**Course Contents for BS (Mathematics)**

**MA-311 Differential Geometry**

**Credit Hours: 3**

**Prerequisites:**

This course is an introduction to differential geometry. Students should have a good knowledge of multivariable calculus and linear algebra, as well as tolerance for a definition–theorem–proof style of exposition. The course itself is mathematically rigorous, but still emphasizes concrete aspects of geometry, centered on the notion of curvature.

**Course Outline:**

**Theory of Space Curves:**

* Introduction, index notation and summation convention.
* Space curve, arc length, tangent normal and binormal.
* Osculating, normal and rectifying planes.
* Curvature and Torsion.
* The Frenet-Serret Theorem.
* Natural Equation of Curve.
* Involutes and evolutes, helices.
* Fundamental Existance theorem of space curve.

**Theory of Surface:**

* Coordinate Transformation.
* Tangent plane and surface normal
* The first fundamental form and the metric tensor
* Christoffel symbols of first and second kinds
* The second fundamental form
* Principle, Gaussian, mean, geodesic and normal curvature
* Gauss and Weingarten equations
* Gauss and Codazzi equations

**Recommended Books:**

1. R.S. Millmn and G.D Parker, *Element of Differential Geometry* (Prtentice-Hall, New Jersy, 1977).

2. A. Goetz , *Introduction to differential Geometry* (Addison-Wesley, 1970).

3. E.Kreyzig, *Differential Geometry* (Dover, 1991).

4 M.M Lipschutz, *Schaum’s Outline of Differential Geometry (McGraw, 1969).*

5. D.Somasundaram, Differential Geometry (Narosa Publishing House, New Delhi, 2