



# FATIMA COLLEGE

(Autonomous)

*Affiliated to Madurai Kamaraj University*

*Re-Accredited with 'A++' by NAAC (Cycle - IV)*

Mary Land, Madurai - 625018, Tamil Nadu

## 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: B.Sc. MATHEMATICS**

**Programme Code: UAMA**

#### **Programme Outcomes:**

On completion (after three years) of B.Sc. Mathematics, the graduates would be able to

<b>PO 1</b>	Apply acquired scientific knowledge to solve complex issues.
<b>PO 2</b>	Attain Analytical skills to solve complex cultural, societal and environmental issues.
<b>PO 3</b>	Employ latest and updated tools and technologies to analyse complex issues.
<b>PO 4</b>	Demonstrate Professional Ethics that foster Community, Nation and Environment Building Initiatives.



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## Programme Specific Outcomes:

<b>PSO 1</b>	Gain broad knowledge and understanding in pure Mathematics and applications of Mathematics.
<b>PSO 2</b>	Demonstrate a computational ability and apply logical thinking skills to solve problems that can be modelled Mathematically.
<b>PSO 3</b>	Read, understand, analyse and formulate Mathematical theorems.
<b>PSO 4</b>	Acquire proficiency in the use of technology to assist in learning and investigating, Mathematical ideas and in problem solving.
<b>PSO 5</b>	Communicate Mathematical concepts accurately, precisely and effectively with clarity and coherence both verbal and in written form



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## Course Outcomes:

Course Code	Course Title	Nature of the Course (Local/ National/ Regional/ Global)	Course Description	Course Outcomes
23M1CC1	Algebra and Trigonometry	Global	This course provides broad view on Algebra and Trigonometry.	CO1: Classify and Solve reciprocal equations. CO2: Find the sum of binomial, exponential and logarithmic series. CO3: Find Eigen values, eigen vectors, verify Cayley – Hamilton theorem and diagonalize a given matrix. CO4: Expand the powers and multiples of trigonometric functions in terms of sine and cosine. CO5: Determine relationship between circular and hyperbolic functions and the summation of trigonometric series.
23M1CC2	Differential Calculus Classify and Solve reciprocal equations	Global	This course provides broad view on differential and integral calculus.	CO1: Find the nth derivative, form equations involving derivatives and apply Leibnitz formula. CO2: Find the partial derivative and total derivative coefficient. CO3: Determine maxima and minima of functions of two variables and to use the Lagrange's method of undetermined multipliers. CO4: Find the envelope of a given family of curves. CO5: Find the evolutes and involutes and to find the radius of Curvature using polar co-ordinates.
23M1GEP1	Mathematics-I for Physics	Global	This course provides the basic concepts in various branches of Mathematics.	CO1: Find summation of any series. CO2: Explain the concepts of theory of equations. CO3: Calculate roots of equations using different methods.



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				CO4: Expand trigonometric functions. CO5: Apply the Leibnitz's theorem to find the $n^{\text{th}}$ derivative.
23M1GEC1	Mathematics-I for Chemistry	Global	The course develops Mathematical knowledge needed by the chemistry students.	CO1: Appraise rank of a matrix. CO2: Obtain higher derivatives of functions. CO3: Solve exact and higher order differential equations. CO4: Expand trigonometric functions. CO5: Define Moments, kurtosis and to apply the same.
23M1SE1	Quantitative Aptitude	National	This course is designed to help the students to appear in competitive examinations.	CO1: Solve problems on ages. CO2: Illustrate profit and loss with examples. CO3: Explain partnership and related problems. CO4: Discuss problems on time and work. CO5: Solve problems on time and distance
23M1FC	Bridge Mathematics	National	This course provides the basic concepts in various branches of Mathematics	CO1: Prove the binomial theorem and apply it to find the expansions of any $(x + y)^n$ and also, solve the related problems. CO2: Find the various sequences and series and solve the problems related to them. Explain the principle of counting. CO3: Find the number of permutations and combinations in different cases. Apply the principle of counting to solve the problems on permutations and combinations. CO4: Explain various trigonometric ratios and find them for different angles, including sum of the angles, multiple and submultiple angles, etc. Also, they can solve the problems using the transformations. CO5: Find the limit and derivative of a function at a point, the definite and indefinite integral of a function. Find the points of min/max of a function.



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23M2CC3	Analytical Geometry(Two & Three Dimensions)	Global	This course provides broad view on Analytical Geometry of two & Three Dimensions.	CO1: Find pole, polar for conics, diameters, conjugate diameters for ellipse and hyperbola. CO2: Find the polar equations of straight line and circle, equations of chord, tangent and normal and to find the asymptotes of hyperbola. CO3: Explain in detail the system of Planes . CO4: Explain in detail the system of Straight lines. CO5: Explain in detail the system of Spheres.
23M2CC4	Integral Calculus	Global	This course provides broad view on Integral Calculus.	CO1:Determine the integrals of algebraic, trigonometric and logarithmic functions and to find the reduction formulae. CO2: Evaluate double and triple integrals and problems using change of order of integration. CO3: Solve multiple integrals and to find the areas of curved surfaces and volumes of solids of revolution. CO4: Explain beta and gamma functions and to use them in solving problems of integration. CO5: Explain Geometric and Physical applications of integral calculus.
23M2GEP2	Mathematics-II for Physics	Global	This course provides the fundamentals concepts in various branches of Mathematics	CO1: Solve linear differential equations. CO2: Solve second order linear differential equations with variable coefficient. CO3: Define Laplace transform and apply it to solve differential equation. CO4: Explain the concepts of gradient, divergence, curl and their properties. CO5: Apply line, volume and surface integrals to verify the Gauss divergence and Stoke's theorem.
23M2GEC2	Mathematics-II for Chemistry	Global	The course provides the mathematical skills needed by the chemistry	CO1: Describe the concepts of groups, subgroups and normal subgroups. CO2: Compute the definite integral and construct reduction formula.



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			students for advanced study.	CO3: Solve differential equations using Laplace transforms. CO4: Explain the concepts of correlation, rank correlation coefficient and regression. CO5: Apply the principle of least squares to fit a straight line and parabola.
23M2SE2	Mathematics for Competitive Examinations	National	This course is designed to help the students to appear in competitive examinations.	CO1: Simplify the Problems. CO2: Find the percentage. CO3: Identify Problems on Permutation and Combination. CO4: Solve Problems on blood relation and direction sense test. CO5: Solve Problems on Arithmetical Reasoning.
23M2SE3	Data Interpretation	National	This course helps the students to prepare for competitive examinations.	CO1: Solve problems on Data Interpretation. CO2: Identify Analogy. CO3: Classify coding and Decoding. CO4: Solving Problems using ven diagram. CO5: Identify missing numbers and character
19M3CC5	Modern Algebra	GLOBAL	This course introduces the abstract concepts of modern algebra.	CO1: Classify groups and explain their properties. CO2: Describe cosets and Lagrange's theorem. CO3: Explain the characteristics of different types of rings and their properties. CO4: Classify various types of ideals. CO5: Construct polynomial rings over UFD.
19M3CC6	Advanced Statistics	GLOBAL	This course provides a strong background in statistical tools which will be used in various	CO1: Classify discrete and continuous random variables and characteristics of Binomial distribution and Poisson distribution. CO2: Explain and illustrate the properties of Normal Distribution and solve variety of problems.



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			physical and social sciences.	CO3: Distinguish between a population and a sample and explain testing of hypothesis. CO4: Explain chi square distribution, t- distribution and describe their various applications in Statistics. CO5: Define F- distribution and apply it to solve problems in analysis of variance.
21M3ACC1	Allied Mathematics-I	GLOBAL	This course develops Mathematical knowledge needed by the chemistry students.	CO1: Appraise rank of a matrix, Eigen value and Eigen vectors. CO2: Obtain higher derivatives of functions. CO3: Solve exact and higher order differential equations. CO4: Expand trigonometric functions. CO5: Define Moments, kurtosis and to apply the same.
21M3ACB1	Linear Programming	LOCAL	This course provides appropriate methods for the efficient computation of optimal solutions to problems which are modeled by objective function and linear constraints.	CO1: Define basic concepts of Linear Programming problems. CO2: Apply various simplex methods to solve linear programming problems. CO3: Construct dual problem and solve the primal problem. CO4: Solve transportation problems. CO5: Distinguish assignment problem and travelling salesman problem.
19M3SB1	Applications of Calculus and Differential Equations	GLOBAL	This course deals with applications of calculus and differential equations.	CO1: Explain Beta and Gamma functions and their properties. CO2: Solve the problems in Maxima minima of functions of two variables. CO3: Describe trajectories and orthogonal trajectories. CO4: Solve Brachistochrone problems. CO5: Discuss dynamical problems with variable mass.





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19M4CC7	Sequences and Series	GLOBAL	This course introduces the concept of sequence and series and to enable the students to understand the fundamental ideas in Real Analysis.	CO1:Define basic concepts of sequences. CO2:Explain subsequences and Cauchy sequences. CO3:Differentiate various convergence test for series and use them to solve problems. CO4:Recognize alternating, convergent, conditionally and absolutely convergent series. CO5:Distinguish the behaviour of series and power series.
19M4CC8	Linear Algebra	GLOBAL	This course will focus on matrix as linear transformations relative to a basis of a vector space	CO1:Define Vector Space and explain its various concepts. CO2:Illustrate Inner Product Spaces. CO3:Define basic concepts of matrices and solve linear equations. CO4:Appraise Eigen Value and Eigen Vectors of matrices. CO5:Describe bilinear forms and quadratic.
21M4ACC2	Allied Mathematics-II	GLOBAL	This course provides the fundamentals concepts in various branches of Mathematics	CO1:Describe the concepts of groups, subgroups and normal subgroups. CO2:Compute the definite integral and construct reduction formula. CO3:Solve differential equations using Laplace transforms. CO4:Explain the concepts of correlation, rank correlation coefficient and regression. CO5:Apply the principle of least squares to fit a straight line and parabola.
21M4ACB2	Algebra and Graph Theory	GLOBAL	This course enables the students to have better application of abstract	CO1:Recall relations and functions. CO2:Appraise Eigen values and Eigen vectors. CO3:Define various types of graphs.





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			concepts through Graph Theory.	CO4:List out the characterization of trees. CO5:Apply different algorithms to find the shortest path in graphs.
22M4SB2	Trigonometry	GLOBAL	This course helps the students to develop their problem solving skills.	CO1:Recall some expansions of Trigonometric functions in $\sin nx$ , $\cos nx$ , $\tan nx$ . CO2: Recall some expansions of Trigonometric functions in $\sin nx$ , $\cos nx$ , $\sin mx \cos nx$ . CO3:Recall some expansions of Trigonometric functions in $\cos \theta$ , $\sin \theta$ and $\tan \theta$ in a series of ascending powers of $\theta$ . CO4: Do the problems in hyperbolic functions. CO5: Explain Logarithms of Complex quantities.
19M5CC9	Real Analysis	GLOBAL	This course introduces the basic concepts in analysis and to enable the students to understand fundamental ideas and theorems on metric spaces.	CO1:Describe fundamental ideas and theorems on Metric spaces. CO2:Distinguish the continuity, discontinuity and uniform continuity of functions. CO3:Demonstrate the connectedness and its properties. CO4:Explain the concept of compactness and their roles in the real line. CO5:Organize theorems in a correct mathematical way.
19M5CC10	Statics	GLOBAL	This course describes laws, principles, and	CO1:Explain the concept of the forces and static equilibrium conditions. CO2:Describe the perception of parallel forces and moments.



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			postulates governing the statics of the system in physical reality.	CO3:Classify a thorough force analysis of rigid bodies and simple structures in equilibrium. CO4:Illustrate and give examples of couples and equilibrium of three forces acting on a rigid body. CO5:Solve problems related to friction forces in various applications. Summarize the concept of equilibrium of strings to prepare and demonstrate the models.
19M5CC11	Linear Programming	LOCAL	This course provides appropriate methods for the efficient computation of optimal solutions to problems which are modeled by objective function and linear constraints.	CO1:Formulate linear programming problems and solve by graphical method. CO2:Classify simplex, two phase and Big - M method to solve linear programming problems. CO3:Illustrate Duality in Linear programming. CO4:Recognize and formulate transportation, assignment problems and find the optimal solution. CO5:Define two person zero sum game, saddle point and solve problems.
19M5CC12	Graph Theory	GLOBAL	This course is designed to introduce the students the basics of graph theory.	CO1:Define graphs and operations on graphs. CO2: Summarize and understand various techniques in proving theorems on connectedness. CO3: Create examples and counter examples to illustrate Eulerian and Hamiltonian graphs with examples. CO4: List out the characterization of trees and construct Various matchings for a graph. CO5: Solve problems involving planarity and colourability
23M5ME1/ 23M5ME2	Numerical Methods/ Vector Calculus	GLOBAL	This course enables the students to solve	CO1:Solve algebraic and transcendental equations using various methods. CO2: Identify the various methods of solving simultaneous



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	and Fourier Transforms		equations using various Numerical Methods.	linear algebraic equations. CO3: Recognize difference operators and apply the concept of interpolation. CO4: Compute the values of the derivatives at some point using numerical differentiation and integration. CO5: Solve problems on higher order differential equations using Euler's, Runge- kutta and Predictor-Corrector methods.
19M5SB3	Data Interpretation and Analytical Aptitude	NATIONAL	This course helps the students to prepare for competitive examinations.	CO1:Solve problems on Data Interpretation. CO2:Identify Analogy. CO3:Classify coding and Decoding . CO4:Solving Problems using ven diagram. CO5:Identify missing numbers and character.
19M5SB4	Cryptography	GLOBAL	This course provides important tools for ensuring the privacy, authenticity and integrity of the sensitive information involved in modern digital systems.	CO1:Explain the fundamentals of cryptography. CO2:Describe Security Services. CO3:Explain Symmetric Cipher Model. CO4:Discuss Block Ciphers. CO5:Explain Block Cipher Design Principles.
19M6CC13	Complex Analysis	GLOBAL	This course provides various concepts in complex analysis of one variable	CO1:Explain the concept of bilinear transformations. CO2: Identify continuous, differentiable and analytic functions. CO3: Solve problems on complex integration. CO4: Compute analytic functions in series form and classify singularities. CO5: Evaluate definite integrals using Residues.



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19M6CC14	Dynamics	GLOBAL	This course will provide a sound knowledge of the concepts and principles in Dynamics.	CO1:Describe the behaviour related to projectiles. CO2:Apply the laws and principles governing dynamics of the system in physical reality. CO3:Describe the collision of elastic bodies. CO4:Explain Simple harmonic motion and its properties. CO5:Explain the motion under the action of central forces.
19M6CC15	Operations Research	GLOBAL	This helps in solving problems in different environments that needs decisions.	CO1:Define sequencing problem and apply it to solve real life problems. CO2: Solve problems in decision making. CO3: Apply inventory control to solve practical problems. CO4: Classify queuing models. CO5: Explain CPM and PERT to plan schedule and control project activities.
19M6ME3/ 19M6ME4	Fuzzy Mathematics/ Theory of Numbers	GLOBAL	This course discusses the fundamentals of fuzzy set theory and fuzzy logic.	CO1:Explain the difference between crisp set and fuzzy set theory. CO2:Identify the methods of fuzzy logic. CO3:Recognize the operations on fuzzy sets and combination of fuzzy operations. CO4:Illustrate and give examples related to fuzzy relations. CO5:Build sufficient understanding of fuzzy numbers and $\alpha$ - cuts.
19M6ME5/ 19M6ME6	Lattices and Boolean Algebra/Discrete Mathematics	GLOBAL	This course helps the students to know more about Lattices and Boolean Algebra and their usefulness in other areas of Mathematics.	CO1:Recall Posets and classify Lattices. CO2:Identify ideals and dual ideals in Lattices. CO3:Classify Modular and Distributive Lattices. CO4:Explain the concepts of Boolean Rings and Boolean Functions. CO5:Apply Switching Circuits in real life situations.



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19M6SB5	MATLAB	GLOBAL	This course provides knowledge of basic concepts in MATLAB.	CO1:Solve scientific problems using MATLAB. CO2:Explain Operators in MATLAB. CO3:Apply MATLAB in Data Analysis. CO4:Construct MATLAB programs for Mathematical Calculations. CO5:Describe MATLAB tools.
19M6SB6	Combinatorial Mathematics	GLOBAL	This course enables to study of different enumeration techniques of finite but large sets.	CO1:Explain the concepts of various combinatorial numbers. CO2:Identify solutions by the technique of generating functions and recurrence relation. CO3:Solve problems on principle of inclusion and exclusion. CO4:Identify Euler's function and the Menage problem. CO5:Explain Burnside's lemma and solve problems on Fibonacci numbers.
21UGME2SL	Mathematics and Economics For Competitive Exams	NATIONAL	This course is designed to extend skills in problem solving and to foster mathematical creativity	CO1:Solve some real life problems on numbers. CO2: Ability to understand logical reasoning. CO3: Solve problems involving Permutations and Combinations. CO4: Awareness on overall social and economic problems of India. CO5: Gained knowledge on the functions of banking sector, money market and capital market.
22UGMA4SL	Financial Mathematics	NATIONAL	The course provides the mathematical and commerce concepts needed by the students for advanced study.	CO1:Classify various concepts in structure of interest rate and basic models for asset prices. CO2:Explain elementary statistical analysis of returns and estimation of the distribution.



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				CO3: Gain thorough Knowledge in preparing journal, ledger, Trial Balance. CO4: Extensively apply knowledge on Accounting Ratios and Investment Accounts. CO5: Have an understanding on inflation Accounting.
19UGM6SL	History of Mathematics	GLOBAL	This course helps the learners to study the historical development of mathematics. The emphasis will be on mathematical concepts, problem solving, and pedagogy from a historical perspective.	CO1: Describe the development of mathematics across and within civilizations around the world. CO2: Explain how different cultures have affected and been affected by the history of mathematics. CO3: Recognize the distinction between formal and intuitive mathematics. CO4: Research historical mathematical concepts and present the conclusions of them. CO5: Present the history of mathematics in written forms.
21UGVAM1	Verbal and Non-Verbal Reasoning	NATIONAL	This course helps the learners to develop general mental ability & apply analytical reasoning.	CO1: Develop General Mental Ability. CO2: Apply Analytical Reasoning. CO3: Understand Pattern.