

Semester-II (Major Core-1)

Subject Title: Calculus and Coordinate Geometry (Theory)

Course Code: MT-2501

No. of Credits: 04

Learning Hours: 4 Hours/Week

Unit 1: (a) Successive Differentiation: Introduction to successive derivatives, n^{th} order derivatives of some standard functions, Leibnitz's theorem, Application of Leibnitz's theorem
(b) Mean Value theorems: Rolle's mean value theorem, Lagrange's mean value theorem, Different forms of Lagrange's mean value theorem, Cauchy's mean value theorem, Applications of mean value theorems.

Unit 2: (a) Convergence and divergence of infinite series: Definition of series, Convergent and divergent series of real numbers, sum of infinite series, different test of convergence of infinite series-convergence of geometric series, comparison test, practical comparison test, D'Alembert's ratio test, Cauchy's root test, alternating series, absolutely convergent series, power series and radius of convergence.
(b) Expansions: Taylor's and Maclaurin's Theorems statements (without proof), expansions of some standard functions as infinite power series without validity of the expansions, Applications of Taylor and Maclaurin's theorem.

Unit 3: Sphere: Definition of a sphere in R^3 , Cartesian equation of a sphere, general equation of a sphere, equation of a sphere with diametrical end points, intersection of a sphere with line/plane/ sphere (no theory and only problems), equation of a tangent plane and normal line to a sphere. The condition for tangency of a plane and normality of a line to a sphere, plane of contact, orthogonal spheres.

Unit 4: (a) Different Coordinate systems: Polar coordinates in R^2 and its relationships with Cartesian coordinates, polar equation of line/ circle/ conic and properties of conic. Spherical, cylindrical coordinates in R^3 and its relationship with Cartesian coordinates in R^3 .
(b) Cone & Cylinder: Introduction to of cone and cylinder, Cone and Cylinder generated by a guiding curve, equation of enveloping cone and cylinder, right circular cone and right circular cylinder, Problems on cone and cylinder.

Reference Books:

- 1 Differential Calculus, Shanti Narayan, S. K. Mittal, S. Chand and Co. Publication.
- 2 Anton, Biven and Davis, Calculus, 10th edition, Willey Publication.
- 3 Thomas, Calculus early transcendental, Addison-Wesley person publication.
- 4 Calculus - David V. Widder- PHI-second edition.
- 5 Calculus & Analytic Geometry - G. B. Thomas & R. L. Finney Addison-Wesley pub. India.
- 6 Calculus with Early Transcendental functions - James Stewart, Indian Edition, Engage Learning India Pvt Ltd.
- 7 Advanced Calculus Volume I & II – T. M. Apostol.
- 8 Anton, Howard, Stephen Davis, and IrlBivens. Calculus: a new horizon. New York: Wiley, 1999.
- 9 The calculus with analytic geometry, Louis Leithold, Harper & Row, 5th edition, 1986
- 10 Analytical Solid Geometry- Shanti Narayan

- 11 Co-ordinate Geometry By : R.J.T. Bell.
- 12 Solid Geometry(three dimension) – H. K. Das ,S. C. Saxena and Raisinghania , S. Chand
- 13 Coordinate Geometry, Polar Coordinate approach, M M Tripathi, Alpha Science International

Semester-II (Major Core-2)**Subject Title: Mathematics Practical-2 (Practical)****Course Code: MT-2502L****No. of Credits: 04****Learning Hours: 8 Hours/Week****List of practical to be performed:**

- (1) Problems on limit and continuity of real valued functions of one variable using definition.
- (2) Derivation of some standard derivative.
- (3) Problems on extreme values of functions of one variables.
- (4) Limit using L' Hospital's rule.
- (5) Discuss concavity and point of inflexion of a curve in \mathbb{R}^2 .
- (6) Asymptotes of curve in \mathbb{R}^2 .
- (7) Problems on successive differentiation of some standard functions.
- (8) Applications of Leibnitz's theorem.
- (9) Convergence and divergence of infinite series-I.(Based on infinite sum, geometric series, practical comparison test, Alternating series, Absolutely convergent series)
- (10) Convergence and divergence of infinite series-II. (practical ratio test and root test, convergence of power series and radius of convergence)
- (11) Expansion of functions as infinite power series using Taylor's & Maclaurin's theorem
- (12) Cardon's Method
- (13) Ferrari's Method
- (14) Problems based on Principle of Mathematical Induction
- (15) Problems on line in \mathbb{R}^3
- (16) Problems on plane in \mathbb{R}^3 .
- (17) Problems on various coordinate systems in \mathbb{R}^2 and \mathbb{R}^3 (polar, cylindrical, spherical)
- (18) Problems based on polar equation of line in \mathbb{R}^2 .
- (19) Problems based on polar equation of circle in \mathbb{R}^2 .
- (20) Problems on polar equations of conic in \mathbb{R}^2 .
- (21) Problems on Sphere-I.
- (22) Problems on Sphere-II.
- (23) Problems on cone generated by base curve and enveloping cone.
- (24) Problems on right circular cone.
- (25) Problems on cylinder generated by base curve and enveloping cylinder.
- (26) Problems on right circular cylinder.
- (27) Introduction to conicoids in \mathbb{R}^3 (types of conicoids, its properties and diagram)
- (28) Project on curves/surfaces.

Reference Books:

- 1 Differential Calculus, Shanti Narayan, S. K. Mittal, S. Chand and Co. Publication.
- 2 Anton, Biven and Davis, Calculus, 10th edition, Wiley Publication.
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- 8 Analytical Solid Geometry- Shanti Narayan
- 9 Co-ordinate Geometry By : R.J.T. Bell.
- 10 Solid Geometry(three dimension) – H. K. Das ,S. C. Saxena and Raisinghania , S. Chand
- 11 Coordinate Geometry, Polar Coordinate approach, M M Tripathi, Alpha Science International
- 12 Higher algebra- Bernard an Child.