

SEMESTER-V

COURSE 13: VECTOR CALCULUS

Theory

Credits: 4

5 hrs/week

Course Outcomes

Students after successful completion of the course will be able to

1. Learn multiple integrals
as a natural extension of definite integral to a function of two variables
in the case of double integral/three variables in the case of triple integral.
2. Learn applications in terms of finding surface area by double integral and volume by triple integral.
3. Determine the gradient, divergence and curl of a vector and vector identities.
4. Evaluate line, surface and volume integrals.
5. understand relation between surface and volume integrals (Gauss divergence theorem), relation between line integral and volume integral (Green's theorem), relation between line and surface integral (Stokes theorem)

Course Content

Unit-1

Multiple Integrals-I

Introduction - Double integrals - Evaluation of double integrals - Properties of double integrals - Region of integration - double integration in Polar Co-ordinates - Change of variables in double integrals - change of order of integration.

Unit-2

Multiple Integrals-II

Triple integral - region of integration - change of variables - Plane areas by double integrals - surface area by double integral - Volume as a double integral, volume as a triple integral.

Unit-3

Vector differentiation

Vector differentiation - ordinary - derivatives of vectors - Differentiability - Gradient - Divergence - Curl operators - Formulae involving these operators.

Unit-4

Vector integration

Line Integrals with examples - Surface Integral with examples - Volume integral with examples.

Unit-5

Vector integration applications

Gauss theorem and applications of Gauss theorem - Green's theorem in plane and applications of Green's theorem - Stokes' theorem and applications of Stokes theorem.

Activities

Seminar/ Quiz/ Assignments/ Applications of Vector calculus to Real life Problems /Problem Solving Sessions.

Text Book

A text Book of Higher Engineering Mathematics by B.S.Grawal, Khanna Publishers, 43rd Edition

ReferenceBooks

1. Vector Calculus by P.C.Matthews, Springer Verlag publications.
2. Vector Analysis by Murray Spiegel, Schaum Publishing Company, NewYork
