DEPARTMENT OF MATHEMATICS

Programme Outcome of B.Sc. /M.Sc. (Mathematics)

- Enabling students to develop a positive attitude towards mathematics as an interesting and valuable subject of study.
- Ability to analyze a problem, identify and define the computing requirements, which may be appropriate to its solution.
- Understanding Concepts
- Development of Writing, Listening and Teaching Skills
- Group Discussion (Skill of Team work, interpersonal skills)
- Promotion of thinking.
- Introduction to various courses like group theory, ring theory, field theory, metric spaces, number theory, programming in C, Analysis etc. in UG level as well as the advanced area of mathematics like Operation research, Partial Differential Equations, Discrete Mathematics in PG level.
- Enhancing student's overall development and to equip them with mathematical modeling abilities, problem solving skills, creative talent and power of communication necessary for various kinds of employment.
- Ability to pursue advanced studies and research in pure and applied mathematical science.

Programme Specific Outcome of B.Sc. / M.Sc. Mathematics

- To enable the students to cultivate a mathematical way of thinking i.e. making conjectures, verifying them with further observations, generalizing them, trying to find proofs and making observations.
- To enable the students to learn the basic structures of mathematics through unifying concepts and to motivate these structures through applications.
- To enable the students to study mathematics for themselves.
- Know when there is a need for information, to be able to identify, locate, evaluate, and effectively use that information for the issue or problem at hand.
- Formulate and develop mathematical arguments in a logical manner.
- Acquire good knowledge and understanding in advanced areas of mathematics chosen by the student from the given courses.
- Understand the importance of Mathematics and its techniques to solve real life problems.

COURSE OUTCOME

Algebra & Trigonometry

On completion of this course students will be expected to

- Evaluate Inverse of matrix using elementary operation and application of Matrices to solve systems of linear equations .
- Understand Theory of Equations.
- Prove results involving divisibility and greatest common divisors..
- Polynomial addition, subtraction, division, multiplication, roots of polynomials.
- Understand group theory, ring theory, field, Integral Domain.
- Evaluate trigonometric and inverse trigonometric functions
- Solve trigonometric equations and applications.
- Apply and prove trigonometric identities.

Calculus/Advanced Calculus

Upon successful completion of Calculus/Advanced Calculus the student will be able to

- Verify the value of the limit of a function at a point using the definition of the limit
- Introduction to sequence and series.
- Learn to check function is continuous understand the consequences of the intermediate value theorem for continuous functions
- Calculate the partial derivatives of functions of several variables
- Apply the chain rule for functions of several variables
- Solve problems involving tangent planes and normal lines
- Determine the extrema of functions of several variables
- Use the Lagrange multiplier method to find extrema of functions with constraints.
- Evaluation and Properties of Beta and Gamma Function as well as evaluation of double and triple integration.

Vector Analysis and Geometry

By the end of this course, students will be able to:

- Use Greens, divergence, and Stokes theorems by combining vector differential calculus and vector integral calculus.
- Calculate the gradients and directional derivatives of functions of several variables
- Used cut-out shapes as a means to develop the mental transformation of geometric shapes.
- Perform translations and rotations of the coordinate axes to eliminate certain terms from equations

- To find nature of general conics.
- Find equation of spheres, cylinders and cones.

Numerical Analysis and programming in C

Upon successful completion of this course, students will be able to

- To apply appropriate numerical methods to solve the problem with most accuracy.
- Using appropriate numerical methods determine approximate solution of ODE and system of linear equation.
- Compare different methods in numerical analysis w.r.t accuracy and efficiency of solution.
- Recollect various programming constructs and to develop C programs.
- Understand the fundamentals of C programming and basics of C Language as well as develop programming skills using them.
- Choose the right data representation formats based on the requirements of the problem.
- Implement different Operations on arrays, functions, pointers, structures, unions and files.
- Develop programs using the basic elements like control statements, Arrays and Strings .
- Implement files and command line arguments.

Analysis

On completion of this course students will be expected to

- Explain the completeness of a system of real numbers: a least upper bound, a greatest lower bound.
- Elaborate on the topological concepts of the real numbers: open sets, closed sets, accumulation points, closure, open covers, compact sets.
- Define and utilize the following concepts: sequence, subsequence, monotone sequence, Cauchy sequence.
- Prove that a given function is continuous or discontinuous and classify its points of discontinuity.
- Justify the convergence/divergence of a given number series;
- Prove some of the classical theorems of real analysis.
- Deal with various examples of metric spaces;
- Have some familiarity with continuous maps;
- Work with compact sets in Euclidean space;
- Work with completeness;
- Apply the ideas of metric spaces to other areas of mathematics
- Understand the concept of Fourier series and Riemann Integrability.

Real Analysis

Upon successful completion of this course the student will be able to:

- Demonstrate an understanding of limits and how they are used in sequences, series, differentiation and integration.
- construct rigorous mathematical proofs of basic results in real analysis
- Appreciate how abstract ideas and rigorous methods in mathematical analysis can be applied to important practical problems.

Complex Analysis

Upon successful completion of this course the student will be able to:

- Represent complex numbers algebraically and geometrically,
- Define and analyze limits and continuity for complex functions as well as consequences of continuity,
- Apply the concept and consequences of analyticity and the Cauchy-Riemann equations and of results on harmonic and entire functions including the fundamental theorem of algebra,
- Analyze sequences and series of analytic functions and types of convergence,
- Evaluate complex contour integrals directly and by the fundamental theorem, apply the Cauchy integral theorem in its various versions, and the Cauchy integral formula.
- Represent functions as Taylor, power and Laurent series, classify singularities and poles, find residues and evaluate complex integrals using the residue theorem.
- Analyses the Bilinear transformation, conformal mapping with their applications.

Operation Research

On completion of this unit successful students will be able to:

- Apply the techniques used in operations research to solve real life problem in mining, industry and various fields.
- select an optimum solution with profit maximization;
- Have complete understand of the significant role operation research play in real world problems.
- Solve transportation problems during the allocation of trucks to excavators
- Eliminate customers / clients waiting period for service delivery
- Turn real life problems into formulation of models to be solve by linear programming etc.
- Determine critical path analysis to solve real life project scheduling time and timely
- Delivery use critical path analysis and programming evaluation production and review techniques

- For timely project scheduling and completion and conduct literature search on the internet in the use of operation research techniques in mining projects execution and completion.

Discrete Mathematics

On completion of this unit successful students will be able to:

- To understand logical concepts and to show logical equivalences by using truth tables and rules in logics.
- Learn concept related to counting.
- Introduction to advanced counting.
- Understand the basic concepts of graph theory, Trees, circuits, Computability theory and Formulation of Language and grammar.

Differential Equation

On completion of this course students will be expected to

- Explain the concepts of partial differential equations.
- Understand the difference between ordinary & partial differential equations.
- Classify the partial differential equations.
- Solve the partial differential equation using Charpit's method, Jacobi's method etc.
- Able to understand the Laplace transform of elementary functions.
- Able to use the rules of integration & definition of Laplace transform students to prove the properties of Laplace transform.
- Learns the topics inverse Laplace transform, application of Laplace transform helps to solve linear higher order differential equation, system of differential equations.

Functional Analysis

Upon completing the course, students will be able to:

- To learn to recognize the fundamental properties of normed spaces and of the transformations between them.
- Understand the notions of dot productand Hilbert space and apply the spectral theorem to the resolution of integral equations.
- Co-relate Functional Analysis to problems arising in Partial Differential Equations, Measure Theory and other branches of Mathematics.

OS and DBMS

Upon completing the course, students will be able to:

- Define data independence, data models for database systems.

- Understand and use data manipulation language to query and manage a database.
- Analyze and design a real database application.
- Apply normalization concepts for designing a good database with integrity constraints.
- Remember the basic concepts of operating system.
- Understand the concepts like database design, data modeling, memory management and I/O management.
- Analyze the need for scheduling algorithms.

Fundamentals of Computer Science

Upon completing the course, students will be able to:

- Remember the characteristics of Procedure and Object Oriented Programming Languages.
- Understand the fundamentals of C++ programming structure, function overloading and constructors.
- To be able to program using C++ features such as composition of objects, Operator overloading, inheritance etc.

PDE and Mechanics

On completion of this course students will

- Know the importance of concepts such as generalized coordinates and constrained motion.
- Understand the Lagrangian and Hamiltonian formulation of Classical Mechanics.
- State the conservation principles involving momentum, angular momentum and energy and understand that they follow from the fundamental equations of motion.
- Understand about motion of a particle under central force field.
- understand Poisson brackets and canonical transformations

Topology

Upon successful completion of this course students will

- Understand terms, definitions and theorems related to topology.
- Demonstrate knowledge and understanding of concepts such as open and closed sets, interior, closure and boundary.
- Create new topological spaces by using subspace, product and quotient topologies.
- Use continuous functions and homeomorphisms to understand structure of topological spaces.