SYLLABUS

Time : 3 Hrs   Max. Marks : 80

Unit		No. of Periods	Marks
I	Relations and Functions	30	08
II	Algebra	50	10
III	Calculus	80	35
IV	Vectors and Three-Dimensional Geometry	30	14
V	Linear Programming	20	05
VI	Probability	30	08
	Total	240	80
	Internal Assessment		20

UNIT I   Relations and Functions

Chapter 1 : Relations and Functions   **15 Periods**

Types of relations—reflexive, symmetric, transitive and equivalence relations.
One-one and onto functions.

Chapter 2 : Inverse Trigonometric Functions   **15 Periods**

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

UNIT II   Algebra

Chapter 3 : Matrices   **25 Periods**

Concept, notation, order, equality, types of matrices, zero and identity matrix,
transpose of a matrix, symmetric and skew-symmetric matrices. Operation on Matrices:
Addition, 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).

Chapter 4 : Determinants   **15 Periods**

Determinant of a square matrix (upto 3×3 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

20 Periods

Chapter 5 : Continuity and Differentiability

Continuity and differentiability, chain rule, derivatives of inverse trigonometric functions, derivative of implicit functions. Concept of exponential and logarithmic functions.

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

10 Periods

Chapter 6 : 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).

20 Periods

Chapter 7 : 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 type and problems 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.

15 Periods

Chapter 8 : Applications of Integrals

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

15 Periods

Chapter 9 : Differential Equations

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

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

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

UNIT IV

Vectors and Three-Dimensional Geometry

Chapter 10 : Vectors

15 Periods

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.

Chapter 11 : Three-Dimensional Geometry

15 Periods

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

UNIT V Linear Programming

Chapter 12 : Linear Programming

20 Periods

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

UNIT VI Probability

Chapter 13 : Probability

30 Periods

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