FATIMA COLLEGE

(Autonomous)
Affiliated to Madurai Kamaraj University
Re-Accredited with 'A++' by NAAC (Cycle - IV)
Mary Land, Madurai - 625018, Tamil Nadu

PROGRAMME OUTCOMES AND COURSE OUTCOMES

2023 – 2024

Name of the Programme: B. Sc.MATHEMATICS (SF)   **Programme Code: USMA**

Programme Outcomes:

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

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Course Outcomes:

Course Code	Course Title	Course Outcomes
23G1CC1	Algebra And Trigonometry	CO 1: Classify and Solve reciprocal equations CO 2: Find the sum of binomial, exponential and logarithmic series. CO3:Find Eigen values, eigen vectors, verify Cayley – Hamilton theorem and diagonalize a given matrix. CO 4: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.
23G1CC2	Differential Calculus	CO 1: Find the nth derivative, form equations involving derivatives and apply Leibnitz formula CO 2: Find the partial derivative and total derivative coefficient.ibnitz formula CO 3:Determine maxima and minima of functions of two variables and to use the Lagrange's method of undetermined multipliers CO 4: Find the envelope of a given family of curves

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		CO 5:Find the evolutes and involutes and to find the radius of curvature using polar co-ordinates
23G1GE1	Mathematics For Statistics	**CO-1** Distinguish between proper and improper fractions. Express an algebraic fraction as the sum of its partial fractions. **CO-2** Demonstrate the knowledge to determine the sums, expansion and approximation of series including binomial, exponential, logarithmic and fourier. **CO-3** Solve problems about polynomials with real coefficients, imaginary and irrational roots. Explain the relationship between the derivative of a function as a function and the notion of the derivative. **CO-4** Calculate limits of a function. **CO-5** Obtain the nth derivative in successive differentiation. Apply Euler's theorem on homogenous function.
23G1GECI1/23G1GEJ1	Discrete Mathematics	CO1: Understand the basic principles of sets and operations in sets. CO2: Describe any statement formula in normal forms. CO3: Understand the basics of matrices and able to solve system of equation using matrix. CO4: Demonstrate an understanding of relations and functions

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		and be able to determine their properties CO5: Understand Boolean algebra and basic properties of Boolean algebra; able to simplify simple Boolean functions by using the basic Boolean properties.
23G1FC	Foundation Course - Bridge Mathematics	CO 1:Prove the binomial theorem and apply it to find the expansions of any $(x + y)^n$ and also, solve the related problems CO 2: Find the various sequences and series and solve the problems related to them. Explain the principle of counting. CO 3: Find the number of permutations and combinations in different cases. Apply the principle of counting to solve the problems on permutations and combinations CO 4: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. CO 5: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.
23G1SE1	Quantitative Aptitude	CO 1:Solve problems on ages CO 2: Illustrate profit and loss with examples

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		CO 3:Explain partnership and related problems
		CO 4: Discuss problems on time and work
		CO 5: Solve problems on time and distance-
23G2CC3	Analytical Geometry (Two & Three Dimensions)	CO 1: Find pole, polar for conics, diameters, conjugate diameters for ellipse and hyperbola
		CO 2: Find the polar equations of straight line and circle, equations of chord, tangent and normal and to find the asymptotes of hyperbola
		CO 3: Explain in detail the system of Planes
		CO 4: Explain in detail the system of Straight lines
		CO 5:Explain in detail the system of Spheres
23M2CC4	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

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		solving problems of integration CO5: Explain Geometric and Physical applications of integral calculus.
23G2SE3	Data Interpretation	CO 1: Solve problems on Data Interpretation CO 2: Identify Analogy CO 3: Classify coding and Decoding CO 4: Solving Problems using ven diagram CO 5: Identify missing numbers and character
23G2SE2	Mathematics For Competitive Examinations	CO 1:Simplify the Problems CO 2: Find the percentage CO 3: Identify Problems on Permutation and Combination CO 4: Solve Problems on blood relation and direction sense test. CO5: Solve Problems on blood relation and direction sense test.

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19G2ACI2/19G2ACJ 2	Operations Research	CO 1: Simplify the Problems CO 2: Find the percentage CO 3: Identify Problems on Permutation and Combination CO 4: Solve Problems on blood relation and direction sense test. CO 5: Solve Problems on blood relation and direction sense test.
19G3CC5	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
19G3CC6	Advanced Statistics	CO1: Classify discrete and continuous random variables and characteristics of Binomial distribution and Poisson distribution CO2: Explain and illustrate the properties of Normal distribution

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		and solve variety of problems. 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 is Statistics CO5: Define F- distribution and apply it to solve problems in analysis of variance
19G3SB1	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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19G4CC7	Sequences And Series	CO1: Define basic concepts of sequences CO2: Explain subsequence 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
19G4CC8	Linear Algebra	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

22G4SB2	Trigonometry	CO 1: Recall some expansions of Trigonometric functions in sinnx, cosnx, tannx.
		CO 2: Recall some expansions of Trigonometric functions in $\sin^n x$, $\cos^n x$, $\sin^m x \cos^n x$
		CO 3: Recall some expansions of Trigonometric functions in $\cos\theta$, $\sin\theta$ and $\tan\theta$ in a series of ascending powers of θ
		CO 4: Do the problems in hyperbolic functions
		CO 5: Explain Logarithms of Complex quantities.

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9G5CC9	Real Analysis	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

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19G5CC10	Statics	CO1: Explain the concept of the forces and static equilibrium conditions CO2: Describe the perception of parallel forces and moments 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.
19G5CC11	Linear Programming	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

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		problems and find the optimal solution CO5: Define two person zero sum game, saddle point and solve problems.
19G5CC12	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	Numerical Methods	CO 1: Solve algebraic and transcendental equations using various methods.
		CO 2: Identify the various methods of solving simultaneous linear algebraic equations.
		CO 3: Recognize difference operators and apply the concept of interpolation.
		CO 4: Compute the values of the derivatives at some point using numerical differentiation
		CO 5: Compute the values of the derivatives at some point using numerical differentiation and integration.
23M5ME2	Vector Calculus And Fourier Transforms	CO 1: Explain the concept of differentiation of vectors
		CO 2: Compute divergence and curl of vectors.
		CO 3: Compute divergence and curl of vectors.
		CO 4: Compute Fourier sine and cosine transforms.
		CO 5: Describe the properties of Fourier transforms.
19G5ME1	Computer Programming In C	CO1: Explain various data types and operators in C
		CO2: Summarize Decision Making Branching, looping statements and arrays
		CO3: Categorize function, pointers and structures

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		CO4: Describe Strings and String Handling Functions. CO5: Create C program for real life problems
19G5SB3	Data Interpretation And Analytical Aptitude	CO 1: Solve problems on Data Interpretation CO 2: Identify Analogy CO 3: Classify coding and Decoding CO 4: Solving Problems using ven diagram CO 5: Identify missing numbers and character
19G5SB4	Cryptography	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
19G6CC13	Complex Analysis	CO1: Explain the concept of bilinear transformations. CO2: Identify continuous, differentiable and analytic functions CO3: Solve problems on complex integration

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		CO4: Compute analytic functions in series form and classify singularities
		CO5: Evaluate definite integrals using Residues
19G6CC14	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.
19G6CC15	Operations Research	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

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		activities.
19G5ME3	Fuzzy Mathematics	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 α-cuts
19G6ME4	Theory Of Numbers	CO1: Explain prime number and its distributions CO2: Define and interpret the concepts of divisibility, greatest common divisor, relatively prime integers and Fibonacci sequence CO3: Recognize the congruences, properties of congruences, special divisibility tests and Chinese remainder theorem. CO4: Explain the Law of Quadratic reciprocity, Quadratic

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		Congruence with Prime and Composite Modulus CO5: Explain Fermat's theorem and its applications
19G6ME5	Lattices And Boolean Algebra	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.
19G6ME6	Discrete Mathematics	CO1: Describe any statement formula in normal forms CO2:Analyse the consistency of premises CO3: Classify various functions CO4: Solve Recurrence Relations CO5: Distinguish Posets and Lattices

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19G6SB5	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
19G6SB6	Combinatorial Mathematics	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 Ménage problem CO5: Explain Burnside's lemma and solve problems on Fibonacci numbers