

Module Code: MATH-304
Module Title: **Vector and Tensor Analysis**
Module Rating: 3 Cr. Hours

Vector Integration

- Line integrals
- Surface area and surface integrals
- Volume integrals

Integral Theorems

- Green's theorem
- Gauss divergence theorem
- Stoke's theorem

Curvilinear Coordinates

- Orthogonal coordinates
- Unit vectors in curvilinear systems
- Arc length and volume elements
- The gradient, divergence and curl
- Special orthogonal coordinate systems

Tensor Analysis

- Coordinate transformations
- Einstein summation convention
- Tensors of different ranks
- Contravariant, covariant and mixed tensors
- Symmetric and skew symmetric tensors
- Addition, subtraction, inner and outer products of tensors
- Contraction theorem, quotient law
- The line element and metric tensor
- Christoffel symbols

Recommended Books

1. F. Chorlton, *Vector and Tensor Methods*, (Ellis Horwood Publisher, Chichester, U.K., 1977)
2. M. R. Spiegel, *Vector Analysis*, (McGraw Hill Book Company, Singapore, 1981)
3. A. W. Joshi, *Matrices and Tensors in Physics*, (Wiley Eastern Limited, 1991)
4. Hwei P. Hsu, *Applied Vector Analysis*, (Harcourt Brace Jovanovich Publishers, San Diego, New York, 1984)



CHAIRMAN
Department of Mathematics
University of the Punjab
Lahore-Pakistan