Syllabus for BSDS Admission Test

- **Sets, relations and functions**

  Sets and their representations; Union, intersection, difference and complement of sets and their algebraic properties; Power set.

  Types of relations and equivalence relations.

  Functions as maps; One-one, into and onto functions; Essential real-valued functions such as polynomials, rational, trigonometric, logarithmic, and exponential functions; Equations involving polynomials, exponential and logarithmic functions; Inverse functions; Transformation of functions; Composition of functions; Graphs of simple functions.

- **Complex number system**

  Different representations of complex numbers; Conjugate, modulus and argument of a complex number; Powers of complex numbers; Roots of unity; Quadratic equations and their solutions; Fundamental theorem of algebra.

- **Basics of combinatorics**

  Permutation and combination; Fundamental principles of counting; Binomial theorem and its applications; Principle of mathematical induction and its applications.

- **Sequence and series**

  Arithmetic and geometric progressions and their combinations; Convergence of infinite series; Sums of integer powers of natural numbers; Relationship between arithmetic and geometric means.

- **Limits, continuity and differentiability of functions**

  Definition of limit, continuity and differentiability; Properties of continuous functions and differentiable functions; Chain rule of differentiation; Differentiation of trigonometric, inverse trigonometric, logarithmic, exponential, composite, and implicit functions; Rolle's theorem and mean-value theorem and their applications; Maxima and minima of functions of one variable.

- **Trigonometry**

  Trigonometric functions and their inverses; Trigonometric identities and equations; applications to measuring heights, computation of distances and areas.

- **Integral calculus**

  Integrals as limits of sums; Properties of indefinite integrals; Fundamental theorem of calculus and its simple applications; Fundamental integral involving algebraic, trigonometric, exponential, and logarithmic functions. Integration by substitution and by parts; Definite integrals, their properties, and applications to determining areas of regions bounded by simple and standard curves.

- **Basics of differential equations**

  Ordinary differential equations, their order and degree; First order linear differential equations; Solving differential equations by methods of separation of variables and substitution; Solution of homogeneous and first order linear differential equations.

- **Coordinate geometry**

  Cartesian system and locus of a point; Straight lines and their intersections; Angles between straight lines and distance between a point and a straight line; Equation of a circle, its radius and centre; Equations of conic sections (parabola, ellipse, and hyperbola) in standard forms and in parametric forms; Tangent and normal at a point on a circle and on conics

- **Vector algebra**

  Vectors and scalars; Addition of vectors; Components of a vector in two dimensions and three dimensional space; Scalar (dot) and vector (cross) products; Scalar and vector triple products; Simple properties and applications: Directions ratios, and direction cosines; Angle between two straight lines and skew lines; Point of intersection of two straight lines and shortest distance between two straight lines.

- **3-dimensional geometry**

  Coordinates of points in 3D space; Angles between straight lines and planes; Intersection formulas

- **Matrices and determinants**

  Algebra of matrices; Types of matrices; Matrices of order two and three; Evaluation of determinants; Adjoint and determinant of a matrix; Evaluation of the inverse of a non-singular matrix; Properties of matrix inverses; Elementary transformations of a matrix; Rank of a matrix; Test of consistency and solution of simultaneous linear equations in two or three variables using matrices.

- **Introductory statistics and probability**

  Measures of centrality and dispersion; Mean, median, mode, variance and standard deviation for grouped and ungrouped data.

  Probability of an event; Fundamental rules of probability calculation; Probability distribution; Binomial distribution; Bayes' theorem.