MSc. MATHEMATICS

PROGRAMME AND COURSE OUTCOMES

MSc. Mathematics

Programme Outcomes

PO1	Solve problems in various fields of Mathematics.
PO2	Sharpening of mathematical concepts leading to research.
PO3	Knowledge about scientific method and skills in mathematical computation
PO4	Extension of domain knowledge to face real life problems
PO5	Enhancement of critical thinking skills and attitudes to become a thinker and professional
PO6	Creating academic excellence in mathematics and allied subjects

Course Outcomes

Semester 1

COURSE TYPE	CORE
COURSE NAME	LINEAR ALGEBRA
COURSE CODE	MM 211
HOURS	108
COURSE OUTCOMES	
CO1	Understand the concepts of vector spaces, subspaces, bases, dimension and their properties
CO2	Acquire the skill in matrix manipulation and linear modeling problems
CO3	Relate matrices and linear transformations
CO4	Compute eigenvalues and eigenvectors of linear transformations and use them in applications
CO5	Apply the knowledge to many fields in engineering, statistics and computer science

COURSE TYPE	CORE
COURSE NAME	REAL ANALYSIS-1
COURSE CODE	MM 212
HOURS	108
COURSE OUTCOMES	
CO1	Understand the concepts and results in analysis and apply these results to other branches of mathematics and real world applications
CO2	Demonstrate the importance of Riemann Stieltjles Integrals, Riemann condition, sufficient condition for the existence of Riemann Stieltjes integrals
CO3	Analyse the concepts of sequence of functions, its properties and to what extent this property is transferred to its limit functions.
CO4	Understand and demonstrate the concepts of multivariable differential calculus.
CO5	Enhance the ability to apply the concepts in geometrical situation.

COURSE TYPE	CORE
COURSE NAME	ORDINARY DIFFERENTIAL EQUATIONS
COURSE CODE	MM 213
HOURS	108
COURSE OUTCOMES	
CO1	To understand the concepts of Ordinary Differential Equations.
CO2	Classify the problems and recognize appropriate methods to solve differential equations.
CO3	Apply the methods of solving differential equations to real-world problems.
CO4	Find the extremum of an integral $f(x, y, y^J)dx$, using Euler's formula.
CO5	Solve an isoperimetric problem.

COURSE TYPE	CORE
COURSE NAME	TOPOLOGY -1
COURSE CODE	MM 214
HOURS	126
COURSE OUTCOMES	
CO1	Understanding metrics as a generalization of distance in real and complex plane and discuss the basic concepts of metric spaces.
CO2	Compare the concepts of open and closed sets of real line and complex plane to abstract spaces
CO3	To develop the student's ability to handle abstract ideas of mathematics and mathematical proofs
CO4	Construction of topological spaces with desired properties.
CO5	Improve skills in mathematical reading, writing and communication.
CO6	Appreciate the importance of topology as a fundamental subject in mathe- matics, with connections to many other branches of the knowledge.

Semester 2

COURSE TYPE	CORE
COURSE NAME	ABSTRACT ALGEBRA
COURSE CODE	MM 221
HOURS	108
COURSE OUTCOMES	
CO1	Get familiarised with different algebraic structures.
CO2	Understand the Fundamental Theorem of finitely generated abelian groups and list abelian groups of finite orders.
CO3	Apply Sylow's Theorems to classify simple groups.
CO4	Discuss different field extensions and examine the existence of zeros of irreducible polynomials over extension fields.
CO5	Solve polynomial equations by radicals along with the understanding of ruler and compass constructions.
CO6	Establish the connection between the concept of field extensions and Galois Theory.

COURSE TYPE	CORE
COURSE NAME	CORE COURSE
COURSE CODE	REAL ANALYSIS -11
HOURS	MM 222
COURSE OUTCOMES	
CO1	Create a frame work to generalise integration theory.
CO2	Understand why and for what the theory of measures was introduced.
CO3	Formulate complex problems using appropriate measure theory techniques.
CO4	Apply the theory of measures to solve a variety of problems at an appropriate level of difficulty.
CO5	Understand the notion of different types of convergence

CO6	Apply the theory of measures in probability theory

COURSE TYPE	CORE
COURSE NAME	TOPOLOGY -11
COURSE CODE	MM 223
HOURS	126
COURSE OUTCOMES	
CO1	Understand more about point set topology and the concepts of algebraic topology
CO2	Apply abstract algebra to understand the topological properties
CO3	Construct new topological spaces from existing ones and comparing their properties
CO4	Learn to use algebraic techniques to prove algebraic properties such as fundamental group and Brouwer fixed point theorem
CO5	To develop the student's ability to handle abstract ideas of mathematics and mathematical proofs in topology
CO6	Develop capacity for mathematical reasoning through analyzing, proving and explaining concepts from algebraic topology

COURSE TYPE	CORE
COURSE NAME	PARTIAL DIFFERENTIAL EQUATIONS AND CALCULUS OF VARIATION
COURSE CODE	MM 224
HOURS	108
COURSE OUTCOMES	
CO1	To understand the concepts of PDE's.
CO2	To solve the real-world problems using PDE's.
CO3	To solve the wave equation and the heat equation.
CO4	Understand the concepts, methods and structures of integral equation theory.

Semester 3

COURSE TYPE	CORE
COURSE NAME	COMPLEX ANLYSIS
COURSE CODE	MM 231
HOURS	126
COURSE OUTCOMES	
CO1	Establish relationship between analytic functions and power series and to evaluate the radius of convergence of the power series
CO2	Understand the concepts of Mobius transformations and apply the concepts to solve problems
CO3	Solve problems related to integrals
CO4	Classify Singularities and to find residues
CO5	Characterize the Conformal maps using Mobius transformations

COURSE TYPE	CORE
COURSE NAME	FUNCTIONAL ANALYSIS-1
COURSE CODE	MM 232
HOURS	108
COURSE OUTCOMES	
CO1	Understand the basics of normed linear spaces, bounded linear maps
CO2	Enable the students to realise different types of spectra and their relevance
CO3	Create an idea about different types of convergence of sequences in normed spaces and their relations.
CO4	Enable the student to apply the knowledge of functional analysis to solve mathematical problems.

COURSE TYPE	ELECTIVE I
COURSE NAME	AUTOMATA THEORY
COURSE CODE	MM 233
HOURS	108
COURSE OUTCOMES	
CO1	Understand the concept of abstract machines and their power to recognize languages
CO2	Employ finite state machines for modeling and solving computing problems.
CO3	Design context free grammars for formal languages.
CO4	Distinguish between decidability and undecidability.
CO5	Gain proficiency with mathematical tools and formal methods.

COURSE TYPE	ELECTIVE II
COURSE NAME	GRAPH THEORY
COURSE CODE	MM 234
HOURS	108
COURSE OUTCOMES	
CO1	Explain the concepts of graph isomorphism, cut-vertices, blocks, connectivity and demonstrate the relation between groups and graphs
CO2	Determine whether a graph is Eulerian or Hamiltonian and to establish the relation between Hamiltonian walks and numbers
CO3	Describe the properties of strong digraphs, tournaments, matching and factorizations
CO4	Apply the concepts of vertex coloring, edge coloring and Ramsey number of graphs for solving real life problems
CO5	Understand the concepts of center of graphs, different distant vertices, locating numbers, Detour and directed distance

Semester 4

COURSE TYPE	CORE
COURSE NAME	ANALYTIC NUMBER THEORY
COURSE CODE	MM 241
HOURS	126
COURSE OUTCOMES	
CO1	Find whether a number is a quadratic residue or non-residue
CO2	Acquire knowledge about different arithmetical functions and work with problems related to arithmetical functions
CO3	Understand the concept of Diophantine equations and existence of solutions of the Diophantine equation
CO4	Get an idea about algebraic numbers, algebraic integers and their properties
CO5	Explain the concepts of simple crypto systems and Enciphering Matrices and describe public key and RSA

COURSE TYPE	CORE
COURSE NAME	FUNCTIONAL ANALYSIS II
COURSE CODE	MM 242
HOURS	108
COURSE OUTCOMES	
CO1	Understand basic concepts and principles of inner productspace.
CO2	Develop the concepts of compact linear operator and spectrum
CO3	Create an idea of compact linear operators on Hilbert space and the behaviour of spectrum of such operators.
CO4	Apply the spectral analysis of compact self-adjoint operators for finding the solution of integral equations.
CO5	Application to many areas of mathematics such as classical analysis, probability theory, approximation and optimization theory.
CO6	Explain sustainable development and aspects related to SDGs and describe the scope of ecotourism in India and Kerala

COURSE TYPE	ELECTIVE
COURSE NAME	DIFFERENCE EQUATIONS
COURSE CODE	MM 243
HOURS	108
COURSE OUTCOMES	
CO1	Understand the concept of difference equations.
CO2	Classify difference equations with respect to their order and nature.
CO3	Apply solution techniques to autonomous equations.
CO4	Analyse the convergence behaviour of various difference equations.
CO5	Use Z-transform to solve difference equations
CO6	Describe and analyze the environmental standards and the scheme of labelling environment friendly products

COURSE TYPE	ELECTIVE
COURSE NAME	ADVANCED COMPLEX ANALYSIS
COURSE CODE	MM 244
HOURS	108
COURSE OUTCOMES	
CO1	Draw connections among ideas between space of continuous functions and space of analytic functions
CO2	Formulate an analytic function with given zeros of infinite number and given multiplicity
CO3	Apply Weierstrass Factorization Theorem to factorise certain complex valued functions
CO4	Identify the equivalent conditions of simply connected regions
CO5	Describe the method of extending the domain of analytic functions
CO6	Describe Harmonic functions on a disk