UMA001 MATHEMATICS-I

Successive Differentiation: Higher order derivatives, n^{th} derivatives of standard functions, nth derivatives of rational functions, Leibnitz theorem.

Applications of Derivatives: Mean value theorems and their geometrical interpretation, Cartesian graphing using first and second order derivatives, Asymptotes and dominant terms, Graphing of polar curves, Polar equations for conic sections.

Sequences and Series: Introduction to sequences and Infinite series, Tests for convergence/divergence: Limit comparison test, Ratio test, Root test, Cauchy integral test, Cauchy condensation test. Alternating series, Absolute convergence and conditional convergence.

Series Expansions: Power series, Taylor series, Convergence of Taylor series, Error estimates, Term by term differentiation and integration, Multiplication and division process in power series.

Partial Differentiation: Functions of several variables, Limits and continuity, Chain rule, Change of variables, Partial differentiation of implicit functions, Taylor series of two variables, Directional derivatives and its properties, Maxima and minima by using second order derivatives.

Multiple Integrals: Change of order of integration, Change of variables, Applications of multiple integrals to areas and volumes.

Vector Calculus: Differentiation and integration of vector valued functions, velocity, acceleration, tangent, principle normal and binormal vectors, Curvature, Torsion and TNB frame. Scalar and vector fields, Gradient, Divergence and Curl. Line integrals, Work, Circulation and Flux. Green's theorem in Plane, Gauss-divergence and Stoke's theorem (without proof).

Text Books

1. *Thomas, G.B. and Finney, R.L., Calculus and Analytic Geometry, Pearson Education (2007) 9th ed.*
2. *Stewart James, Essential Calculus; Thomson Publishers (2007) 6th ed.*

Reference Books

1. *Wider David V, Advanced Calculus: Early Trancedentals, Cengage Learning (2007).*
2. *Apostol Tom M, Calculus, Vol I and II John Wiley (2003).*