

SYLLABUS

- (1) **APPLICATIONS OF MATRICES AND DETERMINANTS** : *Adjoint, Inverse* – Properties, Computation of inverses, solution of system of linear equations by matrix inversion method. *Rank of a Matrix* – Elementary transformation on a matrix, consistency of a system of linear equations, Cramer's rule, Non-homogeneous equations, homogeneous linear system, rank method.

- (2) **VECTOR ALGEBRA** : *Scalar Product* – Angle between two vectors, properties of scalar product, applications of dot products. *Vector Product* – Right handed and left handed systems, properties of vector product, applications of cross product. *Product of three vectors* – Scalar triple product, properties of scalar triple product, vector triple product, vector product of four vectors, scalar product of four vectors. *Lines* – Equation of a straight line passing through a given point and parallel to a given vector, passing through two given points (derivations are not required), angle between two lines. *Skew lines* – Shortest distance between two lines, condition for two lines to intersect, point of intersection, collinearity of three points. *Planes* – Equation of a plane (derivations are not required), passing through a given point and perpendicular to a vector, given the distance from the origin and unit normal, passing through a given point and parallel to two given vectors, passing through two given points and parallel to a given vector, passing through three given non-collinear points, passing through the line of intersection of two given planes, the distance between a point and a plane, the plane which contains two given lines, angle between two given planes, angle between a line and a plane. *Sphere* – Equation of the sphere (derivations are not required) whose centre and radius are given, equation of a sphere when the extremities of the diameter are given

- (3) **COMPLEX NUMBERS** : Complex number system, *Conjugate* – properties, ordered pair representation. *Modulus* – properties, geometrical representation, meaning, polar form, principal value, conjugate, sum, difference, product, quotient, vector interpretation, solutions of polynomial equations, De Moivre's theorem and its applications. *Roots of a complex number* – n th roots, cube roots, fourth roots.

- (4) **ANALYTICAL GEOMETRY** : *Definition of a Conic* – General equation of a conic, classification with respect to the general equation of a conic, classification of conics with respect to eccentricity. *Parabola* – Standard equation of a parabola

(derivation and tracing the parabola are not required), other standard parabolas, the process of shifting the origin, general form of the standard equation, some practical problems. **Ellipse** – Standard equation of the ellipse (derivation and tracing the ellipse are not required), $x^2/a^2 + y^2/b^2 = 1$, ($a > b$), Other standard form of the ellipse, general forms, some practical problems, **Hyperbola** – standard equation (derivation and tracing the hyperbola are not required), $x^2/a^2 - y^2/b^2 = 1$, Other form of the hyperbola, parametric form of conics, chords. **Tangents and Normals** – Cartesian form and **Parametric form**, equation of chord of contact of tangents from a point (x_1, y_1) , **Asymptotes, Rectangular hyperbola** – standard equation of a rectangular hyperbola.

- (5) **DIFFERENTIAL CALCULUS – APPLICATIONS I : Derivative as a rate measure** – rate of change – velocity – acceleration – related rates – Derivative as a measure of slope – tangent, normal and angle between curves. Maxima and Minima. **Mean value theorem** – Rolle's Theorem – Lagrange Mean Value Theorem – Taylor's and Maclaurin's series, l' Hôpital's Rule, stationary points – increasing, decreasing, maxima, minima, concavity convexity, points of inflexion.
- (6) **DIFFERENTIAL CALCULUS – APPLICATIONS II : Errors and approximations** – absolute, relative, percentage errors, curve tracing, partial derivatives – Euler's theorem.
- (7) **INTEGRAL CALCULUS AND ITS APPLICATIONS** : Properties of definite integrals, reduction formulae for $\sin^n x$ and $\cos^n x$ (only results), Area, length, volume and surface area
- (8) **DIFFERENTIAL EQUATIONS** : Formation of differential equations, order and degree, solving differential equations (1st order) – variable separable homogeneous, linear equations. Second order linear equations with constant coefficients $f(x) = e^{mx}$, $\sin mx$, $\cos mx$, x , x^2 .
- (9A) **DISCRETE MATHEMATICS : Mathematical Logic** – Logical statements, connectives, truth tables, Tautologies.
- (9B) **GROUPS : Binary Operations** – Semi groups – monoids, groups (Problems and simple properties only), order of a group, order of an element.
- (10) **PROBABILITY DISTRIBUTIONS** : Random Variable, Probability density function, distribution function, mathematical expectation, variance, Discrete Distributions – Binomial, Poisson, Continuous Distribution – Normal distribution