Version No:
Approval Date:

Calculus and Analytical Geometry

Programme(s) in which it is offered: B.Sc.B.Ed. Mathematics

Course Category: Core	**Schedule of Offering**: Odd
Course Credit Structure: 4	**Course Code:** EG411
Total Number of Hours: 5	**Contact Hours Per Week:** 5
Lecture: 3, 3	**Tutorial:** 1, 2
Practical: 0, 0	**Medium of Instruction:** English
Date of Revision:	**Skill Focus:** Others
Short Name of the Course: Calculus & Analytical Geometry	**Course Stream**
Grading Method: Regular	**Repeatable:** Credit
Course Level: Beginner	

Course Description

This course is a core course for B.Sc.B.Ed. Mathematics students. This course is an introductory course to the theory of calculus and bridges the students' knowledge of differential calculus and integral calculus from school to that required at undergraduate level. This course is followed by advance calculus courses in the later semesters. The course also discusses analytical geometry that is continuation from the concepts discussed at school level.

Course Introduction

Calculus is the mathematics of motion and change. This course is an introductory course in Calculus (both differential and integral), which will serve as a foundation to many more courses in the program. This course also introduces three dimension geometry as an extension to the two dimension geometry learnt at school.

Course Objective

The objectives of the course are:

1. To provide a theoretical foundation to calculus
2. To inculcate the skills of problem-solving among the students through a few classic problems

3. To familiarize the students with the concepts and techniques of analytic geometry
4. To create a foundational base for advanced calculus courses

Course Outcome

At the end of the course students will be able to

1. Appreciate and apply the theory of differential calculus
2. Apply appropriate results in finding the derivatives of functions of one real variable and use them in solving problems in a real setup
3. Appreciate the techniques of integral calculus in solving problems in geometry
4. Apply appropriate techniques to find area bounded by curves, and volumes of certain solids using integration
5. Appreciate the techniques of analytic geometry in understanding lines and planes in three dimensional space
6. Apply the tools and techniques of analytic geometry in solving problems

PO-CO Mapping

<This should explain how the Course Outcomes (CO) are mapped with the Programme Outcomes (PO). All programmes to have two generic POs which can map to all minors/proficiency courses and foundation/self-immersion courses. Please tick the respective cells only; leave the other cells blank.>

PO-CO Mapping Matrix

CO/PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6
CO1						
CO2						
CO3						
CO4						
CO5						

Prerequisites and other constraints

This course is offered to all students of B.Sc.B.Ed. Mathematics. There is no prerequisite course.

Pedagogy

The teaching-learning of the course is organized through lectures, problem-solving

sessions and student presentations. It also includes use technological tools (like GeoGebra software) in demonstrating visualisation of abstract concepts.

Suggested Reading:

1. Anton, Bivens and Davis (2015). Calculus. Wiley.
2. Thomas and Finney (2010). Calculus and Analytic Geometry. Pearson Education India.
3. Lang (1998). First Course in Calculus. Addison-Wiley
4. Prasad (2016). Differential Calculus. Pothishala Private Limited.
5. Narayan and Mittal (2005). Integral Calculus. S Chand and Co Ltd.
6. Narayan and Mittal (2007). Analytical Solid Geometry. S Chand and Co Ltd.

Evaluation Pattern

Evaluation Matrix

	Component Type	Weightage Percentage	Total Marks	Tentative Dates	Course Outcome Mapping
Continuous Internal Assessment (CIA) Components*	Mid-semester exam	50% of CIA	30	Around 9th week	1, 2, 3
	Assignment	25% of CIA	15	End of each module	1, 2, 3, 4, 5, 6
	Quizzes	17% of CIA	10	Every two weeks	1, 2, 3, 4, 6
	Presentations	8% of CIA	5	End of two modules	1, 2, 3, 4, 5, 6
	CIA Marks	**100% of CIA**	**60**		
ESE		40%	**80**	End of the semester	1, 2, 3, 4, 5, 6

Module Sessions

Module I: Differential Calculus **(20 Hours)**

Limits revisited, Continuous functions, Discontinuous functions and types. Differentiation, Linear approximation theorem, Higher derivatives, Leibnitz's theorem. Monotone functions, Maxima and Minima, Concavity, Convexity and Points of inflection. Angle of intersection between two curves.
Differentiability theorems: Rolle's Theorem, Mean Value theorems, Taylor's theorem, Maclaurin's theorem, Taylor's and Maclaurin's infinite series, Indeterminate forms.

Reading:

1. Anton
2. Lang
3. Thomas

Activities:

a) Quiz
b) Assignment

Module II: Integral Calculus (18 Hours)

The integral of a function, Techniques of integration, Integration of rational functions, Rationalizable integrals.
Definite integral, Properties, Definite integral as the limit of a sum, the fundamental theorem of calculus, Reduction formulae, Area, Volume and Length.

Reading:

1. Anton
2. Lang
3. Thomas

Activities:

a) Quiz
b) Assignment
c) Individual Presentation

Module III: Analytical Geometry I (17 Hours)

Cartesian coordinates in three dimensional spaces, Relation between Cartesian

coordinates and position vector, Distance formula (Cartesian and Vector form), Direction cosines, Direction ratios, Projection on a Straight line, angle between two lines, Area of Triangle, Volume of a tetrahedron. Straight line, equations of straight lines (Cartesian and Vector form).

Reading:

1. Thomas
2. Narayan (2007)

Activities:

a) Quiz
b) Assignment

Module IV: Analytical Geometry II **(20 Hours)**

Planes, Equations of Planes (Cartesian and Vector form), Normal form, Angle between planes, Coaxial planes, Parallel and Perpendicular planes, Length of a Perpendicular from a point to a plane, Bisectors of angles between two planes, Shortest distance between two skew lines.

Translation and Rotation of Cartesian axes in plane, Curves of second degree, Discriminant and Trace, Theorem on Discriminant and trace, Classification theorem on second degree equation.

Reading:

1. Thomas
2. Narayan (2007)

Activity:

a) Quiz
b) Assignment
c) Individual Presentation