# Course Outcome

## M.Sc Mathematics

| Name of the paper | Course outcome |
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| Algebra-I | • Introduces Direct products & finitely generated Abelian groups<br>• Introduces Factors groups<br>• Introduces Group action<br>• Introduces Sylow theorems & applications<br>• Introduces rings of polynomials<br>IntroducesHomomorphisms and factor rings |
| Linear Algebra | • Lays foundations of Vector spaces & Linear transformations<br>• Explain Elementary canonical forms and Inner product spaces |
| Real Analysis- I | • Introduces Basic topology<br>• Introduces Differentiation<br>• Introduces The Riemann Stieltjes integral<br>• Explain Uniform convergence and continuity<br>• Introduces Uniform convergence and integration<br>• Introduces Uniform convergence and differentiation |
| Number Theory | • Introduces Arithmetical functions<br>• Introduces Dirichlet multiplication<br>• Introduces elementary theorems on the distribution of prime numbers<br>• Introduces Quadratic residues and quadratic reciprocity law<br>• Introduces Cryptography, Public key |
| Discrete Mathematics | • Introduces order relations<br>• Introduces lattices<br>• Introduces Boolean algebra<br>• Introduces Basic concepts of Graphs, trees, Planar and non planar graphs, Euler |
| Algebra-II | • Intorduces Prime and Maximal ideals<br>• Introduces Extension fields<br>• Introduces Algebraic extensions<br>• Introduces Geometric constructions,Finite fields<br>• Introduces Automorphisms of fields<br>• Introduces Isomorphism extension theorem<br>• Introduces Splitting fields<br>• Introduces separable extensions |

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| | • Introduces Galois theory |
| Real Analysis- II | • Lays foundation s of Lebesgue outer measure, measurable sets, measurable functions<br>• IntroducesBorel and Lebesgue measurability<br>• Introduces Differentiation<br>• Introducesfunctions of bounded variations<br>• IntroducesLebesgues differentiation theorem<br>• IntroducesLebesgues set, Measures and outer measures, Extension of a measure<br>• Introduces Signed measures and Hahn decomposition, Jordan decomposition<br>• Introduces Radon Nikodym theorem<br>• Introduces Lebesgue Stieltjes measure, Riesz representation theorem for C(I) |
| Topology-I | • Introduces topological spaces<br>• IntroducesBasic concepts, quotient spaces<br>• IntroducesSpaces with special properties<br>• Introduces Separation axioms<br>• IntroducesHierarchy of Separation axioms<br>• IntroducesCompactness and separation axioms<br>• Introduces the UrysohnCharacterisation of Normality<br>• IntroducesTietze characterization of Normality |
| Topology-II | • Introduces Products and Coproducts<br>• Introduces Embedding and Metrization,Fundamental Groups and covering spaces<br>• Introduces Compactness, Complete metric spaces |
| ODE and Calculus of Variations | • Introduces Power series solutions and special functions<br>• Introduces Special functions of mathematical physics<br>• Introduces systems of first order equations<br>• Introduces Non linear equations<br>• Introduces Oscillation theory of boundary value problems<br>• Introduces The Calculus of variations |
| Operations Research | • Introduces convex functions<br>• Introduces linear programming<br>• Introduces Transportation problem<br>• Introduces integer programming<br>• Introduces sensitivity analysis<br>• Introduces Flow and potential in networks<br>• Introduces Theory of games |
| Multivariable Calculus and Geometry | • Introduces Functions of Several Variables – Linear Transformations, Differentiation, The Contraction Principle,The Inverse Function Theorem, the Implicit Function Theorem, Curves |

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| | • Introduces Re-parametrization, Closed curves Level curves versus parametrized curves, Curvature, Plane curves, Space curves, Surface, Smooth surfaces<br>• Introduces Smooth maps, Tangents and derivatives, Normals and orientability<br>• Introduces Applications of the inverse function theorem<br>• Introduces Lengths of curves on surfaces, The second fundamental form, The Gauss and Weingarten maps<br>• Introduces Normal and geodesic curvatures, Gaussian and mean curvatures<br>• Introduces Principal curvatures of a surface. |
| Complex Analysis | • Analyze Analytic functions and exponential functions,<br>• Apply Cauchy's theorem for disk and the Integral formula<br>• Understand Local properties of Analytic functions.<br>• Study Residue theorem and the argument principle<br>• Differentiate the Taylor's series and Laurent series.<br>• Introduces Simply Periodic Functions, Doubly Periodic Functions, The Weierstrass Theory |
| Functional Analysis | • Introduces Metric spaces and Continuous Functions<br>• IntroducesLp spaces<br>• IntroducesFourier series and Integrals Normed spaces ,Continuity of linear maps<br>• Introduces Hahn-Banach Theorems<br>• IntroducesBanach spaces<br>• IntroducesUniform Boundedness Principle<br>• IntroducesClosed Graph and Open Mapping Theorems<br>• Introduces Bounded Inverse Theorem<br>• Introduces Inner product spaces, Orthonormal sets |
| PDE and Integral Equations | • Introduces First Order PDE<br>• Introduces Second Order PDE<br>• Introduces Integral Equation |
| Commutative Algebra | • Introduces Rings and Ideals, Modules, Rings and Modules of Fractions<br>• Introduces Primary Decomposition<br>• IntroducesIntegral Dependence and Valuation<br>• Introduces Chain conditions<br>• Introduces Noetherian rings, Artinian rings |
| Measure and integration | • Introduces The concept of measurability<br>• Introduces Simple functions<br>• Introduces Elementary properties of measures<br>• Introduces Arithmetic in [0,infinity] |

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| | • Introduces Integration of Positive Functions<br>• IntroducesIntegration of Complex Functions<br>• Introduces The Role Played by Sets of Measure zero<br>• Introduces Topological Preliminaries<br>• Introduces The Riesz Representation Theorem<br>• IntroducesRegularity Properties of Borel Measures, Lebesgue Measure, Continuity Properties of Measurable Functions<br>• Introduces Total Variation<br>• Introduces Absolute Continuity<br>• Introduces Consequences of Radon - Nikodym Theorem<br>• IntroducesBounded Linear Functionals on LP<br>• Introduces The Riesz Representation Theorem<br>• Introduces Measurability on Cartesian Products<br>• IntroducesProduct Measures<br>• IntroducesThe Fubini Theorem<br>• Introduces Completion of Product Measures. |
| Graph Theory | • Introduces Basic concepts of Graph. Trees, Cut edges and Bonds, Cut vertices, Cayley's Formula<br>• Introduces The Connector Problem, Connectivity<br>• Introduces Blocks, Construction of Reliable Communication Networks, Euler Tours, Hamilton Cycles<br>• Introduces The Chineese Postman Problem, The Travelling Salesman Problem. Matchings, Matchings and Coverings in Bipartite Graphs, Perfect Matchings<br>• Introduces The Personnel Assignment Problem, Edge Chromatic Number, Vizing's Theorem<br>• Introduces The Timetabling Problem, Independent Sets, Ramsey's Theorem,VertexColouring-Chromatic Number<br>• Introduces Brooks' Theorem<br>• Introduces Chromatic Polynomial<br>• Introduces Girth and Chromatic Number<br>• Introduces A Storage Problem, Plane and Planar Graphs<br>• Introduces Dual Graphs, Euler's Formula<br>• IntroducesBridges, Kuratowski's Theorem, The Five-Colour Theorem, Directed Graphs, Directed Paths, Directed Cycles. |
| Differential geometry | • Introduces Graphs and Level Set, Vector fields<br>• Introduces The Tangent Space, Surfaces<br>• Introduces Vector Fields on |

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| | Surfaces<br>• Introduces Orientation<br>• Introduces The Gauss Map<br>• IntroducesGeodesics<br>• Introduces Parallel Transport<br>• Introduces The Weingarten Map, Curvature of Plane Curves<br>• Introduces Arc Length and Line Integrals<br>• Introduces Curvature of Surfaces<br>• Introduces Parametrized Surfaces<br>• Introduces Local Equivalence of Surfaces and Parametrized Surfaces. |
| Functional Analysis I | • Introduces Metric spaces and Continuous Functions<br>• IntroducesLp spaces<br>• Introduces Fourier series and Integrals Normed spacesContinuity of linear maps<br>• IntroducesHahn-Banach Theorems<br>• IntroducesBanach spaces<br>• Introduces Uniform Boundedness Principle |
| Functional Analysis II | • Introduces Closed graph and open mapping theorem, Boundedness theorem, Spectrum of a bounded operator, Duals and Transposes<br>• IntroducesReflexivity,Compact linear map, Projection and Reisz Representation theorems<br>• Introduces Bounded operators and adjoints, Normal, Unitary and Self adjoint operators<br>• Introduces Spectrum and Numerical Range, Compact self adjoint operators |
| Commutative Algebra | • Introduces Rings and ideals, Modules<br>• Introduces Rings and modules of fractions primary decomposition<br>• Introduces Integral dependence and valuation chain conditions, Noetherian rings, Artin rings |