MATH-234, Multivariable Calculus

Course Name: **Multivariable Calculus**

Credit Hours: 3-0

Contact Hours: 3-0

Pre-requisites:

Course Introduction:

The course provide fundamental differential, integral and vector calculus for functions of more than one variable.

CLO No	Course Learning Outcomes	Bloom Taxonomy
CLO-1	Work out equation of line, planes, surfaces and parametric curves.	C3 (Apply)
CLO-2	Evaluating divergence and curl of vector fields.	C5 (Evaluate)
CLO-3	Understanding problems of surface and curve integrals	C2 (Understand)

Course Plan:

Sr. No	Main Topics to be covered	Estimated Contact Hours
1	Parametric Equations and Polar Coordinates, Parameterizations of Plane Curves, Calculus with Parametric Curves, Polar Coordinates, Graphing Polar Coordinate Equations, Areas and Lengths in Polar Coordinates	6
2	Vectors and the Geometry of Space, Three-Dimensional Coordinate Systems, Vectors, The Dot Product, The Cross Product, Lines and Planes in Space, Cylinders and Quadric Surfaces	7
3	Vector-Valued Functions , Curves in Space and Their Tangents, Arc Length in Space, Curvature and Normal Vectors of a Curve, Torsion	5

4	Partial Derivatives, Functions of Several Variables, Limits and Continuity in Higher Dimensions, Partial Derivatives, The Chain Rule, Directional Derivatives and Gradient Vectors, Tangent Planes and Differentials, Extreme Values and Saddle Points, Lagrange Multipliers, Taylor's Formula for Two Variables, Partial Derivatives with Constrained Variables	12
5	Multiple Integrals Double and Iterated Integrals over Rectangles, Double Integrals over General Regions, Area by Double Integration, Double Integrals in Polar Form, Triple Integrals in Rectangular Coordinates, Triple Integrals in Cylindrical and Spherical Coordinates, Substitutions in Multiple Integrals	9
6	Integrals and Vector Field Line Integrals, Vector Fields and Line Integrals: Work, Circulation, and Flux, Path Independence, Conservative Fields, and Potential Functions, Green's Theorem in the Plane, Surfaces and Area, Surface Integrals, Stokes' Theorem, The Divergence Theorem and a Unified Theory	9

Reference Materials:

- Advanced Engineering Mathematics, (9th Edition) by Erwin Kreyszig, John Wiley and Sons, Inc. 2006.