B.A. /B.Sc. Mathematics

Programme Outcomes

i) Ability to communicate mathematical ideas clearly using correct mathematical terminology and proper mathematical notation and use their mathematical knowledge to solve problems.

ii) Develop appreciation and competency for application of mathematical approaches and techniques to variety of problems and applications to problems in other disciplines such as engineering, business and other decisional sciences.

iii) Prepare sound mathematical base for enhancing understanding in interdisciplinary subjects such as physics, engineering, computer science etc. and for pursuing further Master's Degree in Mathematics or Engineering/Computer science/ Business/Economics

iv) Utilize mathematical skills to coach school and colleges students or enhance their own career prospects through pursuit of advanced degree in mathematics or full-fill prerequisites of eligibility for various national and international competitive examinations.

Programme Specific Outcomes

i) To formulate, analyze, and solve problems through application of fundamental mathematical techniques

ii) To develop the ability to determine the validity of a given argument, develop mathematical thinking and be able to solve mathematical problems and construct mathematical proofs independently.

iii) To demonstrate an understanding of the foundations of various branches of mathematics and apply the same to formulate and develop mathematical arguments in a logical manner

iv) Apply knowledge and mathematical skills to translate information presented into mathematical form, select and use appropriate mathematical formulae or techniques in order to process the information and draw the relevant conclusion.

v) Investigate and apply mathematical solutions in a variety of contexts related to science, technology, business and industry, and illustrate these solutions using symbolic, numeric, or graphical methods.

vi) Build a solid foundation for higher studies in mathematics and other disciplines requiring quantitative techniques and enhancing their career prospects through success in competitive examinations for further academic progression or placement in various positions requiring mathematical or quantitative background as a pre-requisite.

Course Structure of B.A./B.Sc. (Mathematics) Semester I - VI	
B.A. /B.Sc. Semester I	**B.A./B.Sc. Semester II**
Paper I : Differential Calculus Paper II: Integral Calculus	Paper I : Matrices & Differential Equations Paper II: Geometry
B.A. /B.Sc. Semester III	**B.A./B.Sc. Semester IV**
Paper I : Algebra Paper II: Mathematical Methods	Paper I : Differential Equations Paper II: Mechanics
B.A. /B.Sc. Semester V	**B.A./B.Sc. Semester VI**
Paper I : Numerical Analysis Paper II: Linear & Abstract Algebra Paper III: Linear Programming	Paper I : Analysis Paper II: Differential Geometry & Tensor Analysis Paper III: Discrete Mathematics

B.A. /B.Sc. Semester I

Paper I: **Differential Calculus**

Course Outcomes:

This course is to introduce the basic tools of differential calculus and geometric properties of different type of functions of real variables.

Course specific Outcomes:

This course will enable the students to:

1. Know the concepts of calculus, namely, limits, continuity, differentiability and their applications in the form of mean value theorem and Taylor's theorem.
2. Understand real valued functions, sequences and series, their convergence.
3. Sketch curves in a plane using its mathematical properties in the different coordinate systems of reference.
4. Apply derivatives in Optimization, Social sciences, Physics and Life sciences etc.
5. Get knowledge of curvature, envelopes and evolutes.

Paper II: **Integral Calculus**

Course Outcomes:

To understand the integration of bounded functions on a closed and bounded interval and its extension to the cases where either the interval of integration is infinite, or the integrand has infinite limits at a finite number of points on the interval of integration.

Course specific Outcomes:

The course will enable the students to learn about:

1. Some of the families and properties of Riemann integrable functions, and the applications of the fundamental theorems of integration.
2. Beta and Gamma functions and their properties.
3. The valid situations for the inter-changeability of differentiability and integrability with infinite sum, and approximation of transcendental functions in terms of power series.
4. Compute area of surfaces of revolution and the volume of solids by integrating over cross-sectional areas.

B.A. /B.Sc. Semester II

Paper I: **Matrices & Differential Equations**

Course Outcomes: The subjects of the course are designed in such a way that they focus on developing mathematical skills in algebra, calculus and analysis.

Course specific Outcomes:

This course will enable the students to:

1. Find the rank and eigen values of matrices
2. Study the system of linear homogeneous and non- homogeneous equations.
3. Comprehend the geometric meaning of differential equations.
4. Configure various types of differential equations and develop problem solving skills for solving the same.

Paper II: **Geometry**

Course Outcomes: The students learn and visualize the fundamental ideas about coordinate geometry and learn to describe some of the surfaces by using analytical geometry.

Course specific Outcomes:

On successful completion of the course students have gained knowledge about regular geometrical figures and their properties. They have the foundation for going for higher course in geometry.

B.A. /B.Sc. Semester III

Paper I**: Algebra**

Course Outcomes:

Group theory is the building blocks of modern algebra. The course is to introduce the fundamental theory of groups, rings and their homomorphisms. Symmetric groups and group of symmetries are also studied in detail. Fermat's Little theorem as a consequence of the Lagrange's theorem on finite groups.

Course specific Outcomes:

The course will enable the students to:

1. Recognize the mathematical objects that are groups, and classify them as abelian, cyclic and permutation groups, etc.
2. Link the fundamental concepts of Groups and symmetrical figures.
3. Analyze the subgroups of cyclic groups.
4. Explain the significance of the notion of cosets, normal subgroups, and factor groups.

Paper II: **Mathematical Methods**

Course Outcomes:

The course gives emphasis to enhance student's knowledge of functions of two variables, Laplace Transforms, Fourier series.

Course specific Outcomes:

On successful completion of the course students should have gained knowledge about higher different mathematical methods and will help them in going for higher studies and research.

B.A. /B.Sc. Semester IV

Paper I: **Differential Equations**

Course Outcomes:

The main objectives of this course are to familiarize the students with various methods of solving differential equations of first and second order with several applications.

Course Outcomes:

The course will enable the students to

1. Formulate Differential Equations for various Mathematical models.
2. Solve first order non-linear differential equation and linear differential equations of higher order using various techniques.
3. Apply these techniques to solve and analyze various mathematical models.

Paper II: **Mechanics**

Course Outcomes:

The course aims at understanding the various concepts of basic mechanics like simple harmonic motion, motion under other laws and forces.

Course Outcomes:

The course will enable the students to understand:

1. The significance of mathematics involved in physical quantities and their uses.
2. To study and to learn the cause-effect related to these.
3. The applications in observing and relating real situations/structures.

B.A. /B.Sc. Semester V

Paper I: **Numerical Analysis**

Course Outcomes:

To comprehend various computational techniques to find approximate value for possible root(s) of non-algebraic equations, to find the approximate solutions of system of linear equations and ordinary differential equations. Also, the use of Computer Algebra System (CAS) by which the numerical problems can be solved both numerically and analytically, and to enhance the problem solving skills.

Course specific Outcomes:

The course will enable the students to learn the following:

1. Some numerical methods to find the zeroes of nonlinear functions of a single variable and solution of a system of linear equations, up to a certain given level of precision.
2. Interpolation techniques to compute the values for a tabulated function at points not in the table.
3. Applications of numerical differentiation and integration to convert differential equations into difference equations for numerical solutions.

Paper II: **Linear & Abstract Algebra**

Course Outcomes:

The objective of this course is to introduce the fundamental theory of two objects, namely - rings and vector spaces, and their corresponding homomorphisms. Classification of all finite Abelian groups (up to isomorphism) can be done.

Course specific Outcomes:

The course will enable the students to learn about:

1. The fundamental concept of Rings, Fields, subrings, integral domains and the corresponding morphisms.
2. The concept of linear independence of vectors over a field, the idea of a finite dimensional vector space, basis of a vector space and the dimension of a vector space.
3. Basic concepts of linear transformations, the Rank-Nullity Theorem, matrix of a linear transformation, algebra of transformations and the change of basis.
4. Automorphisms for constructing new groups from the given group.
5. External direct product applies to data security and electric circuits.
6. Group actions, Sylow theorems and their applications to check nonsimplicity.
7. Compute inner products and determine orthogonality on vector spaces.

Paper III: **Linear Programming**

Course Outcomes:

This course develops the ideas underlying the Simplex Method for Linear Programming Problem, as an important branch of Operations Research. The course covers Linear Programming with applications to Transportation, Assignment and Game Problem. Such problems arise in manufacturing resource planning and financial sectors.

Course specific Outcomes:

This course will enable the students to learn:

1. Analyze and solve linear programming models of real life situations.
2. The graphical solution of LPP with only two variables, and illustrate the concept of convex set and extreme points. The theory of the simplex method is developed.
3. The relationships between the primal and dual problems and their solutions with applications to transportation, assignment and two-person zero-sum game problem.

B.A. /B.Sc. Semester VI

Paper I: **Analysis**

Course Outcomes:

The course aims at providing the basic knowledge pertaining to metric spaces such as open and closed balls, neighborhood, interior, closure, subspace, continuity, compactness, connectedness etc. This course aims to introduce the basic ideas of analysis for complex functions in complex variables. Particular emphasis has been laid on Cauchy's theorems, series expansions and calculation of residues.

Course specific Outcomes:

The course will enable the students to:

1. Understand the basic concepts of metric spaces.
2. Know the concepts such as open balls, closed balls, compactness, connectedness etc.
3. Understand the significance of differentiability of complex valued functions leading to the understanding of Cauchy-Riemann equations.
4. Evaluate the contour integrals and understand the role of Cauchy-Goursat theorem and the Cauchy integral formula.
5. Expand some simple functions as their Taylor and Laurent series, classify the nature of singularities, find residues and apply Cauchy Residue theorem to evaluate integrals.

Paper II: **Differential Geometry & Tensor Analysis**

Course Outcomes:

This course aims at introducing the basic concepts of tensors and understands the role of Tensors in Differential Geometry.

Course specific Outcomes:

By the end of this course students will be able to-

1. Explain the concept of differentiable geometry.
2. Understand the concepts of tensors in differentiable geometry.
3. Apply various concept of differential calculus in tensors.

Paper III: **Discrete Mathematics**

Course Outcomes:

This course aims at introducing the concepts of lattices, Boolean algebras, switching circuits and graph theory. The course discusses some important applications of Boolean algebra and graph theory in real life situations through switching circuits and shortest path algorithms.

Course specific Outcomes:

After the course, the student will be able to understand the concepts of:

1. Lattices and their types;
2. Boolean algebra, switching circuits and their applications;
3. Graphs, their types and its applications in study of shortest path algorithms.