

MA-303 DIFFERENTIAL GEOMETRY-I

Historical background; Motivation and applications. Index notation and summation convention; Space curves; The tangent vector field; Reparametrization; Arc length; Curvature; Principal normal; Binormal; Torsion; The osculating, the normal and the rectifying planes; The Frenet-Serret Theorem; Spherical images; Sphere curves; Spherical contacts; Fundamental theorem of space curves; Line integrals and Green's theorem; Local surface theory; Coordinate transformations; The tangent and the normal planes; Parametric curves; The first fundamental form and the metric tensor; Normal and geodesic curvatures; Gauss's formulae; Christoffel symbols of first and second kinds; Parallel vector fields along a curve and parallelism; The second fundamental form and the Weingarten map; Principal, Gaussian, Mean and Normal curvatures; Dupin indicatrices; Conjugate and asymptotic directions; Isometries and the fundamental theorem of surfaces.

RECOMMENDED BOOKS:

1. Millman, R.S and Parker., G.D. Elements of Differential Geometry, Prentice-Hall Inc., New Jersey, 1977.
2. Struik, D.J., Lectures on Classical Differential Geometry, Addison-Wesley Publishing Company, Inc., Massachusetts, 1977.
3. Do Carmo, M.P., Differential Geometry of Curves and Surfaces, Prentice-Hall, Inc., Englewood, New Jersey, 1985.
4. Neil, B.O., Elementary Differential Geometry, Academic Press, 1966.
5. Goetz, A., Introduction to Differential Geometry, Addison-Wesley, 1970.
6. Charlton, F., Vector and Tensor Methods, Ellis Horwood, 1976.