Postgraduate Department of Mathematics

M.Sc. Mathematics

Programme Outcomes

PO1	To help the students to learn Mathematics as per modern requirement.
PO2	To improve the logical, reasoning, analytical and problem solving skills of students.
PO3	To give an orientation towards the applications of Mathematics.
PO4	To build interest and confidence in learning the subject in the students.
PO5	To create a research aptitude and culture in young minds.
PO6	To encourage students to pursue higher studies in mathematics.
PO7	To ensure that the learning of mathematics becomes more alive, vibrant, relevant and meaningful and understand the world around them through Mathematics.
PO8	To motivate students to uphold scientific integrity and objectivity in professional endeavors.

Programme Specific Outcomes

PSO1	Enable to acquire real insight to Modern Mathematics.
PSO2	Build up a strong foundation in classical areas like Analysis, Abstract Algebra and Measure theory.
PSO3	Build interest and confidence in the subject to pursue higher studies in Mathematics.
PSO4	Inculcate a research mind among students through project work.
PSO5	Improve the level of understanding in areas of Applied Mathematics.
PSO6	Develop the skill of modeling real world problems into Mathematics problems and find solutions in a logical way.

Course Outcomes

SEMESTER 1				
1	ME010101	**Abstract Algebra**	CO1	Familiarize Direct products, finitely generated Abelian groups, factor groups.
			CO2	Understand inner automorphism, group action on sets, isotropy subgroups Apply G-sets to counting
			CO3	Understand and apply Isomorphism theorems and Sylow theorems
			CO4	Conceive more on the field of quotients of an integral domain and factor rings
			CO5	Factorise polynomials over a field, understand polynomial rings and associated properties, derive Eisenstein criterion for irreducibility of polynomials
			CO6	Understand the ideal theory in polynomial rings
2	ME010102	**Linear Algebra**	CO1	Conceive more on the theory of Vector spaces
			CO2	Understand the algebra of linear transformation and linear functional.
			CO3	Represent transformations by matrices and find transpose of a linear transformation
			CO4	Familiarize general properties of determinant and applications
			CO5	Understand elementary canonical forms, characteristic values, annihilatory polynomials, invariant subspaces, Direct sum Decompositions
3	ME010103	**Basic Topology**	CO1	Familiarize topological spaces, Bases and Sub bases, Subspaces
			CO2	Understanding the concepts of Closures, Neighbourhoods, Interior and Accumulation points.
			CO3	Familiarize the concepts of continuous functions and Quotient spaces

			CO4	Identify spaces with special properties like Compactness and Lindelloffness, Second countability , First countability and their properties	
			CO5	Understand Connectedness, Local connectedness and Path connectedness of spaces	
			CO6	Acquire basic concepts of Separation axioms and understand hierarchy of separation axioms	
4	ME010104	**Real Analysis**	CO1	Understanding and familiarize, functions of bounded variation, total variation, additive property of total variation and their properties.	
			CO2	Familiarizing rectifiable path and arc length, additive and continuity properties of arc length, equivalence of paths and change of parameter.	
			CO3	Understanding and use the basic concepts and properties of the Riemann - Stieltjes Integral and integration vector valued functions	
			CO4	Attainment of a deeper and wider knowledge of Sequence and Series of Functions and uniform convergence.	
			CO5	A deeper Knowledge on Weierstrass Approximation Theory and algebraic completeness of complex field	
5	ME010105	**Graph Theory**	CO1	Familiarize basic concepts of graphs, automorphism of a simple graph, line graphs, operations on graphs , graph products, directed graph and tournaments.	
			CO2	Learn more on connectivity ,blocks and cyclical edge connectivity	
			CO3	Understand theorems and concepts related to Trees and apply these in everyday life problems.	
			CO4	Understand more about Eulerian and Hamiltonian Graphs	
			CO5	Acquire knowledge on Graph Colorings and its applications	

			CO6	Familiarize Planar graphs, Plane graphs , properties of plane graphs including Euler Formula and its Consequences and Dual of a Plane Graph
			CO7	Understand Spectral Properties of Graphs
SEMESTER 2				
6	ME010201	**Advanced Abstract Algebra**	CO1	Familiarize extension fields, algebraic extensions
			CO2	Understand geometric constructions finite fields
			CO3	Acquire knowledge about Gaussian integers and multiplicative norms
			CO4	Find automorphism of fields
			CO5	Understand isomorphism extension theorem and find splitting fields
			CO6	Understand Galois Theory and its applications
7	ME010202	**Advanced Topology**	CO1	Understand and apply the Urysohn Characterization of normality and Tietze Characterization of normality
			CO2	Familiarize the product space and product topology
			CO3	Identify productive properties
			CO4	Understand and apply embedding lemma, Tychonoff Embedding and The Urysohn Metrisation Theorem
			CO5	Understanding the concept of Net and its convergence
			CO6	Familiarize the idea of Homotopy of paths.
8	ME010203	**Numerical Analysis with Python**	CO1	Identify Symbols and Symbolic Operations in Python
			CO2	Solve Equations and Plot Using SymPy
			CO3	Apply the techniques of differentiation and integration to solve problems
			CO4	Program problems to verify the continuity of a function at a point, area between two curves and finding the length of a curve
			CO5	Familiarize Interpolation and Curve Fitting
			CO6	Find roots of equations using iterative methods
			CO7	Apply Gauss Elimination Method, Doolittle's

				Decomposition Method to solve problems
			CO8	Understand Numerical Integration methods
			CO9	Develop program to solve problems applying numerical differentiation and integration
9	ME010204	**Complex Analysis**	CO1	Familiarize Riemann Sphere and Stereographic projection
			CO2	Understand and apply theorems on convergence of the power series
			CO3	Solve problems related to analytic functions in regions, conformal mappings and linear transformations
			CO4	Learn the theory and techniques of complex integration
			CO5	Find higher order derivatives of complex functions
			CO6	Understand Morera's Theorem, Liouville's Theorem, Fundamental Theorem and their applications in solving problems
			CO7	To learn the way of Integrating complex valued functions using residue theorem.
			CO8	Familiarize with different types of definite integrals
10	ME010205	**Measure Theory and Integration**	CO1	A deep understanding into basics and applications of Lebesgue outer measure and measurability of sets
			CO2	Conceivement of the idea of Lebesgue Measurable Functions and Lebesgue Integration
			CO3	Understanding and applications Lebesgue integral and comparisons with Riemann Integral
			CO4	Familiarizing General Measure Space and Measurable Functions and Integration over General Measure Space
			CO5	Introduction to product measure and applications of the theorems of Fubini and Tonelli

SEMESTER 3				
11	ME010301	**Advanced Complex Analysis**	CO1	Familiarize Harmonic Functions and its basic properties,
			CO2	Understand and apply the Mean-Value Property, Poisson's Formula, Schwarz's theorem and the Reflection Principle
			CO3	Understand the theory and applications of the power series expansions.
			CO4	Solve problems using Jensen's Formula and Hadamard's Theorem. problems
			CO5	Familiarize the Riemann Zeta Function and its properties.
			CO6	Understand and apply the Riemann Mapping Theorem, Boundary behaviour and the Reflection Principle
			CO7	Familiarize the idea of the Weierstrass' ρ-function and the functions ζ and σ .
12	ME010302	**Partial Differential Equations**	CO1	Familiarize the orthogonal trajectory of the system of curves on a given surface
			CO2	Solve differential equation of the form $dx/P = dy/Q = dz/R$
			CO3	Identify Pfaffian differential forms and solve of Pfaffian differential equations in three variables
			CO4	Find integral surfaces passing through a given curve and surfaces orthogonal to a given system of surfaces
			CO5	Understand nonlinear partial differential equation of the first order and methods of solutions
			CO6	Find solutions of Linear partial differential equations with constant coefficients
			CO7	Solve non linear equations of the second order
			CO8	Familiarize families of equipotential surfaces

13	ME010303	**Multivariate Calculus and Integral Transforms**	CO1	Familiarize different forms of Fourier series and applications	
			CO2	Understanding the Fourier integral theorem, the exponential form of the Fourier integral theorem and the convolution theorem for Fourier transforms	
			CO3	Conceivement of the theory of directional derivatives, the total derivative and Jacobian matrix of a linear function.	
			CO4	Understanding on the Chain rule, mean value theorem for differentiable functions, inverse function theorem and the implicit function theorem	
			CO5	Familiarize integration in higher dimensions and Differential Forms	
14	ME010304	**Functional Analysis**	CO1	Familiarize with Normed Spaces and their properties.	
			CO2	Understand compactness of normed spaces	
			CO3	Familiarize Linear Operators, Bounded and Continuous Linear Operators and Linear Functionals	
			CO4	Understand Normed spaces of operators, Dual space	
			CO5	Familiarise Inner Product Space, Hilbert space and further properties.	
			CO6	Understand orthonormal sets and sequences	
			CO7	Derive representation of functional on Hilbert Spaces	
			CO8	Conceive more on the theory of operators- Hilbert-Adjoint Operator, Self-Adjoint, Unitary and Normal Operators, Adjoint Operators	
			CO9	Understand Zorn's lemma, Hahn-Banach theorem, Hahn-Banach theorem for Complex Vector Spaces and Normed Spaces	

				CO1	To acquaint with simplex method, simplex multipliers , revised simplex method and dual simplex method and develop the ability to solve linear programming problems
15	ME010305	**Optimization Techniques**		CO2	Familiarise cutting plane method, branch and bound method and develop the ability to solve General I.L.P. and M.I.L.P problems.
				CO3	Conceive the concepts of Goal programming problem and the method to solve it.
				CO4	Familiarize the concept of Networks and develop the ability to solve minimum path problems, spanning tree of minimum length, maximum flow problem and Schedule sequential activities.
				CO5	Understand non-linear programming

SEMESTER 4

				CO1	Understand category theorem and Uniform Boundedness theorem
16	ME010401	**Spectral Theory**		CO2	Familiarise Convergence of Sequences of Operators and Functionals
				CO3	Understand Open Mapping Theorem and Closed Graph Theorem
				CO4	Familiarise Spectral Properties of Bounded Linear Operators
				CO5	Apply Complex Analysis in Spectral Theory
				CO6	Familiarize Banach Algebras and Properties
				CO7	Learn compact Linear Operators on Normed spaces and their spectral properties
				CO8	Understand Spectral Properties of Bounded Self adjoint linear operators
				CO9	Understand Projection Operators and their properties.

17	ME010402	**Analytic Number Theory**	CO1	Familiarize the theory of Arithmetic Functions
			CO2	Understand The Möbius function μ(n),The Euler totient function φ(n), and the relation connecting μ and φ
			CO3	Find product of arithmetical functions, Dirichlet inverses and the Möbius inversion formula
			CO4	Familiarize Multiplicative functions and Dirichlet Multiplication,
			CO5	Understand The Liouville's function, the divisor function and Generalized convolutions
			CO6	Conceive more on the theory Arithmetical functions and its applications
			CO7	Understand some Elementary Theorems on the Distribution of Prime Numbers
			CO8	Acquire deep knowledge on the theory of congruence
			CO9	Understand more about Quadratic Residues and further properties of Quadratic Residues
			CO10	Familiarize Primitive roots and reduced residue systems

Elective Courses

SEMESTER 4				
1	ME800401	**Differential Geometry**	CO1	Explain the concepts of differential geometry and its role in modern mathematics
			CO2	To obtain sound knowledge in understanding the basic concepts in geometry of curves and surfaces in Euclidean space, especially
			CO3	To study geodesics and parallel transport
			CO4	To introduce parametrized surface and study its basic properties
			CO5	To gain sufficient knowledge for generalizing these concepts to higher dimensions

2	ME800402	**Algorithmic Graph Theory**	CO1	Acquire knowledge on Algorithms and its complexity and develop a feel for the concept of an efficient algorithm.
			CO2	Learn the basic properties of trees and their usefulness in algorithmic techniques.
			CO3	Familiarize with concepts of Networks and understand how the max-flow min-cut algorithm can be used to find the connectivity and edge connectivity of a graph.
			CO4	Study matchings and factorizations of graphs.
3	ME800403	**Combinatorics**	CO1	To use algebraic concepts to solve basic problems in real life using permutations and combinations
			CO2	To introduce Ramsey type problems and Ramsey numbers
			CO3	To get an idea about generating functions and recurrence relations.