MT504: DIFFERENTIAL GEOMETRY-I

Syllabus: Space curves; Tangent; Contact of curve and surface, Osculating plane; Principal normal and Binormal. Curvature; Torsion, Serret-Frenet's formulae; Osculating circle and Osculating sphere; Existence and Uniqueness theorems, Bertrand curves, Involute; Evolutes; Conoids; Inflexional tangents; Singular points, Indicatrix.; Envelope; Edge of regression; Ruled surface; Developable surface; Tangent plane to a ruled surface; Necessary and sufficient condition that a surface $\zeta = f(\xi, \eta)$ should represent a developable surface; Metric of a surface; First, second and third fundamental forms; Fundamental magnitudes of some importanl surfaces; Orthogonal trajectories; Normal curvature; Meunier's theorem, Principal directions and Principal curvatures; First curvature; Mean curvature; Gaussian curvature; Umbilics; Radius of curvature of any normal section at an umbilic on $z = f(x, y)$; Radius of curvature of a given section through any point on $z = f(x, y)$; Lines of curvature; Principal radii, Relation between fundamental forms. Asymptotic lines; Differential equation of an asymptotic line; Curvature and Torsion of an asymptotic line

UNIT SCHEDULE

Unit 1 Space curves, Tangent, Contact of curve and surface, Osculating plane

Unit 2 Principal normal and Binormal, Curvature; Torsion, Serret-Frenet's formulae; Osculating circle and Osculating sphere

Unit 3 Existence and Uniqueness theorems, Bertrand curves, Involute; Evolutes; Conoids; Inflexional tangents; Singular points, Indicatrix

Unit 4 Envelope, Edge of regression, Ruled surface, Developable surface, Tangent plane to a ruled surface

Unit 5 Existence and Uniqueness theorems, Bertrand curves, Involute, Evolutes, Conoids, Inflexional tangents, Singular points

Unit 6 First, second and third fundamental forms; Fundamental magnitudes of some importanl surfaces; Orthogonal trajectories; Normal curvature

Unit 7 Meunier's theorem, Principal directions and Principal curvatures; First curvature; Mean curvature; Gaussian curvature; Umbilics; Radius of curvature of any normal section at an umbilic on $z = f(x, y)$; Radius of curvature of a given section through any point on $z = f(x, y)$; Lines of curvature

Unit 8 Principal radii, Relation between fundamental forms. Asymptotic lines; Differential equation of an asymptotic line; Curvature and Torsion of an asymptotic line