Programme Outcomes, Programme Specific Outcomes and Course Outcomes of MSc Mathematics

Department of Mathematics

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Mathematics Program Outcomes(CBCS)

1. **Mathematics is the culmination of in-depth knowledge of algebra, calculus, geometry, differential equations and several other branches of mathematics. This also leads to study of related areas like computer science statistics and mechanics. Thus, this programme helps to learners in building a solid foundation for higher studies in mathematics**
2. **Investigate and apply mathematical problems and solutions in a variety of contexts related to science, technology, business and industry, and illustrate these solutions using symbolic, numeric, or graphical methods.**
3. **Evaluate hypotheses, theories, methods and evidence within their proper contexts and theorems with proof.**
4. **Demonstrate engage with current research and developments in the subject.**
5. **Apply the underlying unifying structures of mathematics (i.e. sets, relations and functions, logical structure) and the relationships among them**
6. **To solve the examples by using and calculate mean,mode,range by using different methods.**
7. **Recognize to need the engage in lifelong learning through continuing education and research.**
8. **To study the several problems, programs to computational methods and finding the approximations and exact values proof of the theorems.**
9. **To solve one dimensional Wave and Heat equations employing the methods in Differential equations.**
10. **This programme will also enable the learners to join teaching profession in primary a secondary schools and higher school and colleges, NET and SET, banking competition and research.**

Courses / PO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
Real analysis	✓		✓		✓		✓	✓		✓
Algebra	✓		✓	✓	✓			✓		✓
Ordinary differential equation	✓	✓	✓	✓	✓		✓	✓	✓	✓
Discrete Mathematics	✓		✓	✓	✓	✓	✓	✓	✓	✓
General topology	✓		✓	✓	✓		✓	✓		✓
Operational Research	✓	✓		✓		✓	✓	✓		✓
Partial differential equation	✓	✓	✓	✓			✓	✓	✓	✓
Linear Algebra	✓		✓	✓	✓		✓	✓		✓
Programming in c		✓		✓	✓		✓			✓
Complex analysis	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Statistics	✓	✓		✓	✓	✓	✓	✓		✓
Functional Analysis	✓	✓	✓	✓	✓		✓	✓		✓
Graph Theory	✓	✓	✓	✓	✓		✓	✓		✓
Numerical analysis	✓	✓	✓	✓		✓	✓	✓		✓
Fluid Mechanics	✓	✓	✓	✓			✓	✓	✓	✓
Measure Theory	✓		✓	✓	✓		✓	✓		✓
Graph Theory	✓	✓	✓	✓	✓		✓	✓		✓
Numerical	✓	✓	✓	✓		✓	✓	✓		✓

analysis										
Differential Geometry	✓	✓	✓	✓	✓		✓	✓	✓	✓
Fluid Mechanics	✓	✓	✓	✓			✓	✓	✓	✓

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Course Outcome of M. Sc. Mathematics

Course Outcome of Algebra

Students will able to

- Define Group and Subgroups, Normal Subgroups, Quotient Groups and Permutation Group with examples.
- Prove Cayley'stheorem, Sylow's theorem.
- Define Ring, Field, Extension Field, Euclidean Rings, Polynomial Rings and Vector Space with examples.
- Find the roots and the derivatives of a Polynomial, irreducible polynomial, simple extension, automorphism of a Field.
- Discuss the symmetric function, normal extension, splitting field, Galois Group.

Course Outcome of Analysis – I

Students will able to

- Determine the basic topological properties of subsets of the real numbers
- Define connectedness and compactness, and prove a selection of related theorems.
- Define the limit of a sequence, series and the Cauchy criterion
- Test the convergence of series using Ratio, Root and comparison tests.
- Define continuity of a function and uniform continuity of a function
- Prove a theorem about continuous functions
- Determine the continuity of a function at a point and on a set.
- Differentiate the concept of continuity and uniform continuity
- Define the derivative of a function
- Prove a theorem about the derivatives of functions
- Prove the Bolzano-Weierstrass theorem, Rolle's theorem, extreme value theorem, and the Mean Value theorem
- Appreciate how abstract ideas and rigorous methods in mathematical analysis can be applied to important practical problems.

Course Outcome of Differential Geometry

Students will able to

- Prove some necessary and sufficient conditions that a curve be a straight line and a curve be a plane curve.
- Illustrate curvature and torsion of a curve.
- Define involutes and evolutes.
- Show fundamental theorem for space curves.
- Analyse some properties of family of curves.
- Find orthogonal trajectories of a family of curves.

- Explain Geodesics and Normal property of Geodesics.
- Prove Geodesic curvature theorems and Gauss – Bonnet theorem.
- Derive some properties of Developable surface.
- Prove Monge's theorem on developables associated with curves on surfaces.

Course Outcome of Mechanics

Students will able to

- Define D'Alembert's principle
- Derive Lagrange's equation for holomonic and non holomonic constraints
- Attain the applications of Lagranges formulation
- Explain the symmetry properties
- Classify orbits
- Solve the problems of Kepler, Laplace.
- Prove Virtual theorem, Bertrands theorem.
- Find the solution of two body central force.

Course Outcome of Probability and Statistics

Students will able to

- Define Probility set function, Expectation of a random variable.
- Derive Chebyshev's inequality.
- Describe conditional Distributions and expectations.
- Solve the problems by using Chebyshev's inequality.
- Illustrate the Poisson, Gamma and Chi-Square Distributions.
- Solve the problems by using Bivariate Normal distribution.
- Explain distributions of order statistics.
- Prove the central limit theorem.

Course Outcome of Discrete Mathematics

Students will able to

- Define Semigroups, Monoids, Homomorphism and Isomorphism.
- Describe the TF statements, connectives, atomic and compound statements.
- Illustrate Tautology, Tautological implication, Truth Tables, Normal Forms, Principal Normal Forms.
- Discuss the theory of inference, quantifiers, predicate calculus.
- Interpret Lattices, Boolean Algebra, Karnaugh Map, Switching Circuits.

Course Outcome of Graph Theory

Students will able to

- Illustrate different types of graph theory.
- Define Euler Tours and Hamiltonian cycles and prove related theorems.
- Explain Matchings and edge colouring.
- Define edge chromatic number and some properties are proved.
- Define independent sets and cliques and prove related theorems.
- Define vertex colouring and prove theorems on vertex colouring.
- Derive properties of planarity and Euler's formula.
- Prove Five colour theorem.

Course Outcome of Complex Analysis

Students will able to

- Recognize the concept of limits, continuity, Differentiability and analytic function
- Test the analyticity of a given function.
- Prove the Lucas's theorem, Abel's theorem and Cauchy's Theorems.
- Discuss conformality, linear transformation, singularities, types of singularities and Residues.
- Prove the local mapping theorem, maximum modulus principle, Residue theorem.
- Evaluate the integral using Cauchy's integral formula and Residue theorem.
- Find the Taylor's and Laurent's series expansion of given function
- Show Jensen's formula.

Course Outcome of Topology

Students will able to

- Define topological spaces, product topology, metric topology, quotient space.
- Discuss the continuous functions, connected space, compact space, complete metric space, related theorems on Baire space.
- Describe closed sets and limit points, components and path components.
- Prove Urysohn's lemma, Urysohn's metrization theorem, Nagata-Snirnov metrization theorem, Ascoli's theorem.
- Understand the separation axiom, a space filling curve.

Course Outcome of Numerical Analysis

Students will able to

- Solve the equations using Newton's method, Fixed point iteration and Relaxation method.
- Uniform Approximation and Least Square approximation by Polynomials.
- Evaluation of differentiation and integration using Gaussian rules and composite rules, Taylor's series and Euler's method.
- Solve the difference equation.
- Estimation of errors.
- Find the solution of the given equation using Predictor – Corrector method.
- Solve the boundary value problem.