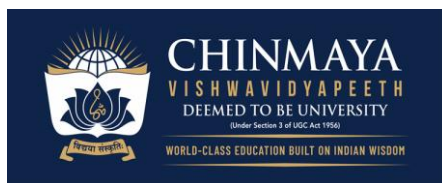


Calculus and Analytical Geometry



Course Name: Calculus and Analytical Geometry

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

| | |
|--------------------------------------|--|
| Course Category: Core | Schedule of Offering: Odd |
| Course Credit Structure: 4 | Course Code: EG 250 |
| Total Number of Hours: 75 | Contact Hours Per Week: 5 |
| Lecture: 3 | Tutorial: 2 |
| Practical: NA | Medium of Instruction: English |
| Date of Revision: | Skill Focus: Employability |
| Short Name of the Course: CAG | The course is considered as a Minor/Elective/ in any other school: No |

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.

Calculus and Analytical Geometry

Course Objective

The major objectives of this 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 the theory of differential calculus
2. Apply appropriate results in finding the derivatives and use them in solving problems
3. Appreciate the techniques of integral calculus in solving problems in geometry
4. Apply appropriate techniques in solving problems using integration
5. Appreciate the techniques of analytic geometry
6. Apply the tools and techniques of analytic geometry in solving problems

PO-CO Mapping

PO-CO Mapping Matrix

| CO/PO Mapping | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 |
|---------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| CO1 | | | | | √ | √ | | | |
| CO2 | | | | | √ | √ | | | √ |
| CO3 | | | | | | √ | | | |
| CO4 | | | | | √ | | | | |
| CO5 | | | | | √ | √ | | | |
| CO6 | | | | | √ | | √ | | |

Calculus and Analytical Geometry

Prerequisites

The course does not require any pre-requisite course. This is a core course in the B.Sc.B.Ed. Mathematics programme.

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 G. (2016). Differential Calculus. Pothishala Private Limited.
5. Narayan, S. and Mittal (2005). Integral Calculus. S Chand and Co Ltd.
6. Narayan, S. And Mittal (2007). Analytical Solid Geometry. S Chand and Co Ltd.

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.

Calculus and Analytical Geometry

Reading:

- a) Anton. 2015.
- b) Lang. 1998.
- c) Thomas. 2010.

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:

- a) Anton. 2015.
- b) Lang. 1998.
- c) Thomas. 2010.

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).

Calculus and Analytical Geometry

Reading:

- a) Thomas. 2010.
- b) 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:

- a) Thomas. 2010.
- b) Narayan. 2007.

Activity:

- a) Quiz
- b) Assignment
- c) Individual Presentation

Calculus and Analytical Geometry

Evaluation Pattern

Evaluation Matrix

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