FATIMA COLLEGE (AUTONOMOUS), MADURAI – 625018

2021 - 2022

1.1.1 Curricula developed and implemented have relevance to the local, national, regional and global developmental needs which is reflected in Programme outcomes (POs), Programme specific outcomes (PSOs) and Course Outcomes (COs), of the Programmes offered by the Institution.

Name of the Programme: M.Sc MATHEMATICS

Programme Outcomes:

PO1	Apply acquired scientific knowledge to solve major and complex issues in the society/industry.
PO2	Attain research skills to solve complex cultural, societal and environmental issues.
PO3	Employ latest and updated tools and technologies to solve complex issues.

Programme Specific Outcomes:

PO1	Develop proficiency in the analysis of complex mathematical problems and the use of Mathematical or other appropriate techniques to solve them.
PO2	Provide a systematic understanding of core mathematical concepts, principles and theories along with their applications.
PO3	Demonstrate the ability to conduct Research independently and pursue higher studies towards the Ph. D degree in Mathematics and computing
PO4	Understand the fundamental axioms in Mathematics and develop Mathematical ideas based on them

PO5	Provide advanced knowledge on topics in Pure Mathematics, empowering the students to pursue higher studies.

Course Outcomes:

Course Code	Course Title	Nature of the Course (Local/National/Regional/Global)	Course Description	Course Outcomes
19PG1M1	ALGEBRA	NATIONAL	This course is designed to emphasis the study of Algebra.	CO1: Recall various properties of algebraic structures and explain counting principle. CO2: Describe Sylow's theorems and solve problems CO3: Distinguish Integral Domain and Euclidean Rings CO4: Classify Rings CO5: Describe basic concepts of Solvable groups
19PG1M2	REAL ANALYSIS		This course provides a comprehensive idea	CO1: Describe analysis concepts in Real and Complex Number systems

		NATIONAL	about the principles of Real Analysis.	CO2: Explain concepts of metric, compact and connected sets CO3: Recall Sequence and series in Real line CO4: Differentiate Continuous functions and Uniformly continuous functions CO5: Describe Derivatives of functions
19PG1M3	NUMBER THEORY	NATIONAL	This course discovers interesting and unexpected relationships between different sorts of numbers and to prove that these relationships are true	CO1: Define and interpret the concepts of divisibility CO2: Explain properties of congruences CO3: Apply the Law of Quadratic Reciprocity CO4: Classify functions of number theory CO5: Solve Linear Diophantine equation

19PG1M4	CLASSICAL MECHANICS	NATIONAL	This course provides a sound knowledge of the concepts and principles in mechanics.	CO1: Describe the behaviour of a particle, the system of particles and D'Alambert's principle CO2: Solve problems using Lagrangian formulation CO3: Explain Hamilton's principle in Physical reality CO4: Construct Lagrange's equation for non - holonomic system CO5: Apply the laws of forces in central orbit to solve Kepler's problem
19PG2M5	ADVANCED ALGEBRA	NATIONAL	This course enables the students to study some advanced concepts in Algebra	CO1: Appraise characteristic roots of linear transformations CO2: Explain Matrices and Nilpotent transformation CO3: Classify transformations CO4: Describe various concepts of fields

				CO5: Analyse Galois theory
19PG2M6	ADVANCED REAL ANALYSIS	NATIONAL	This course enables the students to study some advanced concepts in Real Analysis	CO1: Identify Riemann Integral and Riemann - Stieltjes Integral CO2: Explain Uniform convergence of functions CO3: Define Power Series and Fourier Series CO4: Describe Linear Transformations CO5: Explain Implicit function theorem and Rank theorem
19PG2M7	DIFFERENTIAL EQUATIONS	NATIONAL	This course will provide the knowledge for solving of ordinary and partial differential equations in physical and other phenomena	CO1: Define Linear differential equations with constant coefficients and prove different theorems and solve problems. CO2: Solving problems of the n^{th} order in differential equations with variable coefficients

				CO3: Identify Regular singular points and derive Bessel's Equation. CO4: Explain the methods of solving problems in partial differential equations of first order. CO5: Form Partial differential equations of the second order and solve problems in partial differential equations of second order.
19PG2M8	GRAPH THEORY	NATIONAL	This course enables the students to study some advanced concepts in Graph Theory	CO1: Build the knowledge of Connectivity in graphs CO2: Identify Eulerian and Hamiltonian graphs CO3: Explain Digraphs, Matchings and Factorization in graphs CO4: Describe Planarity and Coloring in graphs CO5: Define and Explain Domination in graph

19M1EDC/ 19M2EDC	OPTIMIZATION METHODS	NATIONAL	This course helps the students to convert real life problems into mathematical models and solve them using various techniques.	CO1: Distinguish Transportation problem and Assignment problem. CO2: Classify the methods of finding IBFS to a transportation problem. CO3: Explain assignment problem and solve. CO4: Solve Sequencing problem. CO5: Define two person zero sum game, saddle point and solve problems
19PG3M9	MEASURE AND INTEGRATION	NATIONAL	This course presents the fundamental concepts and techniques of measure theory. It includes measures, measurable sets, functions, integrals as measures, modes	CO1: Explain Lebesgue measurable sets and measurability CO2: Classify Riemann and Lebesgue Integrals CO3: Describe Abstract measure spaces CO4: Define Signed Measures and distinguish

			of convergence and product measure.	Hahn Decomposition and Jorden Decomposition CO5: Explain the concept of measurability in product space
19PG3M10	OPTIMIZATION TECHNIQUES	NATIONAL	This course makes the better decisions in complex scenarios by the application of a set of advanced analytical methods.	CO1: Explain revised simplex method and solve problems CO2: Classify integer programming problem and explain cutting plane and branch and bound methods CO3: Recognize dynamic programming problem and formulate recurrence relation CO4: Distinguish inventory control models CO5: Identify Queuing models
19PG3M11	COMBINATORICS		Combinatorics may be defined as the study of discrete structures and how these structures can be combined	CO1: Explain the rules of sum and product of permutations and combinations.

		NATIONAL	subject to various constraints. It can be described as the art of counting	CO2: Describe distributions of distinct objects into non-distinct cells and partitions of integers. CO3: Identify solutions by the technique of generating functions and recurrence relations with two indices CO4: Solve problems on principle of inclusion and exclusion CO5: Apply Polya's theory using configuration
19PG3M12	TOPOLOGY	NATIONAL	This course introduces the fundamental notions of topology which provides foundation for many other branches of mathematics.	CO1: Classify various Topologies in Topological spaces CO2: Explain connectedness and Components in Topological spaces CO3: Describe compactness in Topological spaces CO4: Identify Seperation axioms

				CO5: Explain Urysohn Metrization theorem
21PG3ME1	FUZZY SETS AND APPLICATIONS	NATIONAL	This course is focused on the fundamental theory of fuzzy sets, fuzzy logic which can be applied in data mining and decision making in various fields.	CO1: Distinguish crisp sets and Fuzzy sets CO2: Classify operators on Fuzzy sets CO3: Describe Fuzzy relations CO4: Describe Fuzzy Measures CO5: Apply Fuzzy sets in real life situations
19PG3ME2	NUMERICAL ANALYSIS	NATIONAL	This course provides knowledge to solve equations using Numerical methods.	CO1: Identify the various methods of solving simultaneous linear algebraic equations CO2: Recognize difference operators and apply the concept of interpolation. CO3: Compute the values of the derivatives at some point using numerical

				differentiation and integration. CO4: Solve problems on higher order differential equations using Euler's, Runge- kutta methods CO5: Explain Geometrical representation of partial differential quotients
19PG4M13	COMPLEX ANALYSIS	NATIONAL	This course enables the students to study some advanced concepts in Complex Analysis	CO1: Identify continuous, differentiable and analytic functions. CO2: Explain Cauchy's theorem for rectangle and Cauchy's integral formula CO3: Summarize the conditions for a complex variable to be harmonic CO4: Compute analytic functions in series form CO5: Identify the conditions for a function to be elliptic and bring out its properties

19PG4M14	STATISTICS	NATIONAL	This course provides various concepts of Statistics which can be applied in real life situations	CO1: Classify discrete and continuous distributions CO2: Describe t, F and limiting distributions CO3: Explain statistical tests CO4: Summarize maximum likelihood methods CO5: Distinguish tests of hypothesis
19PG4M15	METHODS OF APPLIED MATHEMATICS	NATIONAL	This course provides various methods of Applied Mathematics which will be helpful for the students to attempt NET/SET exams.	CO1: Explain Eulers equation and its applications CO2: Solve variational problems CO3: Distinguish Integral equations. CO4: Describe various methods for solving integral equations CO5: Solving problems using fourier transforms

19PG4M16	FUNCTIONAL ANALYSIS	NATIONAL	This course enables the students to study the advanced concepts of Functional Analysis.	CO1: Create knowledge with the basic concepts, principles and methods of functional analysis and its applications. CO2: Analyze the concept of normed spaces, Banach spaces, and the theory of linear operators CO3: Explain in detail the Hahn-Banach theorem, the open mapping and closed graph theorems CO4: Define and thoroughly explain Hilbert spaces and self-adjoint operators CO5: Discuss in detail the study of the spectrum of an operator and its properties
19PG4ME3	FORMAL LANGUAGES		This course explains and manipulates the different concepts	CO1: Design the basic concepts in automata theory and formal languages

		NATIONAL	in Automata Theory and Formal Languages	CO2: Identify different formal language classes and their relationships CO3: Transform between equivalent deterministic and non-deterministic finite automata, and regular expressions CO4: Discuss about the automata, regular expressions and context-free grammars accepting or generating a certain language CO5: Simplify the theorems in automata theory using its properties
19PG4ME4	ALGEBRAIC GRAPH THEORY	NATIONAL	This course enables the students to study some concepts in	CO1: Explain Automorphism Group of a Graph CO2: Describe Cayley Graphs CO3: Explain Transitive graphs

			Algebraic Graph Theory	CO4: Describe Homomorphism CO5: Explain the concept of Matrix Theory