M.SC. MATHEMATICS - SPECIFIC PROGRAMME OUTCOME

Programme	Specific Programme Outcome
M.Sc.	• Understanding of the fundamental axioms in mathematics and capability of developing ideas Based on them. • Inculcate mathematical reasoning. • Prepare and motivate students for research studies in mathematics and related fields. • Provide knowledge of a wide range of mathematical techniques and application of mathematical methods/tools in other scientific and engineering domains. • Provide advanced knowledge on topics in pure mathematics, empowering the students to pursue higher degrees at reputed academic institutions. • Strong foundation on algebraic topology and representation theory which have strong links and application in theoretical physics, in particular string theory. • Good understanding of number theory which can be used in modern online cryptographic technologies. • Nurture problem solving skills, thinking, creativity through assignments, project work. • Assist students in preparing (personal guidance, books) for competitive exams e.g. NET, GATE, etc.

MATHEMATICS - COURSE OUTCOME

Programme	Class	Paper Title	Compulsory/ Optional	Points to Course Outcome
M.Sc. Mathematics	Semester-I	Advanced Abstract Algebra	Compulsory	CO1. Explain the fundamental concepts of advanced algebra such as groups and rings and their role in modern mathematics and applied contexts CO2. Demonstrate accurate and efficient use of advanced algebraic techniques CO3. Demonstrate capacity for mathematical reasoning through analyzing, proving and explaining concepts from advanced algebra.
		Real Analysis	Compulsory	CO1.Describe the Basic difference between the rational and real numbers. CO2.Give the divination of concepts related to metric spaces such as continuity, compactness, convergent etc. CO3 Give the essence of the proof of bolzanoweistrass theorem the contraction theorem as well as existence of convergent subsequence using equicontinuity. CO4 Evaluate the limits of wide class of real sequences.
		Topology	Compulsory	CO1.Topological spaces CO2 Connectedness, compactness, separation axioms CO3 Continuity CO4 Metric spaces review
		Complex Analysis	Compulsory	CO1: Compute sums, products, quotients, conjugate, modulus, and argument of complex numbers CO2: Write complex numbers in polar form CO3: Introduce elementary complex functions CO4: Find all integral roots and all logarithms of nonzero complex numbers
		Advanced Discrete Mathematics	Compulsory	CO1.More advance topics in combinatory: recurrence relations, generating functions, Polya's theorem, graphs, trees, topics in matching such as Marriage theorem. CO2. Ramsey theory, planar graph. CO3. Partially ordered set: Dilworth's theorem and external set theory. CO4.Application to real life problems such as network theory, data structure, optimization etc.

M.Sc. Mathematics	Semester-II	Abstract Algebra	Compulsory	CO1. Explore the properties of groups, sub-groups, including symmetric groups, permutation groups, cyclic groups, normal sub-groups and quotient groups. CO2. Understand the concepts of homomorphism and isomorphism between groups. CO3. Apply class equation and Sylow theorems to solve different problems. CO4. Explore the properties of rings, sub-rings, ideals including integral domain, principle ideal domain, Euclidean ring and Euclidean domain.
		Real Analysis	Compulsory	CO1: Explain Continuity and Discontinuity of various functions in different contexts CO2: Differentiate Uniform continuity from continuity and related theorems CO3: Understand the meaning of derivative of a function CO4: Acquire skill in applying the various techniques of differentiation and applications
		General and Algebraic Topology	Compulsory	CO1.Concept of homogony of maps and topological spaces CO2.Concept of chain complexes of abelian groups CO3. Concept of homology and cohomology groups of spaces CO4. Exposure to the language of categories and factors
		Advanced Complex Analysis	Compulsory	CO1: Compute sums, products, quotients, conjugate, modulus, and argument of complex numbers CO2: Write complex numbers in polar form CO3: Introduce elementary complex functions CO4: Find all integral roots and all logarithms of nonzero complex numbers
		Advanced Discrete Mathematics	Compulsory	CO1. Construct mathematical arguments using logical connectives and quantifiers. CO2.Validate the correctness of an argument using statement and predicate calculus. CO3.Uunderstand how lattices and Boolean algebra are used as tools and mathematical models in the study of networks. CO4.Learn how to work with some of the discrete structures which include sets, relations, functions, graphs and recurrence relation .

M.Sc. Mathematics	Semester-III	Functional Analysis	Compulsory	CO1.Concept of normed linear spaces and inner product spaces. CO2. Concept of bounded linear operators between these spaces. CO3.Concept of the dual space of a normed linear space. CO4. Concept of compact, self-adjoint and normal operators.
		Partial Differential Equations & Mechanics	Compulsory	CO1.Use knowledge of partial differential equations (PDEs), modelling, the general structure of solutions, and analytic and numerical methods for solutions. CO2.Formulate physical problems as PDEs using conservation laws. understand analogies between mathematical descriptions of different (wave) phenomena in physics and engineering. CO3.Classify PDEs, apply analytical methods, and physically interpret the solutions. CO4.Solve practical PDE problems with finite difference methods, implemented in code, and analyze the consistency, stability and convergence properties of such numerical methods
		Fundamentals of Computer Science (Object Oriented Programmeming and Data Structure)	Optional	CO1.Understand the concept of Dynamic memory management, data types, algorithms, Big O notation. CO2. Understand Basic data structures such as arrays, linked lists, stacks and queues. CO3. Describe the hash function and concepts of collision and its resolution methods CO4. Solve problem involving graphs, trees and heaps
		Operations Research	Optional	CO1: Define a LPP in standard form and Canonical form CO2: Identify a feasible solution, a Basicfeasible solution and an optimal solution using simplex method CO3: Understand the new term LPP CO4: Formulate and model a linear Programmeming problem from a word problem and solve them graphically in 2 and 3 dimensions, while employing some convex analysis
		Programmeming in C (with ANSI Features)	Optional	CO1.Read, understand and trace the execution of Programmes written in C language. CO2. Write the C code for a given algorithm. CO3. Write Programmes that perform operations using derived data types. CO4. Solve an algebraic or transcendental equation using an appropriate numerical method.

M.Sc. Mathematics	Semester-IV	Functional Analysis	Compulsory	CO1.Concept of normed linear spaces and inner product spaces. CO2. Concept of bounded linear operators between these spaces. CO3. Concept of the dual space of a normed linear space. CO4. Concept of compact, self-adjoint and normal operators.
		Partial Differential Equations & Mechanics	Compulsory	CO1.Classify partial differential equations and transform into canonical form CO2. solve linear partial differential equations of both first and second order CO3. apply partial derivative equation techniques to predict the behaviour of certain phenomena. CO4. apply specific methodologies, techniques and resources to conduct research and produce innovative results in the area of specialization.
		Fuzzy Sets and their applications	Optional	CO1.Understand Basic knowledge of fuzzy sets and fuzzy logic. CO2.Apply Basic fuzzy inference and approximate reasoning. CO3.Understand principles of neural networks. CO4.Apply Basic fuzzy system modeling methods.
		Operations Research	Optional	CO1.Identify and develop operational research models from the verbal description of the real system. CO2. Understand the mathematical tools that are needed to solve optimization problems. CO3.Use mathematical software to solve the proposed models. CO4.Develop a report that describes the model and the solving technique, analyze the results and propose recommendations in language understandable to the decision-making processes
		Programmeming in C (with ANSI Features)	Optional	CO1.Read, understand and trace the execution of Programmes written in C language. CO2. Write the C code for a given algorithm. CO3. Write Programmes that perform operations using derived data types. CO4. Solve an algebraic or transcendental equation using an appropriate numerical method.