

VECTOR CALCULUS (MATHEMATICS)

Unit 5: Vector-Valued Functions

5.1 Curves in Space, Limits and Continuity, Derivatives and Motion, Differentiation

Rules for Vector Function, Vector Functions of Constant Length.

5.2 Integrals of Vector Functions.

5.3 Arc Length along a Space Curve, Speed on a Smooth Curve, Unit Tangent Vector.

5.4 Curvature of a Plane Curve, Circle of Curvature for Plane Curves, Curvature and Normal Vectors for a Space Curve.

Unit 6: Integrals

6.1 Line Integral of Scalar Functions, Additivity, Line integral in the Plane.

6.2 Vector Fields, Gradient Fields, Line Integral of Vector Fields, Line Integrals with respect to dx , dy , dz .

6.3 Work done by a Force over a Curve in Space, Flow Integrals and Circulation for Velocity Fields, Flow across the Simple Closed Plane Curve.

6.4 Path Independence, Conservative and Potential Functions.

6.5 Divergence, Two forms for Green's Theorem, Green's Theorem in the Plane (Proof for special regions),

Unit 7: Surface Integrals

7.1 Parameterizations of Surfaces, Implicit surfaces.

7.2 Surface integrals, Orientation of Surfaces.

7.3 Surface Integrals of Vector Fields.

Unit 8: Applications of Integrals

8.1 The Curl Vector Field, Stokes' Theorem (without proof), Conservative Fields and Stokes' Theorem.

8.2 Divergence in three Dimensions, Divergence Theorem (without proof).

8.3 Unifying the Integral Theorems.