TOPIC	CONTENT
Unit 1 : **Basic Algebra**	Real Numbers - Revision: Rational, Irrational Numbers, Expressing inequalities like $x < 2$ or $x \geq 3$ using intervals; Absolute value of x; Exponents - Revision: Properties of exponents, Converting radicals/surds to exponents. Rationalizing fractions with surds; Polynomials - Addition, multiplication and factorization of polynomials, Identities for $(x + \alpha)(x + b)$, $(\alpha \pm b)^2$, $(\alpha \pm b)^3$ $(\alpha + b)(\alpha - b)$, $(\alpha^3 \pm b^3)$, $(x^n -1)$ Method of undetermined coefficients to find a polynomial of given degree; Rational Expressions Simplification of rational expressions by factorization, Partial fractions: linear and quadratic factors; Graphs – Graphical representation of data, Interpreting a graph and answering questions based on it; Equations and simple inequalitiesroots of Linear Equations, quadratic equations, roots of a factored polynomial equation; solving equations with radicals and absolute value; solving simple linear inequalities, graphical representation of equations and inequalities
Unit 2 : **Sets , Relations and Functions**	Sets - recalling: Definitions and Examples, types of sets, algebra of sets, De Morgan Laws, venn diagrams, practical problems; Intervals - open and closed intervals, other types of intervals, neighbourhood of a Point; Cartesian product of sets - definition and examples; Relations - special relations: reflexive, symmetric, transitive, antisymmetric and equivalence relations; Functions and Graphs of Algebraic functions - functions as a formula, real valued functions, identity function, polynomial functions, rational functions, absolute value functions, Signum functions, greatest integer functions; Algebra of functions - addition, subtraction, multiplication and quotient of functions, composition of functions, one to one and onto functions, Inverse of a function
Unit 3 : **Trigonometry**	Basic concepts - angles, signs of an angle, degree and radian measures, trigonometric ratios for all angles, basic trigonometric identities; Formulae for sum of angles and sum and products of trigonometric ratios - formulae for $\sin(A \pm B)$, $\cos (A \pm B)$, $\tan(A \pm B)$, sin2A, cos2A, tan2A, sin3A, cos3A, tan3A, sum and product formulae: $\sin C \pm \sin D$, $\cos C \pm \cos D$ sinAcosB, cosAcosB, sinAsinB; Trigonometric equations - general solutions of the trigonometric equations: $\sin \theta = \sin \alpha$, $\cos\theta = \cos\alpha$, $\tan\theta = \tan \alpha$, a $\cos\theta + b \sin \theta = c$; Properties of Triangles - sine and cosine rule: Projection and area formulae, application to triangles; Inverse trigonometric functions - definitions, Identities and simple problems
Unit 4 : **Combinatorics**	Factorials - definition and examples; Permutations - fundamental principle of counting, permutation of distinct objects, not all

	distinct objects, simple problems; Combinations - definition, relation between Permutation and combinations, properties, simple problems; Mathematical Induction - principles, simple problems
Unit 5 : **Finite and** **Infinite Series**	Binomial theorem - Binomial theorem for positive integral index (proof using combinations and also by induction), applications of binomial theorem; Sequence and Series - AP, GP, HP: Terms and Sum of AP and GP, Arithmetic and Geometric means. Problems on sum of finite series, Arithmetico-geometric progression. $\sum n$, $\sum n^2$, $\sum n^3$ and telescopic sums for series like $\sum \dfrac{1}{n(n+1)}$; Infinite Series - Infinite Geometric Series; Infinite Arithmetico – Geometric Series; Infinite series using principle of telescopic sums; Exponential and logarithmic series (without proof); Binomial theorem for all rational index as an infinite series (without proof)
Unit 6 : **Two Dimensional** **Analytic** **geometry – I**	Locus of a point - definition and simple examples; Straight lines - various forms of equation: Slope – point, Slope – intercept, two points, intercepts, normal and parametric forms; general form; related problems; Pair of Straight lines - equation of a pair of straight lines, problems related with: distance of a point from a line, distance between two parallel lines, equation of a line bisecting the angle between two lines
Unit 7 : **Matrices and** **Determinants -I**	Matrices - definition, concept and types of matrices, operations of transpose, scalar multiplication, multiplying a row or column by a number, adding two rows/columns, reducing a matrix into triangular and echelon form, addition and multiplication of matrices, solving simultaneous linear equations by Gaussian Elimination Method; Determinants - definition of a determinant and its evaluations, properties of determinants, using properties of determinants to evaluate the value, product of determinants, determinant of a square matrix, singular and non-singular matrices
Unit 8 : **Vectors –I**	Scalars and Vector - Concept of scalars and vectors, Magnitude and direction of a general vector, free vectors, localized vectors, zero vector, unit vector, negative of a vector, algebra of vectors, resolution of a vector, vector Arithmetic in space (3D) using $\vec{I}$, $\vec{J}$, $\vec{K}$, , direction ratios and direction cosines; Vector Algebra - equality of vectors, collinear vectors, co-planar vectors, co-initial vectors, like vectors , unlike vectors, triangle law, parallelogram law, Polygon law; Applications of Vector Algebra – position vector of a point, distinction between position vectors and free vectors, section formulae, problems; Product of two vectors - angle between two vectors, definition of dot product, geometrical meaning, properties, definition of cross product, geometrical meaning, properties, applications to geometry, trigonometry and physics
Unit 9 :	Limits - approximations and errors, intuitive understanding of limit

Limits, Continuity and Differentiability	as an extension of approximation, Left hand limits and Right hand limits, definition of Limit, properties of limit, Limit theorems, Standard limits $$\lim_{x \to \alpha} \frac{x^n - \alpha^n}{x - \alpha}, \lim_{x \to 0} \frac{\sin x}{x}, \lim_{x \to} 0 \frac{e^x - 1}{x}, \lim_{x \to 0} \frac{\log(x+1)}{x},$$ Evaluation of limits; Continuity - graphical meaning of continuity of a function, visual identification of continuity and discontinuity, formal definition of continuity , examples, points of discontinuity, kinds of discontinuity, algebra of continuous functions, composite function theorem, standard problems; Slope as Limits - finding the slope of straight lines and curves, definition of a derivative as limit, evaluation of simple derivatives; Differentiability - graphical understanding of differentiability and non-differentiability, formal definition of differentiability and examples, relation between continuity and differentiability, evaluation of derivatives using first principle, properties of derivatives, derivatives as a rate of change, slope of a straight line
Unit 10 : Differential Calculus	Methods of differentiation - differentiation formulae: addition, product, quotient rules, derivative of composite functions, power functions, trigonometric functions, derivative of implicit functions, parametric differentiation, meaning of second, third and higher order derivatives (with problems restricted to second order), differentiation of functions with respect to another functions
Unit 11 : Integral Calculus	Indefinite integral as Anti-derivative - integration as ant derivative, Properties of integrals and integrals of standard functions and also functions of the form $$\sqrt{\alpha^2 - x^2}, \sqrt{x^2 \pm \alpha^2}, \frac{1}{\alpha^2 - x^2}, \frac{1}{\sqrt{\alpha^2 - x^2}}, \frac{1}{\sqrt{x^2 \pm \alpha^2}};$$ Methods of Integration - properties of integration, indefinite integrals: decomposition, substitution, partial fractions and integration by parts methods.