

PHYSICS SYLLABUS
CLASS XI (Theory) - 2021-22

Unit I: Physical World and Measurement	
Chapter 1 Physical World	<ul style="list-style-type: none"> Physics - scope and excitement; nature of physical laws; Physics, technology and society
Chapter 2 Units and Measurements	<ul style="list-style-type: none"> Need for measurement: Units of measurement; systems of units; SI units, fundamental and derived units. Length, mass and time measurements; accuracy and precision of measuring instruments; errors in measurement; significant figures Dimensions of physical quantities, dimensional analysis and its applications
Unit II: Kinematics	
Chapter 3 Motion in a Straight Line	<ul style="list-style-type: none"> Frame of reference, Motion in a straight line: Position-time graph, speed and velocity Elementary concepts of differentiation and integration for describing motion. Uniform and non-uniform motion, average speed and instantaneous velocity. Uniformly accelerated motion, velocity time and position-time graphs Relations for uniformly accelerated motion (graphical treatment)
Chapter 4 Motion in a Plane	<ul style="list-style-type: none"> Scalar and vector quantities; Position and displacement vectors, equality of vectors, multiplication of vectors by a real number; addition and subtraction of vectors. Relative Velocity, Unit vector; Resolution of a vector in a plane - rectangular components. Scalar and vector product of vectors Motion in a plane. Cases of uniform velocity and uniform acceleration-projectile motion. Uniform circular motion.
Unit III: Laws of Motion	
Chapter 5 Laws of Motion	<ul style="list-style-type: none"> Intuitive concept of force. Inertia, Newton's first law of motion; momentum and Newton's second law of motion; impulse; Newton's third law of motion Law of conservation of linear momentum and its applications Equilibrium of concurrent forces. Static and kinetic friction, laws of friction, rolling friction, lubrication Dynamics of uniform circular motion: Centripetal force, examples of circular motion (vehicle on a level circular road, vehicle on banked road)
Unit IV: Work, Energy and Power	
Chapter 6 Work, Energy and Power	<ul style="list-style-type: none"> Work done by a constant force and a variable force; kinetic energy, work-energy theorem, power Notion of potential energy, potential energy of a spring, conservative forces: conservation of mechanical energy (kinetic and potential energies); non-conservative forces: motion in a vertical circle, elastic and inelastic collisions in one and two dimensions

PHYSICS SYLLABUS
CLASS XI (Theory) - 2021-22

Unit V: Motion of System of Particles and Rigid Body

Chapter 7
System of Particles and Rotational Motion

- Centre of mass of a two-particle system, momentum conservation and centre of mass motion
- Centre of mass of a rigid body; centre of mass of a uniform rod
- Moment of a force, torque, angular momentum, laws of conservation of angular momentum and its applications
- Equilibrium of rigid bodies, rigid body rotation and equations of rotational motion, comparison of linear and rotational motions.
- Moment of inertia, radius of gyration. Values of moments of inertia, for simple geometrical objects (no derivation). Statement of parallel and perpendicular axes theorems and their applications

Unit VI: Gravitation

Chapter 8: Gravitation

- Kepler's laws of planetary motion. The universal law of gravitation
- Acceleration due to gravity and its variation with altitude and depth
- Gravitational potential energy and gravitational potential. Escape velocity. Orbital velocity of a satellite. Geo-stationary satellites

Unit VII: Properties of Bulk Matter

Chapter 9: Mechanical Properties of Solids

- Elastic behaviour, Stress-strain relationship, Hooke's law, Young's modulus, bulk modulus, shear modulus of rigidity, Poisson's ratio; elastic energy

Chapter 10: Mechanical Properties of Fluids

- Pressure due to a fluid column; Pascal's law and its applications. (Hydraulic lift and hydraulic brakes), Effect of gravity on fluid pressure
- Viscosity, Stokes' law, terminal velocity, streamline and turbulent flow, critical velocity. Bernoulli's theorem and its applications.
- Surface energy and surface tension, angle of contact, excess of pressure across a curved surface, application of surface tension ideas to drops, bubbles and capillary rise.

Chapter 11: Thermal Properties of Matter

- Heat, temperature, thermal expansion; thermal expansion of solids, liquids and gases, anomalous expansion of water; specific heat capacity; C_p , C_v - calorimetry; change of state -latent heat capacity.
- Heat transfer-conduction, convection and radiation, thermal conductivity, Qualitative ideas of Blackbody radiation, Wein's displacement Law, Stefan's law, Green house effect

Unit VIII: Thermodynamics

Chapter 12: Thermodynamics

- Thermal equilibrium and definition of temperature (zeroth law of thermodynamics). Heat, work and internal energy. First law of thermodynamics. Isothermal and adiabatic processes
- Second law of thermodynamics: reversible and irreversible processes. Heat engine and refrigerator

PHYSICS SYLLABUS
CLASS XI (Theory) - 2021-22

Unit IX: Behaviour of Perfect Gases and Kinetic Theory of Gases

Chapter 13 Kinetic Theory	<ul style="list-style-type: none"> Equation of state of a perfect gas, work done in compressing a gas Kinetic theory of gases - assumptions, concept of pressure. Kinetic interpretation of temperature; rms speed of gas molecules; degrees of freedom, law of equi-partition of energy (statement only) and application to specific heat capacities of gases; concept of mean free path, Avogadro's number
Unit X: Oscillations and Waves	
Chapter 14 Oscillations	<ul style="list-style-type: none"> Periodic motion - time period, frequency, displacement as a function of time. Periodic functions Simple harmonic motion (S.H.M) and its equation; phase; oscillations of a loaded spring-restoring force and force constant; energy in S.H.M. Kinetic and potential energies; simple pendulum derivation of expression for its time period Free, forced and damped oscillations (qualitative ideas only), resonance
Chapter 15 Waves	<ul style="list-style-type: none"> Wave motion. Transverse and longitudinal waves, speed of wave motion. Displacement relation for a progressive wave. Principle of superposition of waves, reflection of waves, standing waves in strings and organ pipes, fundamental mode and harmonics, Beats, Doppler effect

PHYSICS SYLLABUS
CLASS XII - 2022-23

Unit I: Electrostatics

Chapter 1 Electric Charges and Fields	<ul style="list-style-type: none"> Electric Charges; Conservation of charge, Coulomb's law-force between two point charges, forces between multiple charges; superposition principle and continuous charge distribution. Electric field, electric field due to a point charge, electric field lines, electric dipole, electric field due to a dipole, torque on a dipole in uniform electric field. Electric flux, statement of Gauss's theorem and its applications to find field due to infinitely long straight wire, uniformly charged infinite plane sheet and uniformly charged thin spherical shell (field inside and outside).
Chapter 2 Electrostatic Potential and Capacitance	<ul style="list-style-type: none"> Electric potential, potential difference, electric potential due to a point charge, a dipole and system of charges; equipotential surfaces, electrical potential energy of a system of two point charges and of electric dipole in an electrostatic field. Conductors and insulators, free charges and bound charges inside a conductor. Dielectrics and electric polarisation, capacitors and capacitance, combination of capacitors in series and in parallel, capacitance of a parallel plate capacitor with and without dielectric medium between the plates, energy stored in a capacitor. (no derivation, formulae only).

PHYSICS SYLLABUS
CLASS XII - 2022-23

Unit II: Current Electricity	
Chapter 3 Current Electricity	<ul style="list-style-type: none"> • Electric current, flow of electric charges in a metallic conductor, drift velocity, mobility and their relation with electric current; Ohm's law, V-I characteristics (linear and non-linear), electrical energy and power, electrical resistivity and conductivity, temperature dependence of resistance. • Internal resistance of a cell, potential difference and emf of a cell, combination of cells in series and in parallel. <p>Kirchhoff's laws, Wheatstone bridge</p>
Unit III: Magnetic Effects of Current and Magnetism	
Chapter 4 Moving Charges and Magnetism	<ul style="list-style-type: none"> • Concept of magnetic field, Oersted's experiment • Biot - Savart law and its application to current carrying circular loop • Ampere's law and its applications to infinitely long straight wire. Straight solenoid (only qualitative treatment), Force on a moving charge in uniform magnetic and electric fields • Force on a current-carrying conductor in a uniform magnetic field. Force between two parallel current-carrying conductors- definition of ampere. Torque experienced by a current loop in uniform magnetic field; Current loop as a magnetic dipole and its magnetic dipole moment. moving coil galvanometer-its current sensitivity. and conversion to ammeter and voltmeter
Chapter 5 Magnetism and Matter	<ul style="list-style-type: none"> • Bar magnet, bar magnet as an equivalent solenoid, (qualitative treatment only) Magnetic field intensity due to a magnetic dipole (bar magnet) along its axis and perpendicular to its axis. (qualitative treatment only), Torque on a magnetic dipole (bar magnet) in a uniform magnetic field; (qualitative treatment only), magnetic field lines; • Magnetic properties of materials-Para-, dia- and ferro – magnetic substances, with examples • Magnetization of materials, effect of temperature on magnetic properties.
Unit IV: Electromagnetic Induction and Alternating Currents	
Chapter 6 Electromagnetic Induction	<ul style="list-style-type: none"> • Electromagnetic induction; Faraday's laws, induced emf and current; Lenz's Law, Self and mutual induction
Chapter 7 Alternating Current	<ul style="list-style-type: none"> • Alternating currents, peak and rms value of alternating current/voltage; reactance and impedance; LCR series circuit, (phasors only), resonance; power in AC circuits, wattless current • AC generator and transformer.
Unit V: Electromagnetic waves	
Chapter 8 Electromagnetic Waves	<ul style="list-style-type: none"> • Basic idea of displacement current. Electromagnetic waves and their characteristics Transverse nature of electromagnetic waves. (Qualitative ideas only) • Electromagnetic spectrum (radio waves, microwaves, infrared, visible, ultraviolet, X-rays, gamma rays) including elementary facts about their uses

PHYSICS SYLLABUS
CLASS XII - 2022-23

Unit VI: Optics

Chapter 9
Ray Optics and Optical Instruments.

- Ray Optics:
- Reflection of light, spherical mirrors, mirror formula. Refraction of light, total internal reflection and optical fibers, refraction at spherical surfaces, lenses, thin lens formula, lensmaker's formula. Magnification, power of a lens, combination of thin lenses in contact.. Refraction of light through a prism
- Optical instruments: Microscopes and astronomical telescopes (reflecting and refracting) and their magnifying powers

Chapter 10
Wave Optics

- Wave optics: Wave front and Huygen's principle, reflection and refraction of plane wave at a plane surface using wave fronts. Proof of laws of reflection and refraction using Huygen's principle. Interference Young's double slit experiment and expression for fringe width, (No derivation final expression only) coherent sources and sustained interference of light. Diffraction due to a single slit, width of central maximum, (qualitative treatment only).

Unit VII: Dual Nature of Matter and Radiation

Chapter 11
Dual Nature of Radiation and Matter

- Dual nature of radiation. Photoelectric effect, Hertz and Lenard's observations; Einstein's photoelectric equation-particle nature of light. Experimental study of photoelectric effect
- Matter waves-wave nature of particles, de Broglie relation

Unit VIII: Atoms & Nuclei

Chapter 12
Atoms

- Alpha-particle scattering experiment; Rutherford's model of atom; Bohr model, of hydrogen atom, Expression for radius of nth possible orbit, velocity and energy of electron in this orbit, hydrogen line spectra (qualitative treatment only).

Chapter 13
Nuclei

- Composition and size of nucleus, nuclear force
- Mass-energy relation, mass defect; binding energy per nucleon and its variation with mass number; nuclear fission, nuclear fusion

Unit IX: Electronic Devices

Chapter 14: Semiconductor Electronics: Materials, Devices and Simple Circuits

- Energy bands in solids conductors, insulator and semiconductors; (Qualitative ideas only)) Intrinsic and extrinsic semiconductors- p and n type, p-n junction Semiconductor diode– I-V characteristics in forward and reverse bias, application of junction diode - diode as a rectifier

CHEMISTRY SYLLABUS CLASS XI (2021-22)		
CHAPTER	CHAPTER NAME	SUB TOPICS
1	Some Basic Concepts of Chemistry	General Introduction: Importance and scope of Chemistry. Atomic and molecular masses, mole concept and molar mass, percentage composition, empirical and molecular formula, chemical reactions, stoichiometry and calculations based on stoichiometry.
2	Structure of Atom	Bohr's model and its limitations, concept of shells and subshells, dual nature of matter and light, de Broglie's relationship, Heisenberg uncertainty principle, concept of orbitals, quantum numbers, shapes of s, p and d orbitals, rules for filling electrons in orbitals - Aufbau principle, Pauli's exclusion principle and Hund's rule, electronic configuration of atoms, stability of half-filled and completely filled orbitals
3	Classification of Elements and Periodicity in Properties	Modern periodic law and the present form of periodic table, periodic trends in properties of elements -atomic radii, ionic radii, inert gas radii, ionization enthalpy, electron gain enthalpy, electronegativity, valency. Nomenclature of elements with atomic number greater than 100
4	Chemical Bonding and Molecular Structure	Valence electrons, ionic bond, covalent bond, bond parameters, Lewis structure, polar character of covalent bond, covalent character of ionic bond, valence bond theory, resonance, geometry of covalent molecules, VSEPR theory, concept of hybridization, involving s, p and d orbitals and shapes of some simple molecules, molecular orbital theory of homonuclear diatomic molecules (qualitative idea only), Hydrogen bond
5	States of Matter: Gases and Liquids	Three states of matter, intermolecular interactions, types of bonding, melting and boiling points, role of gas laws in elucidating the concept of the molecule, Boyle's law, Charles law, Gay Lussac's law, Avogadro's law, ideal behaviour, empirical derivation of gas equation, Avogadro's number, ideal gas equation and deviation from ideal behaviour.
6	Chemical Thermodynamics	Concepts of System and types of systems, surroundings, work, heat, energy, extensive and intensive properties, state functions. First law of thermodynamics -internal energy and enthalpy, measurement of ΔU and ΔH , Hess's law of constant heat summation, enthalpy of bond dissociation, combustion, formation, atomization, sublimation, phase transition, ionization, solution and dilution. Second law of Thermodynamics (brief introduction) Introduction of entropy as a state function, Gibb's energy change for spontaneous and nonspontaneous processes. Third law of thermodynamics (brief introduction).
7	Equilibrium	Equilibrium in physical and chemical processes, dynamic nature of equilibrium, law of mass action, equilibrium constant, factors affecting equilibrium - Le Chatelier's principle, ionic equilibrium- ionization of acids and bases, strong and weak electrolytes, degree of ionization, ionization of poly basic acids, acid strength, concept of pH, buffer solution, solubility product, common ion effect (with illustrative examples).

CHEMISTRY SYLLABUS
CLASS XI (2021-22)

CHAPTER	CHAPTER NAME	SUB TOPICS
8	Redox Reactions	Concept of oxidation and reduction, redox reactions, oxidation number, balancing redox reactions, in terms of loss and gain of electrons and change in oxidation number
9	Hydrogen	Position of hydrogen in periodic table, occurrence, isotopes, hydrides-ionic covalent and interstitial; physical and chemical properties of water, heavy water, hydrogen as a fuel
10	s-Block Elements	Group 1 and Group 2 Elements -General introduction, electronic configuration, occurrence, anomalous properties of the first element of each group, diagonal relationship, trends in the variation of properties (such as ionization enthalpy, atomic and ionic radii), trends in chemical reactivity with oxygen, water, hydrogen and halogens, uses.
11	Some p-Block Elements	General Introduction to p -Block Elements Group 13 Elements: General introduction, electronic configuration, occurrence, variation of properties, oxidation states, trends in chemical reactivity, anomalous properties of first element of the group, Boron - physical and chemical properties. Group 14 Elements: General introduction, electronic configuration, occurrence, variation of properties, oxidation states, trends in chemical reactivity, anomalous behaviour of first elements. Carbon-catenation, allotropic forms, physical and chemical properties.
12	Organic Chemistry: Some basic Principles and Techniques	General introduction, classification and IUPAC nomenclature of organic compounds. Electronic displacements in a covalent bond: inductive effect, electromeric effect, resonance and hyper conjugation. Homolytic and heterolytic fission of a covalent bond: free radicals, carbocations, carbanions, electrophiles and nucleophiles, types of organic reactions.
13	Hydrocarbons	Classification of Hydrocarbons Aliphatic Hydrocarbons: Alkanes - Nomenclature, isomerism, conformation (ethane only), physical properties, chemical reactions. Alkenes - Nomenclature, structure of double bond (ethene), geometrical isomerism, physical properties, methods of preparation, chemical reactions: addition of hydrogen, halogen, water, hydrogen halides (Markovnikov's addition and peroxide effect), ozonolysis, oxidation, mechanism of electrophilic addition. Alkynes - Nomenclature, structure of triple bond (ethyne), physical properties, methods of preparation, chemical reactions: acidic character of alkynes, addition reaction of - hydrogen, halogens, hydrogen halides and water. Aromatic Hydrocarbons: Introduction, IUPAC nomenclature, benzene: resonance, aromaticity, chemical properties: mechanism of electrophilic substitution. Nitration, sulphonation, halogenation, Friedel Craft's alkylation and acylation, directive influence of functional group in monosubstituted benzene. Carcinogenicity and toxicity

CHEMISTRY SYLLABUS
CLASS XII (2022-23)

CHAPTER	CHAPTER NAME	SUB TOPICS
1	Solutions	Types of solutions, expression of concentration of solutions of solids in liquids, solubility of gases in liquids, solid solutions, Raoult's law, colligative properties - relative lowering of vapour pressure, elevation of boiling point, depression of freezing point, osmotic pressure, determination of molecular masses using colligative properties, abnormal molecular mass, Van't Hoff factor.
2	Electrochemistry	Redox reactions, EMF of a cell, standard electrode potential, Nernst equation and its application to chemical cells, Relation between Gibbs energy change and EMF of a cell, conductance in electrolytic solutions, specific and molar conductivity, variations of conductivity with concentration, Kohlrausch's Law, electrolysis and law of electrolysis (elementary idea), dry cell-electrolytic cells and Galvanic cells, lead accumulator, fuel cells, corrosion.
3	Chemical Kinetics	Rate of a reaction (Average and instantaneous), factors affecting rate of reaction: concentration, temperature, catalyst; order and molecularity of a reaction, rate law and specific rate constant, integrated rate equations and half-life (only for zero and first order reactions), concept of collision theory (elementary idea, no mathematical treatment), activation energy, Arrhenius equation.
4	d -and f -Block Elements	General introduction, electronic configuration, occurrence and characteristics of transition metals, general trends in properties of the first-row transition metals – metallic character, ionization enthalpy, oxidation states, ionic radii, colour, catalytic property, magnetic properties, interstitial properties, alloy formation, preparation and properties of $K_2Cr_2O_7$ and $KMnO_4$. Lanthanoids- electronic configuration, oxidation states, chemical reactivity and lanthanoid contraction and its consequences. Actinoids- electronic configuration, oxidation states, comparison with lanthanoids
5	Coordination Compounds	Coordination compounds - Introduction, ligands, coordination number, colour, magnetic properties and shapes, IUPAC nomenclature of mononuclear coordination compounds. Bonding, Werner's theory, VBT, and CFT; structure and stereoisomerism, the importance of coordination compounds (in qualitative analysis, extraction of metals and biological system).
6	Haloalkanes and Haloarenes	Haloalkanes: Nomenclature, nature of C–X bond, physical and chemical properties, optical rotation mechanism of substitution reactions. Haloarenes: Nature of C–X bond, substitution reactions (Directive influence of halogen in monosubstituted compounds only). Uses and environmental effects of - dichloromethane, trichloromethane, tetrachloromethane, iodoform, freons, DDT.
7	Alcohols, Phenols and Ethers	Nomenclature, methods of preparation, physical and chemical properties (of primary alcohols only), identification of primary, secondary and tertiary alcohols, mechanism of dehydration, uses with special reference to methanol and ethanol. Phenols: Nomenclature, methods of preparation, physical and chemical properties, acidic nature of phenol, electrophilic substitution reactions, uses of phenols. Ethers: Nomenclature, methods of preparation, physical and chemical properties, uses.

CHEMISTRY SYLLABUS
CLASS XII (2022-23)

CHAPTER	CHAPTER NAME	SUB TOPICS
8	Aldehydes, Ketones and Carboxylic Acids	Aldehydes and Ketones: Nomenclature, nature of carbonyl group, methods of preparation, physical and chemical properties, mechanism of nucleophilic addition, reactivity of alpha hydrogen in aldehydes, uses. Carboxylic Acids: Nomenclature, acidic nature, methods of preparation, physical and chemical properties; uses.
9	Amines	Amines: Nomenclature, classification, structure, methods of preparation, physical and chemical properties, uses, identification of primary, secondary and tertiary amines. Diazonium salts: Preparation, chemical reactions and importance in synthetic organic chemistry.
10	Biomolecules	Carbohydrates - Classification (aldoses and ketoses), monosaccharides (glucose and fructose), D-L configuration oligosaccharides (sucrose, lactose, maltose), polysaccharides (starch, cellulose, glycogen); Importance of carbohydrates. Proteins -Elementary idea of - amino acids, peptide bond, polypeptides, proteins, structure of proteins - primary, secondary, tertiary structure and quaternary structures (qualitative idea only), denaturation of proteins; enzymes. Hormones - Elementary idea excluding structure. Vitamins - Classification and functions. Nucleic Acids: DNA and RNA.

MATHEMATICS SYLLABUS
CLASS XI (Theory) - 2021-22

Unit-I: Sets and Functions

1. Sets

Sets and their representations, Empty set, Finite and Infinite sets, Equal sets, Subsets. Subsets of a set of real numbers especially intervals (with notations). Power set. Universal set. Venn diagrams. Union and Intersection of sets.

2. Relations & Functions

Ordered pairs. Cartesian product of sets. Number of elements in the Cartesian product of two finitesets. Cartesian product of the set of reals with itself. Definition of relation, pictorial diagrams, domain, co-domain and range of a relation. Function as a special type of relation. Pictorial representation of a function, domain, co-domain and range of a function. Real valued functions, domain and range of these functions, constant, identity, polynomial, rational, modulus, signum, exponential, logarithmic and greatest integer functions, with their graphs.

3. Trigonometric Functions

Positive and negative angles. Measuring angles in radians and in degrees and conversion from one measure to another. Definition of trigonometric functions with the help of unit circle. Truth of the identity $\cos^2x + \sin^2x = 1$, for all x . Signs of trigonometric functions. Domain and range of trigonometric functions and their graphs. Expressing $\sin(x \pm y)$ and $\cos(x \pm y)$ in terms of $\sin x$, $\sin y$, $\cos x$ & $\cos y$ and their simple applications. Deducing identities like the following:

$$\tan(x \pm y) = \frac{\tan x \pm \tan y}{1 \mp \tan x \tan y}, \quad \cot(x \pm y) = \frac{(\cot x \cot y) \mp 1}{\cot y \pm \cot x}$$

$$\sin \alpha \pm \sin \beta = 2 \sin \left(\frac{\alpha \pm \beta}{2} \right) \cos \left(\frac{\alpha \mp \beta}{2} \right)$$

$$\cos \alpha + \cos \beta = 2 \cos \left(\frac{\alpha + \beta}{2} \right) \cos \left(\frac{\alpha - \beta}{2} \right)$$

$$\cos \alpha - \cos \beta = -2 \sin \left(\frac{\alpha + \beta}{2} \right) \sin \left(\frac{\alpha - \beta}{2} \right)$$

Identities related to $\sin 2x$, $\cos 2x$, $\tan 2x$, $\sin 3x$, $\cos 3x$ and $\tan 3x$.

Unit-II: Algebra

1. Complex numbers and Quadratic Equations

Need for complex numbers, especially $\sqrt{-1}$, to be motivated by inability to solve some of the quadratic equations. Algebraic properties of complex numbers. Statement of

Fundamental Theorem of Algebra, solution of quadratic equations (with real coefficients) in the complex number system.

2. Linear Inequalities

Linear inequalities. Algebraic solutions of linear inequalities in one variable and their representation on the number line. Graphical solution of linear inequalities in two variables. Graphical method of finding a solution of system of linear inequalities in two variables.

3. Permutations & Combinations

Fundamental principle of counting. Factorial n . ($n!$) Permutations and combinations, simple applications.

4. Sequence & Series

Sequence and Series. Arithmetic Progression (A. P.). Arithmetic Mean (A.M.) Geometric Progression (G.P.), general term of a G.P., sum of n terms of a G.P., infinite G.P. and its sum, geometric mean (G.M.), relation between A.M. and G.M.

Unit-III: Co-ordinate Geometry

1. Straight Lines

Brief recall of two dimensional geometry from earlier classes. Slope of a line and angle between two lines. Various forms of equations of a line: parallel to axis, point -slope form, slope-intercept form, two-point form, intercept form and normal form. General equation of a line. Distance of a point from a line.

2. Conic Sections

Sections of a cone: circles, ellipse, parabola, hyperbola. Standard equations and simple properties of parabola, ellipse and hyperbola. Standard equation of a circle.

3. Introduction to Three-Dimensional Geometry

Coordinate axes and coordinate planes in three dimensions. Coordinates of a point. Distance between two points and section formula.

Unit-IV: Calculus

1. Limits & Derivatives

Derivative introduced as rate of change both as that of distance function and geometrically. Intuitive idea of limit. Limits of polynomials and rational functions trigonometric, exponential and logarithmic functions. Definition of derivative relate it to slope of tangent of the curve, derivative of sum, difference, product and quotient of functions. Derivatives of polynomial and trigonometric functions.

Unit-V: Statistics & Probability

1. Statistics

Measures of Dispersion: Range, mean deviation, variance, and standard deviation of ungrouped/grouped data.

2. Probability

Random experiments: outcomes, sample spaces (set representation). Events: occurrence of events, 'not', 'and' and 'or' events, exhaustive events, mutually exclusive events. Probability of an event, probability of 'not', 'and' and 'or' events.

MATHEMATICS (XII)
CLASS XII (Theory) - 2022-23

Unit-I: Relations & Functions

1. Relations & Functions

Types of relations: reflexive, symmetric, transitive and equivalence relations.
One to one and onto functions.

2. Inverse Trigonometric Functions

Definition, range, domain, principal value branch. Graphs of inverse trigonometric functions.

Unit-II: Algebra

1. Matrices

Concept, notation, order, equality, types of matrices, zero and identity matrix, transpose of a matrix, symmetric and skew symmetric matrices. Operation on matrices: Addition and multiplication and multiplication with a scalar. Simple properties of addition, multiplication and scalar multiplication. On- commutativity of multiplication of matrices and existence of non-zero matrices whose product is the zero matrix (restrict to square matrices of order 2). Invertible matrices and proof of the uniqueness of inverse, if it exists; (Here all matrices will have real entries).

2. Determinants

Determinant of a square matrix (up to 3 x 3 matrices), minors, co-factors and applications of determinants in finding the area of a triangle. Adjoint and inverse of a square matrix. Consistency, inconsistency and number of solutions of system of linear equations by examples, solving system of linear equations in two or three variables (having unique solution) using inverse of a matrix.

Unit-III: Calculus

1. Continuity & Differentiability

Continuity and differentiability, chain rule, derivative of inverse trigonometric functions like $\sin^{-1} x$, $\cos^{-1} x$ and $\tan^{-1} x$, derivative of implicit functions. Concept of exponential & logarithmic functions.

Derivatives of logarithmic and exponential functions. Logarithmic differentiation, derivative of functions expressed in parametric forms. Second order derivatives.

2. Applications of Derivatives

Applications of derivatives: rate of change of bodies, increasing/decreasing functions, maxima and minima (first derivative test motivated geometrically and second derivative test given as a provable tool). Simple problems (that illustrate basic principles and understanding of the subject as well as real- life situations).

3. Integrals

Integration as inverse process of differentiation. Integration of a variety of functions by substitution, by partial fractions and by parts, Evaluation of simple integrals of the following types and problems based on them.

$$\int \frac{dx}{x^2 \pm a^2}, \int \frac{dx}{\sqrt{x^2 \pm a^2}}, \int \frac{dx}{\sqrt{a^2 - x^2}}, \int \frac{dx}{ax^2 + bx + c}, \int \frac{dx}{\sqrt{ax^2 + bx + c}},$$
$$\int \frac{px + q}{ax^2 + bx + c} dx, \int \frac{px + q}{\sqrt{ax^2 + bx + c}} dx, \int \sqrt{a^2 \pm x^2} dx, \int \sqrt{x^2 - a^2} dx,$$
$$\int \sqrt{ax^2 + bx + c} dx$$

Fundamental Theorem of Calculus (without proof). Basic properties of definite integrals and evaluation of definite integrals.

4. Applications of Integrals

Applications in finding the area under simple curves, especially lines, circles/parabolas/ellipses (in standard form only)

5. Differential Equations

Definition, order and degree, general and particular solutions of a differential equation. Solution of differential equations by method of separation of variables, solutions of homogeneous differential equations of first order and first degree. Solutions of linear differential equation of the type:

$$\frac{dy}{dx} + py = q, \text{ where } p \text{ \& } q \text{ are functions of } x \text{ or constants}$$

$$\frac{dx}{dy} + px = q, \text{ where } p \text{ and } q \text{ are functions of } y \text{ or constants}$$

Unit-IV: Vectors and Three-Dimensional Geometry

1. Vectors

Vectors and scalars, magnitude and direction of a vector. Direction cosines and direction ratios of a vector. Types of vectors (equal, unit, zero, parallel and collinear vectors), position vector of a point, negative of a vector, components of a vector, addition of vectors, multiplication of a vector by a scalar, position vector of a point dividing a line segment in a given ratio. Definition, Geometrical Interpretation, properties and application of scalar (dot) product of vectors, vector (cross) product of vectors.

2. Three- Dimensional Geometry

Direction cosines and direction ratios of a line joining two points. Cartesian equation and vector equation of a line, skew lines, shortest distance between two lines. Angle between two lines.

Unit-V: Linear Programming

1. Linear Programming

Introduction, related terminology such as constraints, objective function, optimization, graphical method of solution for problems in two variables, feasible and infeasible regions (bounded or unbounded), feasible and infeasible solutions, optimal feasible solutions (up to three non-trivial constraints).

Unit-VI: Probability

1. Probability

Conditional probability, multiplication theorem on probability, independent events, total probability, Bayes' theorem, Random variable and its probability distribution, mean of random variable.