PROGRAMME OUTCOMES AND COURSE OUTCOMES

2021 – 2022

NAME OF THE PROGRAMME: B.Sc Mathematics **PROGRAMME CODE: UAMA/ USMA**

Programme outcomes (POs)

PO 1	Apply acquired scientific knowledge to solve complex issues.
PO2	Attain Analytical skills to solve complex cultural, societal and environmental issues
PO3	Employ latest and updated tools and technologies to analyse complex issues
PO4	Demonstrate Professional Ethics that foster Community, Nation and Environment Building Initiatives.

Course Outcomes (COs)

Course Code	Course Title	Course Outcomes
19M1CC1	Calculus	CO1:Explain higher derivatives and apply Leibnitz theorem to find the n^{th} derivative of functions. CO2: Solve problems on curvature, envelopes, asymptotes and curve tracing. CO3:Construct reduction formula for trigonometric functions. CO4:Define Jacobian, double & triple integrals and apply the knowledge of change of variables to solve the problems in double and triple integrals. CO5:Construct Fourier series by recalling integration.
19M1CC2	Classical Algebra	CO1: Explain sets, relations and functions CO2: Define binomial series, logarithmic and exponential series and solve problems. CO3: Identify Relations between the roots and coefficients of equations.

		CO4: Explain the transformations of equations. CO5: Recognize the important Methods in finding roots.
21B1ACM1	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. CO4: Describe Strings and String Handling Functions. CO5: Create C program for real life problems
19M1ACP1	Allied Mathematics – I	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
19M2CC3	Differential Equations	CO1: Solve problems in differential equations of first order.

		CO2: Classify homogeneous and Non homogeneous differential equations of second order and solve problems. CO3: Solve differential equation problems using Laplace transform. CO4: Define Partial differential equations and solve problems. CO5: Solve problems on Growth,decay and chemical reactions
21M2CC4	Statistics	CO1: Solve problems on moments, skewness, kurtosis and correlation CO2: Construct regression lines and curve equation CO3: Explain random variables and probability density function CO4: Solve problems on expectation. CO5: Define and explain analysis of time series and index numbers.
21B2ACM3	Object Oriented Programming	CO1: Define the features of C++ supporting object oriented programming

	With C++	CO2: Describe classes and objects CO3: Distinguish Constructors and Destructors and Explain overloading concepts CO4: Classify Inheritance in C++ CO5: Design C++ programs for real life situations
19M1NME / 19M2NME	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
19M2ACP2	ALLIED MATHEMATICS –II	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: Define Laplace transform and apply it to solve differential equation. CO5: Apply line, volume and surface integrals to verify the Gauss divergence and Stoke's theorem.
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	Vector Calculus And Fourier Transforms	CO1: Explain the concept of differentiation of vectors CO2: Compute divergence and curl of vectors CO3: Solve problems on line and surface integrals CO4: Compute Fourier sine and cosine transforms CO5: Describe the properties of Fourier transforms

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
19C3ACM1	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
19B3ACM1	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
19M4CC7/ 19G4CC7	Sequences And Series	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	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

19M4SB2/ 19G4SB2	Foundations Of Mathematics	CO1: Recall some expansions of Trigonometric functions. CO2: Explain Logarithms of Complex Quantities. CO3: Describe properties of integers. CO4: Solve puzzles using Chinese Remainder Theorem. CO5: Analyse inequalities.
19C4ACM2	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.

19B4ACM2	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
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 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/ 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

		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.
19M5ME1	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

		CO4: Describe Strings and String Handling Functions. CO5: Create C program for real life problems
19M5ME2	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 $\alpha-$ cuts
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	Object Oriented Programming With C++	CO1: Define the features of C++ supporting object oriented programming CO2: Describe classes and objects CO3: Distinguish Constructors and Destructors and Explain overloading concepts CO4: Classify Inheritance in C++

		CO5: Design C++ programs for real life situations
19M6ME4	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 Congruence with Prime and Composite Modulus CO5: Explain Fermat's theorem and its applications
19M6ME5	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.

19M6ME6	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
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