests. Abel's and Dirichlet's tests.

MAL021-II: DIFFERENTIAL EQUATIONS

Unit-I

Order and Degree of a differential equation. Differential equations of first order and first degree, variables separable, homogeneous equations. Linear equations and equations reducible to linear form. Exact differential equations and equations reducible to exact forms. Differential equations of first order but not of first degree. Solvable for x , y , p Clairaut's form, singular solutions. Geometrical meaning of a differential equation, orthogonal trajectories.

Unit-II

Linear differential equations with constant coefficients, Homogeneous linear differential equations, Total differential equations.

Unit-III

Linear differential equations of second order. Transformation by changing the dependent /independent variable. Method of variation of parameters, Exact differential equations and certain particular forms of equations.

Unit-IV

Partial differential equations of first order, Lagrange's solution. Charpit's general method of solution.

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Unit-V

Partial differential equations of second and higher orders. Classification of linear partial differential equations of second order. Homogeneous and non-homogeneous equations with constant coefficients. Partial differential equations reducible to equations with constant coefficients. Monge's method.

MAL021-III: Statics and Dynamics

Unit-I

Analytical Conditions of equilibrium of a rigid body under coplanar forces. Friction.

Unit-II

Center of Gravity, Common Centenary.

Unit-III

Simple harmonic motion. Motion under repulsion varying as the distance from a point, motion under inverse square law. Motion under earth's attraction. Hooke's Law, Horizontal and vertical elastic strings Rectilinear motion in a resisting medium.

Unit-IV

Velocity and acceleration along radial and transverse directions and along tangential and normal directions. Projectiles: Motion horizontal and inclined planes.

Unit-V

Direct and oblique impact. Constrained Motion- Circular and Cycloidal.

Book Suggested:

1. Shanti Narayan: Elements of real analysis, S.Chand & company Ltd., New Delhi.
2. Shanti Narayan: A Course of Mathematical Analysis, S.Chand & Company Ltd. New Delhi.
3. S.C. Malik, Mathematical Analysis, Wiley Estern Ltd. New Delhi.
4. S.C. Malik, Principles of Real Analysis, New Age International Ltd., New Delhi.
5. Hari Kishan, Real Analysis, Pragati Prakashan Meerut.
6. J.N. Sharma & A.R. Vasistha, Mathematical Analysis, Krishna Prakashan Mandir, Meerut.
7. M. Ray, J.C. Chaturvedi & H.S. Sharma: A Text Book of Differential Equations, Students Friends & Company, Agra.
8. J.L. Bansal & H.S. Dhama : Differential Equations Vol. I & II, Jaipur Publishing House, Jaipur.
9. M.Ray & P.T. Chandi: Statics, Premier Publishing Company, Delhi.
10. M. Ray: A Text Book on Dynamics, Premier Publishing Company, Delhi.
11. S.M. Mathur: A New Text Book of Higher Statics, Atma Ram & sons, New Delhi

Mathematics Practical

1. Solution of differential equations using picard's method and comparison with exact solution.
2. Solution of differential equations using Euler's method and comparison with exact solution.
3. Formation of the ordinary differential equation.
4. Singular solution of differential equations.
5. Solution of differential equations using variation of parameters method.
6. Solution of partial differential equations using charpit's method.
7. Application of differential equations to solve LCR-circuits and harmonic motions.

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8. Find convexity and concavity of the plane curves.
9. Find the singular points and their nature of the plane curves.
10. Formation of partial differential equations.

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