

# DEPARTMENT OF MATHEMATICS

## SEMESTER-I

**Subject:** DIFFERENTIAL AND INTEGRAL CALCULUS

**Paper:** DSC-I

**Code:**101

### Course Objective:

The course is aimed at exposing the students to some basic notions in differential calculus.

### Course Outcomes:

- By the time students complete the course they realize wide ranging applications of the subject
- Explain the relationship between the derivative of a function as a function and the notion of the derivative as the slope of the tangent line to a function at a point.
- To able to calculate limits in indeterminate forms by a repeated use of L' Hospital rule.
- To able to evaluate integrals of rational functions by partial fractions.
- Evaluate the volumes of solids using cross-sections
- Calculate the length of an arc of a curve when whose equations are given in parametric and polar form
- Evaluate the area of surfaces of revolution and finding a function is increasing or decreasing functions in a graph.
- Calculus is used in medicine to measure the blood flow, cardiac output, tumor growth and determination of population genetics among many other applications in both biology and medicine.

## SEMESTER-II

**Subject:** DIFFERENTIAL EQUATIONS

**Paper:** DSC-II

**Paper Code:**201

### Course Objective:

The main aim of this course is to introduce the students to the techniques of solving differential equations and to train to apply their skills in solving some of the problems of engineering and science.

### Course Outcomes:

- After learning the course, the students will be equipped with the various tools to solve few types differential equations that arise in several branches of science.
- The main aim of the course is to introduce the students to the technique of solving various problems of engineering and scienc. From your microwaves, cell phones, TV, and car to medicine, economy, and national defence ...etc.
- Distinguish between linear, nonlinear, partial and ordinary differential equations.
- Solve basic application problems described by second order linear differential equations with constant coefficients

## SEMESTER-III

**Subject-REAL ANALYSIS**

**Paper : DSC-III**

**Paper code:301**

### Course Objective:

The course is aimed at exposing the students to the foundations of analysis which will be useful in understanding various physical phenomena.

### Course Outcomes:

After the completion of the course students will be in a position to appreciate beauty and applicability of the course.

- Students will be able to demonstrate competence with elementary properties of sets by proving identities involving union and intersection and Cartesian Products of sets.
- Students will be able to demonstrate competence with elementary properties of functions by proving results involving composite functions and inverse functions.
- Students will be able to use mathematical induction to prove results involving natural numbers.
- Students will be able to demonstrate competence with properties of real numbers by finding supremum and infimum of sets and using the completeness property of real numbers.
- Students will be able to demonstrate competence with elementary properties of sequences by finding limits and proving results involving sum /difference /product /quotients of sequences.
- Students will be able to apply the monotone convergence theorem to prove convergence of bounded monotone sequences.

## SEMESTER-III

**Subject : THEORY OF EQUATIONS**

**Paper: SEC-II**

### Course Objective:

Students learn the relation between roots and coefficients of a polynomial equation, Descartes's rule of signs is used in finding the number of positive and negative roots if any of a polynomial equation besides some other concepts.

### Course Outcome:

By using the concepts learnt the students are expected to solve some of the polynomial equations.

- Describe the relation between roots and coefficients.
- Solve the reciprocal equations.
- Analyze the location and describe the nature of the roots of an equation.
- Compute a real root of an equation by Horner's method.

## SEMESTER-IV

**Subject-ALGEBRA**

**Paper: DSC-IV**

**Paper code : 401**

### Course Objective:

The course is aimed at exposing the students to learn some basic algebraic structures like groups, rings etc.

### Course Outcomes :

On successful completion of the course students will be able to recognize algebraic structures that arise in matrix algebra, linear algebra and will be able to apply the skills learnt in understanding various such subjects.

- **Knowledge gained:**
  - Concept of group action and theorems about group actions.
  - Structure of permutation groups.
  - Polynomial rings, EDs, PIDs, & UFDs, and relations among them.
  - Universality of Polynomial rings
- **Skills gained:**
  - Solving problems using the powerful concept of group action.
  - Facility in understanding the structure of a problem where the problem involves a permutation group - e.g. nature of the roots of a polynomial equation.
  - Ability to understand a large class of commutative rings by regarding them as quotients of polynomial rings by suitable ideals.
- **Competency developed:**
  - Applying the concept of a group action to real life problems such as Counting
  - Facility in handling problems involving polynomial equations
  - Facility in working with situations involving commutative rings, in particular monogenic algebras of matrices. Implies facility in working with matrices, a concept that finds a large number of applications in real life including the graphs and networks.
  - Facility in solving real life problems by thinking logically and outside of box

## SEMESTER-IV

**Subject: VECTOR CALCULUS**

**Paper : SEC-IV**

### Course Objective:

Concepts like gradient, divergence, curl and their physical relevance will be taught.

### Course Outcomes:

Students realize the way vector calculus is used to addresses some of the problems of physics.

- Analyze line, surface and volume integrals and estimate the change of order of integration as well as the change of variable in double integration.
- Understand space curves and partial derivatives of vectors as well perform calculations on gradient, divergence and curl operators.

## SEMESTER-V

**Subject : LINEAR ALGEBRA**

**Paper : DSC-V Paper**

**code :501**

### Course Objective:

The students are exposed to various concepts like vector spaces, bases, dimension, Eigen values etc.

### Course Outcomes:

After completion this course students appreciate its interdisciplinary nature.

- Analyze the solution set of a system of linear equations.
- Express some algebraic concepts (such as binary operation, group, and field).
- Do elementary matrix operations.
- Express a system of linear equations in a matrix form.
- Do the elementary row operations for the matrices and systems of linear equations.
- Investigate the solution of a system using Gauss elimination.
- Apply Cramer's rule for solving a system of linear equations, if the determinant of the matrix of coefficients of the system is not zero.
- Generalize the concepts of a real (complex) vector space to an arbitrary finite.

## SEMESTER-VI

**Subject: ANALYTICAL SOLID GEOMETRY**

**Paper : DSE-1F(C)  
601/C**

**Paper code:BS**

### Course Objective:

Students learn to describe some of the surfaces by using analytical solid geometry.

### Course Outcomes:

Students understand the beautiful interplay between algebra and geometry.

- Students learn the difference between 2D and 3D methods under different conditions.
- Students learn the different shapes and structures, Apply various methods and finite difference concepts wherever applicable.
- Work numerically on the geometrical objects by applying ordinary differential equations using different meth.

## Program Outcomes

- Instill a strong desire to understand mathematics.
- Develop a broad comprehension of mathematical definitions, useful concepts, principles and theorems.
- Enable students to utilize the knowledge and abilities they've gained throughout the curriculum to solve specific theoretical and applied math issues.
- Enforce in students to up skill themselves across relevant mathematical theory tools to solve challenges and problems in the social and natural sciences.
- Offer students with the relevant knowledge and skills to pursue future aspects in mathematics and related fields.

## Program specific outcomes

- To select modern computing tools and techniques to meet the desired needs of the society such as safety, security and applicability.
- Recognize the need for and have the ability to engage in independent, lifelong learning and adapt to technological changes to be globally competent.
- Using Statistical software leading and applying logical and analytical skills to solve real life problems in related areas.
- Gain knowledge on theorems in Algebra, Analysis, Differential Equations and Linear Algebra and enhance themselves in mathematical skills for better employability.

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