



# PROGRAM AND COURSE OUTCOMES

## DEPARTMENT OF MATHEMATICS



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## MSc MATHEMATICS

### *Course Outcomes*

Semester	Course	Course outcomes
1	MTH1CO1: ALGEBRA - I	<ul style="list-style-type: none"> <li>• Learn factor group computation.</li> <li>• Understand the notion of group action on a set.</li> <li>• Understand the notion of free groups.</li> <li>• Understand the concepts rings of polynomials and ideals.</li> <li>• Learn basic properties of field extensions.</li> </ul>
1	MTH1CO2: LINEAR ALGEBRA	<ul style="list-style-type: none"> <li>• Learn basic properties of vector spaces</li> <li>• Understand the relation between linear transformations and matrices</li> <li>• Understand the concept of diagonalizable and triangulable operators and various fundamental results of these operators</li> <li>• Understand Primary decomposition Theorem.</li> <li>• Learn basic properties inner product spaces</li> </ul>
1	MTH1C03: REAL ANALYSIS I	<ul style="list-style-type: none"> <li>• Learn the topology of the real line</li> <li>• Understand the notions of Continuity, Differentiation and</li> <li>• Integration of real functions.</li> <li>• Learn Uniform convergence of sequence of functions, equicontinuity of family of functions, and Weierstrass theorems.</li> </ul>
1	MTH1C04: DISCRETE MATHEMATICS	<ul style="list-style-type: none"> <li>• Understand the fundamentals of Graphs</li> <li>• Learn the structure of graphs and familiarize the basic concepts used to analyse different problems in different branches in different areas</li> <li>• Acquire a basic knowledge of formal languages, grammars and automata.</li> <li>• Learn the equivalence of deterministic and non</li> </ul>

		<p>deterministic finite accepters.</p> <ul style="list-style-type: none"> <li>• Learn the concepts of partial order relation and total order relation.</li> <li>• Acquire knowledge of Boolean algebras and Boolean function and understand how these concepts arise in certain real-life problems.</li> </ul>
1.	MTH1CO5: NUMBER THEORY	<ul style="list-style-type: none"> <li>• Be able to effectively express the concepts and results of number theory.</li> <li>• Learn basic theory of arithmetical functions and Dirichlet multiplication averages of some arithmetical functions.</li> <li>• Understand distribution of prime numbers and prime number theorem.</li> <li>• Learn the concept of quadratic residue and Quadratic reciprocity laws.</li> <li>• Get a basic knowledge in Cryptography</li> </ul>
2.	MTH2 C06 ALGEBRA - II	<ul style="list-style-type: none"> <li>• Be able to apply Sylow's theorem effectively in various contexts.</li> <li>• Learn automorphisms of fields.</li> <li>• Get a basic knowledge in Galois Theory.</li> <li>• Learn how to apply Galois Theory in various contexts.</li> </ul>
2	MTH2 C07- REAL ANALYSIS- II	<ul style="list-style-type: none"> <li>• Learn why and for what the theory of measure was introduced</li> <li>• Learn the concept of measures and measurable functions</li> <li>• Learn Lebesgue integration and its various properties</li> <li>• Learn how to generalize the concept of measure theory.</li> <li>• Learn that a measure may take negative values.</li> </ul>
2	MT2 C08 -TOPOLOGY	<ul style="list-style-type: none"> <li>• Understand topological spaces</li> <li>• Understand continuous functions among topological spaces and quotient spaces</li> </ul>

		<ul style="list-style-type: none"> <li>• Understand the concept of separation axioms</li> <li>• Understand Urysohn characterisation of normality</li> </ul>
2	MTH2C09 - ODE AND CALCULUS OF VARIATIONS	<ul style="list-style-type: none"> <li>• Interpret and analyse Power Series Solutions and Special functions</li> <li>• Understand Systems of First Order Equations; Non linear Equations</li> <li>• Understand and analyse the Existence and Uniqueness of Solutions</li> <li>• Identify critical points of a given system</li> </ul>
2	MTH2C10-OPERATIONS RESEARCH	<ul style="list-style-type: none"> <li>• Apply the method of minimum spanning tree in solving minimum path problems</li> <li>• Apply Simplex method or Dual Simplex Method to solve linear programming problems</li> <li>• Apply the method of minimum spanning tree in solving minimum path problems</li> <li>• Apply Simplex method or Dual Simplex Method to solve linear programming problems</li> </ul>
3	MTH3C11- MULTIVARIABLE CALCULUS AND GEOMETRY	<ul style="list-style-type: none"> <li>• Understand the concept of functions of several variables, the concept of their differentiation and linear transformation</li> <li>• Understand the concept of curve and their properties. Find curvature and torsion of curves.</li> <li>• Understand the concept of surfaces and their</li> <li>• Properties</li> </ul>
3	MTH3C12 -COMPLEX ANALYSIS	<ul style="list-style-type: none"> <li>• Understand Conformality, Linear Transformations, Elementary Conformal Mappings, Fundamental Theorems</li> <li>• Understand Cauchy's Integral Formula, Local Properties of Analytic Functions, The General Form of Cauchy's Theorem, Calculus of Residues</li> <li>• Analyse Harmonic functions, Power series Expansions, Maximum principle.</li> <li>• Be thorough in power series representation of</li> </ul>

		<p>analytic functions, different versions of Cauchy's Theorem.</p> <ul style="list-style-type: none"> <li>• Get an idea of singularities of analytic functions and their classifications.</li> <li>• Learn different versions of maximum modulus theorem</li> </ul>
3	MTH3C13 - FUNCTIONAL ANALYSIS	<ul style="list-style-type: none"> <li>• Learn the concept of normed linear spaces and various properties operators defined on them</li> <li>• Understand Metric spaces and Continuous Functions</li> <li>• Analyze Inner product spaces</li> <li>• Analyze Banach spaces</li> </ul>
3	MTH3C14 - PDE AND INTEGRAL EQUATIONS	<ul style="list-style-type: none"> <li>• Learn a technique to solve first order PDE and analyse the solution to get information about the parameters involved in the model.</li> <li>• Learn explicit representations of solutions of three important classes of PDE Heat equations</li> <li>• Laplace equation and wave equation for initial value problems.</li> <li>• Define first order differential equations and solve quasilinear equations.</li> <li>• Discuss characteristics method and Lagrange method.</li> <li>• Define second order differential equations and canonical form of hyperbolic, parabolic and elliptical equation.</li> <li>• Discuss The Cauchy problem and D'Alemberts formula, Domain of dependence and region of influence.</li> <li>• Discuss Heat equation: homogeneous boundary condition, Separation of variables for the wave equation and basic properties of elliptic problems.</li> <li>• Define Integral equations and discuss Relations between differential and integral equations, the</li> </ul>

		<p>Green's functions, Fredholm equations with separable kernels, Hilbert-Schmidt Theory, The Neumann Series, Fredholm Theory.</p> <ul style="list-style-type: none"> <li>• Learn the relation between Integral and differential Equations</li> </ul>
3	MTH3E01- CODING THEORY	<ul style="list-style-type: none"> <li>• Learn about error detection</li> <li>• Learn about correcting codes and linear codes</li> <li>• Understand error correcting BCH codes</li> </ul>
4	MTH4C15- ADVANCED FUNCTIONAL ANALYSIS	<ul style="list-style-type: none"> <li>• Understand the concept of spectrum and their properties, compact operators and self adjoint operators.</li> <li>• Understand the properties of orderings.</li> <li>• Study the fundamental theorems and basic results</li> </ul>
4	MTH4C11-GRAPH THEORY	<ul style="list-style-type: none"> <li>• Describe basic concepts of Graph Theory.</li> <li>• Define Trees, Cut edges and Bonds, Cut vertices and discuss The Connector Problem, Connectivity, Blocks, Construction of Reliable Communication Networks, Euler Tours, Hamilton Cycles, The Chinese Postman Problem, and The Travelling Salesman Problem.</li> <li>• Explain independent sets and covering sets and some basic theorems.</li> <li>• Discuss Matchings, Matchings and Coverings in Bipartite Graphs, Perfect Matchings, the Personnel Assignment Problem, Edge Chromatic Number, Vizing's Theorem, The Timetabling Problem, Independent Sets, Ramsey's Theorem.</li> <li>• Define Vertex Colouring and Chromatic Number. Discuss Brooks Theorem, Chromatic Polynomial, Girth and Chromatic Number, A Storage Problem</li> <li>• Define Plane and Planar Graphs, Dual Graphs and discuss Euler's Formula, Bridges, Kuratowski's Theorem, The Five-Colour Theorem, Directed</li> </ul>

		Graphs, Directed Paths, Directed Cycles
4	MT4E09 - DIFFERENTIAL GEOMETRY	<ul style="list-style-type: none"> <li>Analyze vector fields on surfaces</li> <li>Understand Geodesics and parallel transport</li> <li>Understand the concept of curvature and use this to find Arc length and line integrals.</li> <li>Understand local equivalence of surfaces and parametrized surfaces</li> </ul>
4	MTH4E08 – COMMUTATIVE ALGEBRA	<ul style="list-style-type: none"> <li>Learn basic properties of commutative rings, ideals and modules over commutative rings</li> <li>Learn uniqueness theorem for a decomposable ideal.</li> <li>Learn integrally closed domain and valuation ring.</li> <li>Understand the basic theory of Noetherian and Artin Rings</li> </ul>