M.Sc. Mathematics

Programme Outcomes

PO1. To improve the perspective of students on mathematics as per modern requirement.

PO2. To enhance the logical, reasoning, analytical and problem solving skills of students.

PO3. To orient students towards relating Mathematics to applications.

PO4. To help the student build interest and confidence in learning the subject.

PO5. To cultivate a research culture in young minds.

PO6. To encourage students for pursuing higher studies in mathematics.

PO7. To ultimately see that the learning of mathematics becomes more alive, vibrant, relevant and meaningful; a program that paves the way to seek and understand the world around them.

PO8. To motivate students to uphold scientific integrity and objectivity in professional endeavours

Programme Specific Outcomes

PSO1. Enable to acquire real insight to Modern Mathematics

PSO2. Attain 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. Attains a common level understanding in areas of Applied Mathematics

PSO6. Develop the skill of modelling real world problems into Mathematics problems and find solutions in a logical way.

Course Outcomes

Semester I

ME010101 -ABSTRACT ALGEBRA

CO1. Familiarize Direct products, finitely generated Abelian groups, factor groups.

CO2. Understand inner automorphism, group action on sets isotropy subgroups

CO3. Apply G-sets to counting

CO4. Understand and apply Isomorphism theorems and Sylow theorems

CO5. Conceive more on the field of quotients of an integral domain and factor rings

CO6. Factorise polynomials over a field

ME010102 -LINEAR ALGEBRA

CO1. Conceive more on the theory of Vector spaces

CO2. Understand the algebra of linear transformations and linear functionals

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

ME010103 -BASIC TOPOLOGY

CO1. Familiarize topological spaces, bases and subbases, subspaces

CO2. Understand Closures , Neighbourhoods, Interior and Accumulation points

CO3. Concieve the concepts of continuous functions and Quotient spaces

CO4. Identify spaces with special properties like compactness and Lindelloff ness, second 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

ME010104 -REAL ANALYSIS

CO1. Understand functions of bounded variation, total variation, additive property of total variation and their properties

CO2. Express total variation on (a, x) as a functions of x and functions of bounded variation as the difference of increasing functions

CO3. Familiarise rectifiable path and arc length, additive and continuity properties of arc length, equivalence of paths and change of parameter

CO4. Conceive the basic concepts and properties of the Riemann-Stieltjes Integral

CO5. Integrate vector valued functions

CO6. Attain a deeper and wider knowledge of Sequence and Series of Functions

CO7. Understand algebraic completeness of complex field

ME010105 –GRAPH THEORY

CO1. Familiarise automorphism of a simple graph

CO2. Understand basic concepts of directed Graphs and tournaments

CO3. Conceive more on connectivity like blocks, cyclical edge connectivity

CO4. Find the centres and cancroids of trees

CO5. Apply Cayley's formula to solve problems

CO6. Understand more about Eulerian and Hamiltonian Graphs

CO7. Acquire knowledge on Graph Colorings and its applications

CO8. Familiarise planar graphs and their properties including Euler Formula and its Consequences, Dual of a Plane Graph

CO9. Understand Spectral Properties of Graphs

Semester II

ME010201 -ADVANCED ABSTRACTALGEBRA

CO1. Familiarise 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

CO6.Understand Galois Theory and its applications

ME010202 –ADVANCEDTOPOLOGY

CO1. Conceive more on compactness and Separation axioms

CO2. Understand and apply the Urysohn Characterisation of normality and Tietze Characterisation of normality

CO3. Familiarize the product space and product topology

CO4. Identify productive properties

CO5. . Understand and apply embedding lemma, Tychonoff Embedding and The Urysohn Metrisation Theorem

CO6. Identify different forms of compactness

CO7. Familiarise the idea of Homotopy of paths.

ME010203 NUMERICAL ANALYSIS WITH PYTHON

CO1. Identify Symbols and Symbolic Operations

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. Familiarise 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 and apply Numerical Integration methods

CO9. Develop program to solve problems applying numerical differentiation and integration

ME010204-COMPLEX ANALYSIS

CO1. Familiarise 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. Familiar with the theory and techniques of complex integration

CO5. Find higher order derivatives of complx functions

CO6. Understand Morera's Theorem, Liouville's Theorem, Fundamental Theorem and their applications in solving problems

CO7. Integrate complex valued functions using residue theorem

CO8. Evaluate definite integrals

ME010205 -MEASURE THEORY AND INTEGRATION

CO1. Familiarize Lebesgue outer measure, The σalgebra of Lebesgue mesurable sets, Outer and inner approximation of Lebesgue measurable sets

CO2. Understand continuity and Borel-Cantelli Lemma

CO3. Conceive the idea of Lebesgue Measurable Functions and Lebesgue Integration

CO4. Understand and apply the Riemann Integral and the Lebesgue integral

CO5. Familiarize General Measure Space and Measureable Functions

CO6. Understand and apply Integration over General Measure Space and Product Measures

CO7. Apply the theorems of Fubini and Tonelli

Semester III

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. Familiar with the theory and applications of the power series expansions

CO4. Apply Jensen's Formula and Hadamard's Theorem to solve 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. Conceive the idea of the Weierstrass' ρ-function and the functions $s\zeta$ and $z\sigma$

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 $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$

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

CO6. Solve different types of first order equations

CO7. Find solutions of Linear partial differential equations with constant coefficients

CO8. Solve non linear equations of the second order

CO9. Familiarize families of equipotential surfaces

ME010303 -MULTIVARIATE CALCULUS AND INTEGRAL TRANSFORMS

CO1. Familiarize other forms of Fourier series

CO2. Understand the Fourier integral theorem, the exponential form of the Fourier integral theorem and the convolution theorem for Fourier transforms

CO3. Conceive the theory of directional derivatives and continuity and the total derivative

CO4 Find the Jacobian matrix of a linear function, the matrix form of the chain rule

CO5. Understand the mean value theorem for differentiable functions

CO6. Derive sufficient condition for differentiability

CO7. Understand the inverse function theorem and the implicit function theorem

CO8. Familiarize integration of Differential Forms

ME010304 -FUNCTIONAL ANALYSIS

CO1. Familiarize Normed Spaces and its properties

CO2. Understand compactness of normed spaces

CO3. Familiarize Linear Operators, Bounded and Continuous Linear Operators and Linear Functionals

CO4. 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 Functionals 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

ME010305- OPTIMIZATION TECHNIQUES

CO1. Sove linear programming problems

CO2. Solve General I.L.P. and M.I.L.P problems

CO3. Familiarise cutting plane methods , branch and bound method

CO4. Solve Goal programming using graphs

CO5. Schedule sequential activities

CO6. Identify duality in the maximum flow problem

CO7. Understand non-linear programming

Semester IV

ME010401 -SPECTRAL THEORY

CO1. Understand category theorem and Uniform Boundedness theorem

CO2. Familiarise Convergence of Sequences of Operators and Functionals

CO3. Understand Open Mapping Theorem and Closed Graph Theorem

CO4. Conceive Spectral Properties of Bounded Linear Operators

CO5. Use Complex Analysis in Spectral Theory

CO5. Familiarize Banach Algebras and Properties of Banach Algebras

CO6. Understand concepts and spectral Properties of compact Linear Operators on Normed spaces

CO7. Conceive Spectral Properties of Bounded Self adjoint linear operators

CO8. Understand Projection Operators and properties of Projections

ME010402 -ANALYTIC NUMBER THEORY

CO1. Familiarise 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 λ(n),The divisor function $\sigma\alpha$(n) 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 Congruences

CO9. Understand more about Quadratic Residues and further properties of Quadratic Residues

CO10. Familiarise Primitive roots and reduced residue systems

ME810401 PROBABILITY THEORY

CO1. Familiarise different approaches to probability

CO2. Understand and apply Probability Axioms to solve problems

CO3. Familiarise Probability distribution of Discrete and Continuous random variables

CO4. Solve problems using Generating Functions and Moment inequalities

CO5. Understand theories involving multiple random variables

CO6. Use Cr inequality, Holder's inequality, Cauchy-Schwartz's inequality, Jensen's inequality, Minkowski's inequality to solve problems

CO7.Familiarise the theory of Convergence of sequence of random variables

CO8. Understand and apply Weak Law of Large Numbers and Strong Law of Large Numbers

CO9. Apply Central Limit Theorems to solve application problems

ME810402 OPERATIONS RESEARCH

CO1. Understand and solve Dynamic Programming Problems

CO2. Understand Computational economy in DP and Serial multistage model

CO3. Apply D.P to continuous systems

CO4. Familiarise continuous time random processes such as Steady state probabilities, Birth death processes and the Poisson process

CO5. Familiarise General Characteristics of Queueing Systems

CO6. Understand Performance Measures and Markovian Queueing Models

CO7. Familiarise some deterministic and probabilistic inventory models

CO8. Understand and solve problems of the classical Economic Order Quantity with and without shortages

ME810403 : CODING THEORY

CO1. Familiarise with various methods of coding and decoding

CO2. Understand more general facts of coding theory

CO3. Understand and solve problems involving Self dual codes, The Golay codes and A double error correction BCH code

CO4. Understand the applications of Finite fields to coding theory

CO5. Understand Cyclic Codes and BCH codes