

## Advanced Calculus

<b>Course Code</b>	<b>Credit Hours</b>
<b>MATH-212</b>	<b>3-0</b>

### Course Description

This course provides a comprehensive exploration of the geometry of Euclidean space, coupled with a detailed study of calculus concepts and applications. Students will investigate vector analysis functions, limits, continuity, differentiation, integration, sequences, and series. The course emphasizes the geometrical interpretation of mathematical concepts and their practical applications, making it suitable for students pursuing studies in civil engineering.

### Text Book:

1. Thomas Calculus by George B. Thomas Jr., Maurice D. Weir and Joel R. Hass
2. Calculus by Earl Swokowski, Michael Olinick, and Dennis D. Pence
3. Calculus by Robert T. Smith & Ronald B. Minton
4. Calculus: Early Transcendentals by James Stewart
5. Calculus and Analytic Geometry by George B. Thomas Jr. and Ross L. Finney

### Reference Book:

### Prerequisites :

Nil.

### ASSESSMENT SYSTEM FOR THEORY

	<b>Without Project (%)</b>	<b>With Project/Complex Engineering Problems (%)</b>
Quizzes	15	10-15
Assignments	10	5-10
Mid Terms	25	25
Project	-	5-10
End Semester Exam	50	45-50

### ASSESSMENT SYSTEM FOR LAB

Lab Work/ Psychomotor Assessment/ Lab Reports	70%
Lab Project/ Open Ended Lab Report/ Assignment/ Quiz	10%
Final Assessment/ Viva	20%

## Teaching Plan

Week No	Topics/Learning Outcomes
1-2	Introduction to Advanced Calculus, Objectives, Outcomes and Assessment Methods, Review of vectors, scalars and vector products, equations of straight line and plane
3-4	Functions of single and several variables, techniques of finding limits and continuity, Parametric Representation of Curves, Tangent and Normal to the curve
5-6	Introduction to ordinary and partial derivatives, Chain Rule with single and several variables, Techniques of finding ordinary derivatives, examples of related rates, Directional Derivatives
7-8	Extrema of functions of single variable, First and second derivative tests, Optimization problems of functions of single variable
9	MSE
10-11	Extrema of functions of several variables, Optimization problems of functions of several variable (Lagrange multipliers), Introduction to integration, Properties and techniques of integration
12-13	Definite integrals, Double integrals, Change of order of integration, Triple integrals, Area under and between the curves
14-15	Volumes of solids of revolution by disk and Washer method, Work Done, Moment of Inertia, Power series and applications
16	Maclaurin/ Taylor series and their applications
17-18	End Semester Exam

**Practical:** Nil.