

FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2025-26

Programme: B. TECH.

Semester: 1

Course Code: 102000211

Course Title: Calculus

Course Group: Basic Science Course

Course Objectives: The course is aimed to convey to the student a sense of continuum of higher secondary calculus and its applications to develop basic understanding of engineering subjects. This course is a cohesive one which unifies differential and integral calculus with approximations and their applications.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
3	1	0	4	50 / 18	50/18	Choose an item.	Choose an item.	100 /36

* J: Jury; V: Viva; P: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	Differentiation: Successive Differentiation, Leibnitz's Rule (Without Proof) Indeterminate Forms, Expansion of Functions by using Taylor's, Maclaurin's Series, Applications of differentiation: Curvature, Radius of Curvature	6
2	Partial Differentiation and its Applications: Functions of two or more Variables, Limits and Continuity, Partial derivatives, Which variable is to be treated as Constant, Homogeneous Functions, Euler's Theorem and its corollaries (Without Proof), Total derivative, Implicit Functions, Change of Variables, Jacobians, Tangent Planes and Normal Lines, Taylor's Theorem for functions of two Variables, Maxima and Minima of Functions of two Variables, Lagrange's Method of Undetermined Multipliers. Applications in Optimization Problems	11
3	Tracing of Curves: Tracing of Cartesian, Parametric, Polar Curves (Standard Curves Only), Envelopes of Curves (Introductory level)	5



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4	Integration: Reduction Formulae (Without Proof), Beta-Gamma Functions, Improper Integrals of both kinds.	4
5	Multiple Integrals: Double Integrals, Change of Order of Integration, Double Integrals in Polar Coordinates, Change of Variables, Area by using Double Integration, Mass and Center of Gravity using Double Integrals, Applications in Heat and Fluid Flow (Introductory problems), Triple Integrals, Volume as Triple Integral.	8
6	Infinite Sequence and Series: Infinite Sequence, Infinite Series, Geometric Series and applications, Telescoping Series, The nth term test for a Divergent Series, The Integral Test, Comparison Tests, D Alembert's Ratio Test and Cauchy's Root Test, Alternating Series, Absolute and Conditional Convergence.	8

List of Practicals / Tutorials:

Sr.	Contents
1	Successive Differentiation, Leibnitz's Rule
2	Indeterminate Forms, Expansions of Functions- Taylor's, Maclaurin's Series and their applications, Curvature, Radius of Curvature
3	Limits and Continuity, Partial derivatives
4	Homogeneous Functions, Euler's Theorem and its corollaries
5	Tangent Planes and Normal Lines, Taylor's Theorem for functions of two Variables, Errors and Approximations
6	Maxima and Minima of Functions of two Variables, Lagrange's Method of Undetermined Multipliers and Optimization problems
7	Tracing of curves and Envelopes of curves
8	Reduction Formulae, Beta-Gamma Functions, Improper Integrals of both kinds
9	Double Integrals, Change of Order of Integration
10	Double Integrals in Polar Coordinates, Change of Variables
11	Area by using double integration, Mass and Center of Gravity using Double Integrals, Applications in Heat and Fluid Flow, Triple Integrals, Volume as Triple Integral
12	Infinite Sequence, Infinite Series, Geometric Series and applications, Telescoping Series, The nth term test for a Divergent Series
13	The Integral Test, Comparison Tests, D Alembert's Ratio Test and Cauchy's Root Test, Alternating Series, Absolute and Conditional Convergence

Reference Books:

1	Thomas' Calculus George B. Thomas, Maurice D. Weir, Joel R. Hass, Pearson Education
2	Elementary Engineering Mathematics, Dr. B.S. Grewal, Khanna Publishers
3	Engineering Mathematics Vol 1 S S Sastry, Prentice Hall of India
4	Introduction to Engineering Mathematics- Vol1 H K Dass, S Chand Publication
5	Calculus with Early Transcendental Functions James Stewart, Cengage Publication

Supplementary learning Material:

1	Lecture Note and Video lectures prepared by faculties of CVM University
2	NPTEL Engineering Mathematics I: https://nptel.ac.in/courses/111105121/
3	https://www.classcentral.com/course/swayam-engineering-mathematics-i-13000

Pedagogy:

- Direct Classroom teaching
- Audio Visual presentations/demonstrations
- Assignments/Quiz
- Continuous assessment (Tutorials)
- Interactive methods
- Seminar/Poster presentation

Internal Evaluation:

The internal evaluation comprised of written exam (40% weightage) along with combination of various components such as Certification courses, Assignments, Mini Project, Simulation, Model making, Case study, Group activity, Seminar, Poster Presentation, Unit test, Quiz, Class Participation, Attendance, Achievements etc. where individual component weightage should not exceed 20%.

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks						R: Remembering; U: Understanding; A: Application, N: Analyze; E: Evaluate; C: Create
R	U	A	N	E	C	
10%	25%	30%	20%	10%	5%	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Understand and apply the concepts of differential calculus including Taylor's and Maclaurin's series, curvature and radius of curvature	20
CO-2	Analyze functions of several variables using partial differentiation, and solve problems involving optimization, Jacobians and transformation of variables	20
CO-3	Trace and interpret the behavior of standard mathematical curves in Cartesian, parametric and polar forms, including basic understanding of envelopes	15
CO-4	Solve problems involving definite and multiple integrals and apply them to compute area, volume, mass, center of gravity and heat flow	25
CO-5	Determine the convergence or divergence of infinite sequences and series using standard tests	20

Curriculum Revision:

Version:	Choose an item.
Drafted on (Month-Year):	Click or tap to enter a date.
Last Reviewed on (Month-Year):	-
Next Review on (Month-Year):	Click or tap to enter a date.