FATIMA COLLEGE (AUTONOMOUS), MADURAI – 625018

AQAR – QUALITATIVE METRIC

2023 - 2024

Criterion 1 - Curricular Aspects

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 Code: PSMA**

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.
PO4	Demonstrate Professional Ethics that foster Community, Nation and Environment Building Initiatives.

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
23PG1M1	Algebraic Structures	Global	This course is designed to emphasis the study of Algebra.	CO1: Recall basic counting principle CO2: Define Solvable groups, define direct products CO3: Define similar Transformations.

				CO4: Define Jordan, canonical form, Jordan block. C05: Define trace, define transpose of a matrix
23PG1M2	Real Analysis-I	Global	This course provides a comprehensive idea about the principles of Real Analysis.	CO1: Describe analysis concepts in Functions of bounded variation and Infinite series. CO2: Explain concepts of Reimann Steljes Integral. CO3: DescrIbe the theorems on Reimann Steljes Integral. CO4: Describe Infinite products. CO5: Describe sEquences of functions.

23PG1M3	Ordinary Differential Equations	Global	This course will provide the knowledge for solving of ordinary and partial differential equations in physical and other phenomena.	CO1: Establish the qualitative behavior of solutions of systems of differential equations. CO2: Recognize the physical phenomena modeled by differential equations and dynamical systems. CO3: Analyze solutions using appropriate methods and give examples. CO4: Formulate Green's function for boundary value problems. CO5: Understand and use various theoretical ideas and results that underlie the mathematics in this course.
23PG1ME1/23PG1ME2	Number Theory/Integral Transforms	Global	This course discovers interesting and unexpected relationships between	CO1: Define and interpret the concepts of divisibility. CO2: Explain properties of congruences. CO3: Apply the Law of Quadratic Reciprocity.

			different sorts of numbers and to prove that these relationships are true.	CO4: Classify functions of number theory. CO5: Solve Linear Diophantine equation.
23PG1ME3/23PG1ME4	Fuzzy Sets and its Applications/Differential Geometry	Global	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.
23PG1MAE	Linear Programming		This course helps the students to	CO1: Formulate linear programming problems

			convert real life problems into mathematical models and solve them using various techniques.	CO2: Solve linear programming problems by graphical Method. CO3: Describe feasible Solution, basic feasible solution, optimum basic feasible solution and degenerate solution. CO4: Describe simplex method to solve linear programming problems. CO5: Solve problems in decision making.
23PG2M4	Advanced Algebra	Global	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: Describe various concepts of fields.

23PG2M5	Real Analysis-II	Global	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 Logarithmic Functions. CO4: Define Fourier Series and Gamma Function. CO5: Describe Linear Transformations and Explain Inverse function theorem.
23PG2M6	Mechanics	Global	This course provides a sound kno wledge 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.
23PG2ME5/23PG2ME6	Mathematical Statistics/Statistical Methods	Global	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: Summarize maximum likelihood methods. CO4: Describe the measures of quality estimators. CO5: Distinguish tests of hypothesis.
23PG2ME7/23PG2ME8	Graph Theory/Numerical Analysis	Global	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 in graphs. CO4: Describe Planarity and Matchings in graphs.

				CO5: Define and Explain Domination in graph.
23PG2MSE1	Optimization Methods	Global	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.
22PG3M9	Measure and Integration	Global	This course presents the fundamental concepts and techniques of measure theory. It includes measures,	CO1: Explain Lebesgue measurable sets and Measurability. CO2: Explain measurable functions. CO3: Classify Riemann and Lebesgue Integrals. CO4: Describe Abstract measure spaces.

			measurable sets, functions, integrals as measures, modes of convergence and product measure.	CO5: Define Signed Measures and distinguish Hahn decomposition and Jorden Decomposition.
19PG3M10	Optimization Techniques	Global	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: Distinguish inventory control models.

19PG3M11	Combinatorics	Global	Combinatorics may be defined as the study of discrete structures and how these structures can be combined subject to various constraints. It can be described as the art of counting.	CO1: Explain the rules of sum and product of permutations and combinations. 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	Global	This course introduces the fundamental notions of topology which	CO1: Classify various Topologies in Topological spaces. CO2: Explain connectedness and Components in Topological spaces.

			provides fo undation for many other branches of mathematic s.	CO3: Describe compactness in Topological spaces. CO4: Identify Seperation axioms. CO5: Explain Urysohn Metrization theorem.
21PG3ME1/21PG3 ME2	Fuzzy sets and Applications/ Numerical Analysis	Global	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: Crisp sets and Fuzzy Distinguish sets. CO2: Classify operators on Fuzzy sets. CO3: Describe Fuzzy relations. CO4: Describe Fuzzy Measures. CO5: Apply Fuzzy sets in real life situations.
19PG4M13	Complex Analysis	Global	This course enables the students to study some	CO1: Identify continuous, differentiable and analytic Functions.

			advanced concepts in Complex Analysis.	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	Global	This course provides various concepts of Statistics which can beapplied 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	Global	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	Global	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.
19PG4ME3/19PG4ME4	Formal Languages/ Algebraic Graph Theory	Global	This course explains and manipulates the different concepts in Automata Theory and Formal Languages.	CO1: Design the basic concepts 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.

19PGSLM1	Problems in Advanced Mathematics	Global	This course enables the students to solve problems in various branches of Mathematics.	CO1: Solve problems in Real Analysis. CO2: Solve problems in Complex Analysis. CO3: Solve problems in Algebra. CO4: Solve problems in Linear Algebra. CO5: Solve problems in Differential Equations.
21PG2SLLM1	Verbal And Numerical Aptitude For National Examinations	Global	This course aims to creating positive attitude among students and motivate them to clear competitive exams to	CO1: enhance the teaching and research quality of Aspirants. CO2: Develop the cognitive and creative thinking ability. CO3: Develop reasoning techniques. CO4: Evaluate quantitative arguments that utilize mathematical, statistical, and quantitative information. CO5: Identify analogy and solve problems on data Interpretation.

			reach their life goals.	