



Janseva Sevabhavi Pratishthan Bhopani's

Kai. Rasika Mahavidyalaya, Deoni

DEPARTMENT OF MATHEMATICS

Course Outcomes (COs) and Program Outcomes (POs)

B.Sc. FY	
Topics in Algebra	<ul style="list-style-type: none">• CO1: Students will be able to perform matrix operations and use them to solve systems of linear equations effectively.• CO2: Students will understand and apply basic set operations and concepts, including unions, intersections, and complements.• CO3: Students will identify different types of relations and functions, and apply them to solve mathematical problems.• CO4: Students will solve linear systems using methods such as substitution, elimination, and matrix operations.
Calculus using SageMath	<ul style="list-style-type: none">• CO1: Students will use SageMath to perform differentiation and integration of functions.• CO2: Students will solve calculus problems involving limits, continuity, and series expansions using SageMath.• CO3: Students will apply SageMath to visualize and analyze calculus concepts such as graphs of functions and their derivatives.
Geometry	<ul style="list-style-type: none">• CO1: Students will be able to apply fundamental theorems of Euclidean geometry in solving problems.• CO2: Students will demonstrate an understanding of geometric proofs and constructions.• CO3: Students will use geometric principles to model and solve practical problems.
Integral Calculus	<ul style="list-style-type: none">• CO1: Students will be proficient in various techniques of integration, including substitution and integration by parts.• CO2: Students will apply integration techniques to solve problems in areas such as physics and engineering.• CO3: Students will use integral calculus to compute areas, volumes, and other applications.
MATLAB	<ul style="list-style-type: none">• CO1: Students will be able to write and debug MATLAB scripts for mathematical computations.• CO2: Students will use MATLAB to visualize mathematical data and functions.• CO3: Students will apply MATLAB to solve complex mathematical problems and analyze results.

B.Sc. SY	
Real Analysis	<ul style="list-style-type: none"> • CO1: Students will understand and apply the concepts of limits, continuity, and differentiability in real analysis. • CO2: Students will prove and use key theorems, such as the Bolzano-Weierstrass theorem and the Intermediate Value Theorem. • CO3: Students will apply real analysis concepts to solve problems involving sequences and series.
•	Group/Ring Theory
1. Group Theory:	<ul style="list-style-type: none"> • CO1: Students will be able to define and work with groups, subgroups, and group homomorphisms. • CO2: Students will solve problems involving group properties and structures. • CO3: Students will apply group theory concepts to solve problems in abstract algebra and related fields.
Ordinary Differential Equations (ODE)	<ul style="list-style-type: none"> • CO1: Students will solve first-order and second-order ordinary differential equations using various methods. • CO2: Students will apply ODE solutions to real-world problems, including engineering and physics applications. • CO3: Students will use qualitative and numerical methods to analyze ODEs.
2. Ring Theory:	<ul style="list-style-type: none"> • CO1: Students will understand the structure of rings, including ideals and ring homomorphisms. • CO2: Students will solve problems involving ring properties and operations. • CO3: Students will apply ring theory to problems in number theory and algebra.
Partial Differential Equations (PDE)	<ul style="list-style-type: none"> • CO1: Students will understand and solve basic partial differential equations, including the heat equation and wave equation. • CO2: Students will apply boundary conditions and initial conditions to solve PDE problems. • CO3: Students will use PDE solutions in modeling physical phenomena.

B.Sc. TY	
Metric Spaces:	<ul style="list-style-type: none"> • CO1: Students will understand the concept of a metric space and related notions such as convergence and continuity. • CO2: Students will solve problems involving open and closed sets in metric spaces. • CO3: Students will apply metric space concepts to analyze and solve problems in analysis.
Linear Algebra	<ul style="list-style-type: none"> • CO1: Students will understand and work with vector spaces, including bases and dimensions. • CO2: Students will solve problems involving linear transformations and eigenvalues. • CO3: Students will apply linear algebra concepts to solve problems in various fields, including computer science and engineering.
Numerical Analysis	<ul style="list-style-type: none"> • CO1: Students will apply numerical methods to approximate solutions of mathematical problems. • CO2: Students will analyze the accuracy and efficiency of different numerical algorithms. • CO3: Students will use numerical analysis techniques to solve real-world problems in science and engineering.
Complex Analysis	<ul style="list-style-type: none"> • CO1: Students will understand and work with complex functions, including differentiation and integration in the complex plane. • CO2: Students will apply complex analysis techniques to solve problems involving contour integration and residues. • CO3: Students will use complex analysis to solve problems in engineering and physics.
Integral Transform	<ul style="list-style-type: none"> • CO1: Students will understand and apply Fourier and Laplace transforms to solve differential equations and analyze signals. • CO2: Students will solve problems involving the inverse transforms and their applications. • CO3: Students will use integral transforms in practical applications such as signal processing and control theory.
Number Theory	<ul style="list-style-type: none"> • CO1: Students will understand and apply basic concepts of number theory, including divisibility, prime numbers, and congruences. • CO2: Students will solve problems involving Diophantine equations and modular arithmetic. • CO3: Students will use number theory concepts to solve problems in cryptography and coding theory.

Program Outcomes (POs)

1. **Critical Thinking and Problem Solving:** Graduates will demonstrate the ability to apply mathematical reasoning and problem-solving techniques to complex problems.
2. **Mathematical Proficiency:** Graduates will have a solid understanding of core mathematical concepts, including algebra, calculus, geometry, and analysis.
3. **Technical Skills:** Graduates will be proficient in using mathematical software and tools (e.g., MATLAB, SageMath) to perform computations and analyze data.
4. **Analytical Skills:** Graduates will be able to analyze and interpret mathematical data, models, and theories, applying them to real-world scenarios.
5. **Communication Skills:** Graduates will effectively communicate mathematical ideas and solutions both verbally and in writing.
6. **Ethical and Professional Responsibility:** Graduates will demonstrate an understanding of ethical issues and professional standards in mathematics and its applications.
7. **Lifelong Learning:** Graduates will be prepared for continued learning and professional development in mathematics and related fields.