MSC PROGRAMMS

M.Sc. Math

Program outcomes listed as follows:

Students would be able to:
PSO1 Communicate concepts of Mathematics and its applications.
PSO2 Acquire analytical and logical thinking through various mathematical tools and techniques.
PSO3 Investigate real life problems and learn to solve them through formulating mathematical models.
PSO4 Attain in-depth knowledge to pursue higher studies and ability to conduct research. Work as mathematical professional.
PSO5 Achieve targets of successfully clearing various examinations/interviews for placements in teaching, banks, industries and various other organizations/services.

S.N.	COURSE OBJECTIVES	COURSE OUTCOMES
1.	**MATHEMATICS : M.SC FIRST YEAR(IST SEMESTER)**	
	16MAT21C1: Abstract Algebra	
	• To able to write rigorous mathematical proofs for basic theorems in group theory. • Use various series to find solvable groups • Analyze and illustrate examples of module, free module. • Get knowledge about Radicals	After the completion of the course, students will be able to ● Apply group theoretic reasoning to group actions. ● Learn properties and analysis of solvable & nilpotent groups, Noetherian & Artinian modules and rings. ● Apply Sylow's theorems to describe the structure of some finite groups and use the concepts of isomorphism and homomorphism for groups and rings. ● Use various canonical types of groups and rings- cyclic groups and groups of permutations, polynomial rings and modular rings. ● Analyze and illustrate examples of composition series, normal series, sub normal series.
	16MAT21C2: Mathematical Analysis	
	1. To introduce students to the fundamentals of mathematical analysis and reading and writing mathematical proofs. 2. To develop deep understanding of uniform convergence and Riemann Stieltje's integral and its properties. 3. To equip students with the skills that they can develop their own mathematical	After the completion of the course, students will be able to • Understand Riemann Stieltjes integral, its properties and rectifiable curves. • Learn about pointwise and uniform convergence of sequence and series of functions and various tests for uniform convergence.

	arguments and communicating them to others in writing. 4. Expertise in applying analysis techniques for the solution of real life problems.	• Find the stationary points and extreme values of implicit functions. • Be familiar with the chain rule, partial derivatives and concept of derivation in an open subset of Rn.

	16MAT21C3: Ordinary Differential Equations	
	1. To provide the standard methods for solving differential equations as well as methods based on the use of matrices. 2. To demonstrate how differential equations can be useful in real life problems. 3. To find or numerically approximate the solution of the resulting differential equation subject to given conditions, and to interpret the solutions obtained.	After the completion of the course, students will be able to • Apply differential equations to variety of problems in diversified fields of life. • Learn use of differential equations for modeling and solving real life problems. • Interpret the obtained solutions in terms of the physical quantities involved in the original problem under reference. • Use various methods of approximation to get qualitative information about the general behaviour of the solutions of various problems.
	16MAT21C4: Complex Analysis	
	1. To Identify and construct complex-differentiable functions. 2. To Use the general Cauchy integral theorem and formula. 3. To Understand the concept of conformal mapping. 4 Express functions as infinite series or products. 5 To define the concept of residues and solve the polynomial equations.	After the completion of the course, students will be able to • Be familiar with complex numbers and their geometrical interpretations. • Understand the concept of complex numbers as an extension of the real numbers. • Represent the sum function of a power series as an analytic function. • Demonstrate the ideas of complex differentiation and integration for solving related problems and establishing theoretical results. • Understand concept of residues, evaluate contour integrals and solve polynomial equations..
	16MAT21C5: Mathematical Statistics	

	1. To acquaint students with fundamentals of Statistics. 2. To develop deep understanding and working knowledge of Statistics. 3. To equip students with consequently requisite quantitative skills that they can employ and build on in flexible ways. 4. Expertise in applying Probability Distributions for the solution of real life problems. 5. Ability to perform to test hypothesis for large samples and small samples.	After the completion of the course, students will be able to • Understand the mathematical basis of probability and its applications in various fields of life. • Use and apply the concepts of probability mass/density functions for the problems involving single/bivariate random variables. • Have competence in practically applying the discrete and continuous probability distributions along with their properties. • Decide as to which test of significance is to be applied for any given large sample problem.
2.	**MATHEMATICS : M.SC FIRST YEAR (IIND SEMESTER)**	
	16MAT22C1: Theory of Field Extensions	
	1.Student will learn different properties of field extensions . 2.Learn the connection between the concept of field extensions and Galois theory. 3.Learn the concept of automorphism, monomorphism and their linear independence in field theory. 4.Get the understanding of ruler and compass constructions.	After the completion of the course, students will be able to • Use diverse properties of field extensions in various areas. • Establish the connection between the concept of field extensions and Galois theory. • Describe the concept of automorphism, monomorphism and their linear independence in field theory. • Compute the Galois group for several classical situations. CO5 Solve polynomial equations by radicals along with the understanding of ruler and compass constructions.

	16MAT22C2: Measure and Integration Theory	
	1. Defining Length of intervals and concept of f measure for sets by comparing with length. 2. Measurable sets and non measurable sets analysis and examples. 3. Lebesgue Integral and compare with Rieaman integration. 4. Functions of Bounded Variation .	After the completion of the course, Students will be able to • Describe the shortcomings of Riemann integral and benefits of Lebesgue integral. • Understand the fundamental concept of measure and Lebesgue measure. • Learn about the differentiation of monotonic function, indefinite integral, use of thefundamental theorem of calculus.
	16MAT22C3: Integral Equations and Calculus of Variations	
	1. The Objective of course is the study of various Banach spaces and the main properties and continuous operation between Banach spaces. 2. The basic results associated with different types of convergence in NLS and spectrum theorem and some of its applications in equations. 3. Properties of finite dimensional spaces .Uniform Boundedness principle 4. Equivalent Norms and convergence.	After the completion of the course, Students will be able to • Understand the methods to reduce Initial value problems associated with linear differential equations to various integral equations. • Categorise and solve different integral equations using various techniques. • Describe importance of Green's function method for solving boundary value problems associated with non-homogeneous ordinary and partial differential equations,especially the Sturm-Liouville boundary value problems. • Learn methods to solve various mathematical and physical problems using variational techniques.
	16MAT22C4:Partial Differential Equations	

	1. To Understand the methods to reduce Initial value problems. 2. To solve different integral equations using various techniques. 3. To describe importance of Green's function method for solving boundary value problems.	After the completion of the course, Students will be able to • Establish a fundamental familiarity with partial differential equations and theirapplications. • Distinguish between linear and nonlinear partial differential equations. • Solve boundary value problems related to Laplace, heat and wave equations byvarious methods. • Use Green's function method to solve partial differential equations. • Find complete integrals of Non-linear first order partial differential equations.
	16MAT22C5: Operations Research Techniques	
	• Formulate real-world problems as a linear programming model and describe the theoretical workings of the graphical and simplex method, demonstrate the solution process by hand and solver • Formulate specialized linear programming problems, namely transportation and assignment problems and describe theoretical workings of the solution methods for transportation and assignment problems, demonstrate solution process by hand and solver • Deep understanding of the theoretical background of queueing systems. • To apply and extend queueing models to analyze real world systems. • To apply and extend inventory models to analyze real world systems. • Apply the knowledge of game theory concepts to articulate real-world decision situations for identifying, analyzing, and practicing strategic decisions to counter the consequences	After the completion of the course, Students will be able to • Identify and develop operations research model describing a real life problem. • Understand the mathematical tools that are needed to solve various optimizationproblems. • Solve various linear programming, transportation, assignment, queuing, inventory and game problems related to real life.
	16ENV01: ENVIRONMENTAL ISSUES	

	• Students will lead to understand the global environmental issues and different problem related to population growth of the world and India. • Students will understand the impact of deforestation on the environment. • Students will be able to learn the Forest and Wildlife management in order to save the environment	After the completion of the course, Students will be able to • Explain the effects of habitat degradation, exotic species, overexploitation, pollution and climate change on biodiversity in general • Analyze the conditions of the prevailing environment with a clearer perspective. • Assess the effects of our daily activities on environment.
	16IMFS2: Fundamentals of Communication & Soft Skills	
3.	**MATHEMATICS : M.SC FINAL YEAR (IIIRD SEMESTER)**	
	17MAT23C1: Functional Analysis	
	• Understand Hilbert spaces and related terms. • Introduces the concept of projections, • measure and outer measure • Learn about Hahn, Jordan and Radon • Nikodym decomposition theorem, Lebesgue- stieltjes integral, Baire sets.	After the completion of the course,students will be able to • Be familiar with the completeness in normed linear spaces. • Understand the concepts of bounded linear transformation, equivalent formulation ofcontinuity and spaces of bounded linear transformations. • Describe the solvability of linear equations in Banach Spaces, weak and strongconvergence and their equivalence in finite dimensional space.
		• Learn the properties of compact operators. • Understand uniform boundedness principle and its consequences
	17MAT23C2: Elementary Topology	

	1. Get familiar with the concepts of topological space and continuous functions. 2. Generate new topologies from a given set with bases. 3. Describe the concept of homeomorphism and topological invariants. 4. Establish connectedness and compactness of topological spaces and proofs of related theorems. 5. Have in-depth knowledge of separation axioms and their properties.	After the completion of the course, Students will be able to ● Get familiar with the concepts of topological space and continuous functions. ● Generate new topologies from a given set with bases. ● Describe the concept of homeomorphism and topological invariants. ● Establish connectedness and compactness of topological spaces and proofs of relatedtheorems. ● Have in-depth knowledge of separation axioms and their properties.
	17MAT23C3: Fluid Dynamics	
	1. To introduce and explain fundamentals of Fluid Mechanics, which is used in the applications of Aerodynamics, Hydraulics, Marine Engineering, Gas dynamics etc. 2. To give fundamental knowledge of fluid, its properties and behavior under various conditions of internal and external flows. 3. To develop understanding about hydrostatic law application of mass, equation of continuity, momentum and energy equation in fluid flow. 4. To imbibe basic laws and equations used for analysis of static and dynamic fluids	After the completion of the course, Students will be able to ● Be familiar with continuum model of fluid flow and classify fluid/flows based on physical properties of a fluid/flow along with Eulerian and Lagrangian descriptions offluid motion. ● Derive and solve equation of continuity, equations of motion, vorticity equation, equation of moving boundary surface, pressure equation and equation of impulsive action for a moving inviscid fluid. ● Calculate velocity fields and forces on bodies for simple steady and unsteady f low including those derived from potentials. ● Understand the concepts of velocity potential, stream function and complex potential, and their use in solving two-dimensional flow problems applying complex-variable techniques. ● Represent mathematically the potentials of source, sink and doublets in two- dimensions as well as three-dimensions, and study their images in impermeable surfaces.
	17MAT23DA1: Discrete Mathematics	

	5. To acquaint students with fundamentals of Discrete Mathematics. 6. To develop deep understanding and working knowledge of Discrete Mathematics. 7. To Solve problems involving recurrence relations and generating functions. 8. To equip students with consequently requisite logical skills that they can employ and build on in their mathematical skills in flexible ways. 9. Expertise in applying rules of inference, tests for validity, and methods of proof including direct and indirect proof forms, proof by contradiction, proof by cases, and mathematical induction and write proofs using symbolic logic and Boolean Algebra. 10. Use Discrete Mathematics for the solution of real life problems.	After the completion of the course, Students will be able to ● Be familiar with fundamental mathematical concepts and terminology of discretemathematics and discrete structures. ● Express a logic sentence in terms of predicates, quantifiers and logical connectives. ● Use finite-state machines to model computer operations. ● Apply the rules of inference and contradiction for proofs of various results. ● Evaluate boolean functions and simplify expressions using the properties of booleanalgebra.
	17MAT23DB1: Analytical Number Theory	
	1. Know about the classical results related to prime numbers and get familiar with the irrationality of *e* and *Π*. 2. Study the algebraic properties of Un and Qn. 3. Learn about the Waring problems and their applicability. 4. Learn the definition, examples and simple properties of arithmetic functions and about perfect numbers. 5. Understand the representation of numbers by two or four squares.	After the completion of the course, Students will be able to ● Know about the classical results related to prime numbers and get familiar with theirrationality of *e* and *Π*. ● Study the algebraic properties of U_n and Qn. ● Learn about the Waring problems and their applicability. ● Learn the definition, examples and simple properties of arithmetic functions and aboutperfect numbers. ● Understand the representation of numbers by two or four squares.
	16EVN02: DISASTER MANAGEMENT	
	1. To increase the knowledge and understanding of the disaster phenomenon, its different contextual aspects, impacts and public health consequences	After the completion of the course, Students will be able to ● Develop Capacity to integrate knowledge and to analyse, evaluate and manage the different public health aspects of disaster

	2. To increase the knowledge and understanding of the International Strategy for Disaster Reduction (UN-ISDR) and to increase skills and abilities for implementing the Disaster Risk Reduction (DRR) Strategy. 3. To ensure skills and abilities to analyse potential effects of disasters and of the strategies and methods to deliver public health response to avert these effects. 4. To ensure skills and ability to design, implement and evaluate research on disasters.	events at a local and global levels, even when limited information is available. • Develop Capacity to describe, analyse and evaluate the environmental, social, cultural, economic, legal and organisational aspects influencing vulnerabilities and capacities to face disasters. • Develop Capacity to work theoretically and practically in the processes of disaster management (disaster risk reduction, response, and recovery) and relate their interconnections, particularly in the field of the Public Health aspects of the disasters. • Capacity to manage the Public Health aspects of the disasters. understand causal relationships between molecule/cell level phenomena ("modern" genetics) and organism-level patterns of heredity ("classical" genetics).
4.	**MATHEMATICS : M.SC FINAL YEAR (IVTH SEMESTER)**	
	17MAT24C1: Inner Product Spaces and Measure Theory	
	1. . Understand Hilbert spaces and related terms. 2. Introduces the concept of projections, measure and outer measure 3. Learn about Hahn, Jordan and Radon-Nikodym decomposition theorem,Lebesgue- stieltjes integral, Baire sets.	After the completion of the course,students will be able to • Understand Hilbert spaces and related terms. • Introduce the concept of projections, measure and outer measure • Learn about Hahn, Jordan and Radon-Nikodyn decomposition theorem, • Lebesgue-stieltjes integral, Baire sets and Baire measure
	17MAT24C2: Classical Mechanics	
	1. To demonstrate knowledge and understanding of the following fundamental concepts in: a. Moment of Inertia and Product of Inertia. b. Angular Momentum c. Principal Axes and principal moment of inertia d. Momental ellipsoid and coplanar mass distribution 2. To know how to impose constraints on a system in order to simplify the methods to be used in solving physics problems	After the completion of the course, Students will be able to • Be familiar with the concepts of momental ellipsoid, Equimomental systems andgeneral motion of a rigid body. • Understand ideal constrains, general equation of dynamics and Lagrange's equationsfor potential forces. • Describe Hamiltonian function, Poincare-Carton integral invariant and principle ofleast action.

	3. To know the importance of concepts such as generalized coordinates and constrained motion. 4. To represent the equations of motion for complicated mechanical systems using the Lagrangian and Hamiltonian formulation of classical mechanics. 5. To develop math skills as applied to physics.	• Get familiar with canonical transformations, conditions of canonicity of atransformation in terms of Lagrange and Poisson brackets.
	17MAT24C3: Viscous Fluid Dynamics	
	1. Viscous fluid flow covers the fundamentals of fluid mechanics from an advanced point of view. 2. Course will cover the derivation of Navier-Stokes equations, exact solutions for simplified configurations, Laminar flows. 3. Course will help to understanding of concepts in viscous fluid flow. 4. Define dimensional analysis and similitude, and understand the common dimensional numbers of fluid dynamics along with their physical and mathematical significance.	After the completion of the course, Students will be able to • Understand about vortex motion and its permanence, rectilinear vertices, vorteximages and specific types of rows of vortices. • Model mathematically the compressible fluid flow and describe various aspects of gasflow. • Acquire knowledge of viscosity, relation between shear stress and rates of shear strainfor Newtonian fluids, energy dissipation due to viscosity, and laminar and turbulent flows. • Derive the equations of motion for a viscous fluid flow and use them for study of flowNewtonian fluids in pipes and ducts for laminar flow fields, and their applications in mechanical engineering. • Get familiar with dimensional analysis and similitude, and understand the common dimensional numbers of fluid dynamics along with their physical and mathematicalsignificance.
	17MAT24DA1: General Topology	

	1. Have the knowledge of the separation axioms. 2. Understand the concept of product topological spaces and their properties. 3. Be familiar with Tychonoff embedding theorem and Urysohn's metrization theorem. 4. Know about methods of generating nets and filters and their relations. 5. Describe paracompact spaces and their characterizations.Get familiar with the concepts of topological space and continuous functions.	After the completion of the course, Students will be able to • Have the knowledge of the separation axioms. • Understand the concept of product topological spaces and their properties. • Be familiar with Tychonoff embedding theorem and Urysohn's metrization theorem. • Know about methods of generating nets and filters and their relations. • Describe paracompact spaces and their characterizations.
	17MAT24DB1: Algebraic Number Theory	
	1. Learn Algebraic Number and Integers: Gaussian integers and its properties, Primes and fundamental theorem . 2. Learn countability of set of algebraic numbers, Liouville theorem and generalizations, transcendental numbers. 3. Learn Norm and trace of an algebraic number, Non degeneracy of bilinear pairing, Existence of an integral basis. 4. Learn Integral closure, Noetherian ring, Characterizing Dedekind domains, Fractional ideals and unique factorization, G.C.D. and L.C.M. of ideals, Chinese remainder theorem, Dedekind theorem.	After the completion of the course, Students will be able to • Learn the arithmetic of algebraic number fields. • Prove theorems for integral bases and unique factorization into ideals. • Factorize an algebraic integer into irreducibles. • Obtain the ideals of an algebraic number ring. • Understand ramified and unramified extensions and their related results.


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