PROGRAMME OUTCOMES AND COURSE OUTCOMES

2023 – 2024

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

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.

Course Outcomes:

Course Code	Course Title	Course Outcomes
23M1CC1	Algebra and Trignometry	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	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	CO1: Find summation of any series. CO2: Explain the concepts of theory of equations. CO3: Calculate roots of equations using different methods. CO4: Expand trigonometric functions. CO5: Apply the Leibnitz's theorem to find the n^{th} derivative.
23M1GEC1	Mathematics-I for Chemistry	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	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	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, multipleand 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.
23M2CC3	Analytical Geometry(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	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 oforder of integration. CO3: Solve multiple integrals and to find the areas of curved surfaces andvolumes 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	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	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.
23M2SE2	Mathematics for Competitive	CO1: Simplify the Problems. CO2:Find the percentage. CO3:Identify Problems on Permutation and Combination.

	Examinations	CO4:Solve Problems on blood relation and direction sense test. CO5: Solve Problems onArithmetical Reasoning.
23M2SE3	Data Interpretation	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	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	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. 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.
21M3ACC1	Allied Mathematics-I	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	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	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.
19M4CC7	Sequences and Series	CO1:Define basic concepts of sequences. CO2:Explainsubsequences 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	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	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	CO1:Recall relations and functions. CO2:Appraise Eigen values and Eigen vectors. CO3:Define various types of graphs. CO4:List out the characterization of trees. CO5:Apply different algorithms to find the shortest path in graphs.
22M4SB2	Trigonometry	CO1:Recall some expansions of Trigonometric functions in Sinnx, cosnx, tannx. CO2: Recall some expansions of Trigonometric functions in sinnx, cosnx, sinmxcosnx. CO3:Recall some expansions of Trigonometric functions in $\cos\theta$, $\sin\theta$ and $\tan\theta$ in a series of ascending powers of θ. CO4: Do the problems in hyperbolic functions.

		CO5: Explain Logarithms of Complex quantities.
19M5CC9	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.
19M5CC10	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 ofcouplesand 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	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	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 and Fourier Transforms	CO1:Solve algebraic and transcendental equations using various methods. CO2: Identify the various methods of solving simultaneous 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	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	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	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.
19M6CC14	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	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	CO1:Explain the difference between crisp set and fuzzy set theory. CO2:Identify the methods of fuzzy logic. CO3:Recognizethe 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/	Lattices and	CO1:RecallPosets and classify Lattices.

19M6ME6	Boolean Algebra/Discrete Mathematics	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.
19M6SB5	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	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	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.
22UGMA4S		CO1:Classify various concepts in structure of interest rate and

L	Financial Mathematics	basic models for asset prices. CO2:Explain elementary statistical analysis of returns and estimation of the distribution. 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	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	CO1:Develop General Mental Ability. CO2: Apply Analytical Reasoning. CO3: Understand Pattern.