



DEPARTMENT OF MATHEMATICS

PROGRAMME OUTCOMES OF UG COURSES (2021 ONWARDS)

Name of the Programme: B.Sc. Mathematics	
PO1	Good foundation in fundamentals of Mathematics subjects will be acquired.
PO2	Knowledge and skills to undertake further studies in Mathematics and its allied areas will be ensured.
PO3	Scientific temper, analytical thinking, imagination, creativity and critical thinking will be developed.
PO4	Knowledge and confidence to face various competitive examinations will be gained.

PROGRAMME SPECIFIC OUTCOMES OF UG COURSES (2021 ONWARDS)

Name of the Programme: B.Sc. Mathematics	
PSO1	A student should be able to recall basic facts about mathematics and should be able to display knowledge of conventions such as notations , terminology.
PSO2	A student should get adequate exposure to global and local concerns that explore them many aspects of mathematical sciences.
PSO3	Student is equipped with mathematical modeling ability, problem solving skills, creative talent and power of communication necessary for various kinds of employment.
PSO4	Student should be able to apply their skills and knowledge that is translate information presented verbally into mathematical form, select and use appropriate mathematical formulae or techniques in order to process the information and draw the relevant conclusion.
PSO5	Enabling students to develop a positive attitude towards mathematics as an interesting and valuable subject of study.



COURSE OUTCOMES OF UG COURSES (2021 ONWARDS)

Name of the Programme: B.Sc. Mathematics		
Course Code & Course Title	Course Outcome	
SEMESTER - I		
21UMA01 CLASSICAL ALGEBRA	CO1	Gain knowledge about binomial, exponential and logarithmic series.
	CO2	Examine the consistency of linear equations and application of Cayley-Hamilton theorem.
	CO3	Know the application of relations between the roots and coefficients of an equation.
	CO4	Analyse the method of solving reciprocal equations and diminishing the roots of an equation.
	CO5	Examine the existence of roots of an equation and determine the roots by using Newton's and Horner's methods.
21UMA02 CALCULUS	CO1	Gain knowledge about curvature and envelopes.
	CO2	Gain knowledge about integration and its applications.



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SEMESTER - II

21UMA03 ANALYTICAL GEOMETRY OF 2D & 3D	CO1	To gain knowledge about Conic 2D
	CO2	Understand the concepts of coplanar lines and skew lines and find the shortest distance between them
	CO3	To gain the knowledge about sphere and identify the characteristics of sphere
	CO4	Enhance the fundamental concepts of cone and cylinder
	CO5	To develop the concepts of coincoides.
21UMA04 TRIGONOMETRY & VECTOR ANALYSIS	CO 1	Recall the basic concepts and understand the expansions of Trigonometric functions.
	CO 2	Acquire knowledge on Hyperbolic functions and Logarithm of complex numbers.
	CO 3	Gain knowledge on the concept of divergence, curl and integration of vector point functions.
	CO 4	Analyse and work with the problems related to line integrals, surface and volume integrals.
	CO 5	Solve the problems related to Gauss, Stoke's and Green's theorems.



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SEMESTER - III

21UMA05 NUMBER THEORY	CO1	To understand the basic properties of integers.
	CO2	Formally understand and prove various theorems.
	CO3	Applying theoretical results acquired to solve different problems.
21UMA06 DIFFERENTIAL EQUATIONS	CO1	Students will be able to classify the differential equations with respect to order and linearity.
	CO2	Students will be able to solve the second order differential equations, linear equations, linear differential equations with constant coefficients.
	CO3	Students will be able to understand the basic properties of standard PDE's and solve the problem in Clairaut's form.
21UMAS01 SBEC I – FINANCIAL MATHEMATICS	CO1	To understand the basic concepts of Financial Mathematics.
	CO2	To understand and prove theorems.
	CO3	To understand the method to solve the problems by applying principles and concepts of Financial Mathematics.



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SEMESTER - IV

<p>21UMA07 LAPLACE TRANSFORMS & FOURIER SERIES</p>	CO1	Have a sound knowledge of Laplace Transform and its properties.
	CO2	Have sufficient exposure to get the solution of certain linear differential equation using Laplace Transform and inverse Laplace Transform.
	CO3	Have an idea of periodic function and come to know how to expand the given functions as a series of sines and cosines which are simple periodic functions.
	CO4	Have an idea of Fourier Transform and its properties which can be applied in future for solving Partial Differential equations by reducing the number of independent variable by one.
<p>21UMA08 NUMERICAL METHODS</p>	CO1	Use numerical methods to solve the algebraic and transcendental equations by using Bisection, Newton's method and some iterative methods.
	CO2	Have a sufficient exposure in constructing difference tables and to use Newton's forward and backward formula for interpolation in equal intervals.
	CO3	Have learnt to construct divided difference table and to use Stirling's, Bessel's and Lagrange's interpolation formula for unequal intervals.
	CO4	Have understood the numerical differentiation and numerical differentiation and numerical integration by using Newton's methods and Trapezoidal, Simpson's rule.
	CO5	Have learnt the methods like matrix inversion, Gaussian, Gauss seidel methods etc., for solving linear system of algebraic equations.



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21UMASP02 SBEC II: LATEX – PRACTICAL	CO 1	Make different Alignments in a document and an Application for a job.
	CO 2	Generate Bio-Data, and Table Structures.
	CO 3	Create Mathematical Statements using LaTeX.
	CO 4	Prepare Articles and Inserting Pictures.
	CO 5	Prepare Question paper and PowerPoint presentation in LaTeX format.

SEMESTER - V

21UMA09 MODERN ALGEBRA	CO 1	Understand the concepts of various Subgroups and its applications.
	CO 2	Acquire Knowledge about the concepts of homomorphisms, isomorphisms and automorphisms.
	CO 3	Gain knowledge about the concepts of Rings and Quotient Rings.
	CO 4	Analyse the concept of Field and Euclidean Ring.
	CO 5	Analyse and demonstrate the properties of Polynomial Rings.
21UMA10 REAL ANALYSIS - I	CO1	Understand basic concepts of sequence and series.
	CO2	Understand and prove various theorems.
	CO3	Understand the method to solve simple problems by applying concepts of Analysis.



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21UMA11 OPERATIONS RESEARCH	CO1	Formulate simple reasoning and learning optimization problems.
	CO2	Analyze a problem and can select a suitable strategy.
	CO3	Apply an appropriate method to obtain the solution to a problem.
	CO4	Manipulate the basic mathematical structures underlying these methods.
	CO5	Evaluate analytically the limitations of these methods.
21UMA12 MECHANICS	CO1	To recollect the basic concept of forces and understand the Varignon's theorem.
	CO2	To understand the laws of friction and equilibrium of a particle on a rough inclined plane under a force.
	CO3	To understand the path of a projectile is a parabola and to apply the concept of projectile.
	CO4	To understand the impulse and impulsive force and to gain knowledge about collision of elastic bodies.
	CO5	To understand the geometrical representation of simple harmonic motion and solve the problems on the seconds pendulum.
	CO1	Understand the structure of C program, its keywords, declaration of variables and defining symbolic commands.



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21UMAS03 SBEC III – C – Programming (Theory)	CO2	Use arithmetic operators, logical operators, relational operators, increment and decrement operators and conditional operators while writing a C program.
	CO3	Know the decision making using IF statement, IF ELSE statement, and to have jumps in loops using GOTO, WHILE, DO, FOR and SWITCH statement.
	CO4	Define one dimensional array, two dimensional arrays, and to declare string variables.
	CO5	Understands the need for user defined functions, return values and their types, calling function, and category of functions.
SEMESTER - VI		
21UMA13 LINEAR ALGEBRA	CO 1	Find the linear dependence and independence, dimension of spaces.
	CO 2	Know the concepts of null spaces, range and Matrix representation of a linear transformation.
	CO 3	Solve System of Linear equations by using Rank.
	CO 4	Understand about Inner Product Spaces.
	CO 5	Compute the orthogonal projection of a vector.
21UMA14 REAL ANALYSIS – II	CO 1	Understand concepts of connectedness, completeness and compactness of metric spaces.
	CO 2	Understand basic concepts of Riemann Integration and solving simple problems.
	CO 3	Solving problems by using theorems on derivatives.



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21UMA15 COMPLEX ANALYSIS	CO 1	Know the concepts of Limits, Continuity and Analytic functions.
	CO 2	Solve Complex Integrals.
	CO 3	Discuss Convergence of Sequences and Series, Taylors series and Laurents series.
	CO 4	Find different Singularities and Residues
	CO 5	Understand various Linear Transformations and Conformal Mappings
21UMA16 GRAPH THEORY	CO1	Formally understand and prove theorems and lemmas.
	CO2	Apply theoretical knowledge acquired to solve realistic problems in real life.
	CO3	Apply principles and concepts of graph theory in practical situations and to improve the proof writing skills.
21UMASP04 SBEC IV: OFFICE AUTOMATION (PRACTICAL)	CO1	Acquire practical knowledge about MS-Word, MS-Excel, MS-PowerPoint and Ms-Access.



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21UMAE01 ELECTIVE – DISCRETE MATHEMATICS	CO 1	Recall the various concepts of Mathematical Logic
	CO 2	Understand the concepts of different types of normal forms
	CO 3	Classify the various types of functions and make them to use in practical applications related to computer science
	CO 4	Gain knowledge about the Algebraic systems
	CO 5	Understand the concepts of Boolean Algebra and its applications
21UMAE04 ELECTIVE – FUZZY SETS AND FUZZY LOGIC	CO1	Calculate support, height, normal alpha cuts and strong alpha cuts from the Membership Functions
	CO2	Manipulate standard fuzzy operations such as complements, t – norms and t – conforms
	CO3	Analyze the concepts of fuzzy numbers and linguistic variables
	CO4	Compute fuzzy relations for equivalence and compatibility
	CO5	Apply the concepts of fuzzy logic, fuzzy propositions and quantified propositions to mathematical modeling in uncertain situation



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21UMAA01 ALLIED MATHEMATICS – I	CO 1	Know the application of relations between the roots and coefficients of an equation and diminishing the roots of an equation.
	CO 2	Ability to solve the consistency of linear equations and application of Cayley-Hamilton theorem.
	CO 3	Understanding the concepts of Cartesian co-ordinates, parametric co-ordinates and polar co-ordinates.
	CO 4	Understand the basic properties of PDE.
	CO 5	Gain the skill to solve problems.
21UMAA02 ALLIED MATHEMATICS – II	CO 1	Understanding the concepts of Maxima and Minima.
	CO 2	Developing the knowledge in Numerical Methods problem solving.
	CO 3	Understanding the second order differential equations with constant coefficients.
	CO 4	Understand the basic properties of Laplace Transforms.
	CO 5	Solving the simple problems in inverse Laplace and its applications.
21UMAAP01 ALLIED MATHEMATICS - III – PRACTICALS	CO 1	Gain the skill to solve the problems in Matrices.
	CO 2	Gain knowledge to solve the problems in partial differentiation.
	CO 3	Gain knowledge on the concept of divergence, curl and integration of vector point functions



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21UMAN01 NON MAJOR ELECTIVE COURSE – I QUANTITATIVE APTITUDE- I	CO 1	Make sense of problems, develop strategies to find solutions and persevere in solving them.
	CO 2	Use appropriate technology in a given context.
	CO 3	Critique and evaluate quantitative arguments that utilize mathematics, statistical and quantitative information.
	CO 4	Solve problems in numbers, decimal fractions, square root and cube roots.
21UMAN02 NON MAJOR ELECTIVE COURSE – II QUANTITATIVE APTITUDE – II	CO 1	Make sense of problems, develop strategies to find solutions and persevere in solving them.
	CO 2	Use appropriate technology in a given context.
	CO 3	Solving the problem on time and work, time and distance, boat and stream.
	CO 4	Solving the problem on logarithms, volume and surface area, height and distance, odd man out.



PROGRAMME OUTCOMES OF PG PROGRAMMES (2021 ONWARDS)

Name of the Programme: M.Sc. Mathematics	
PO1	Gain knowledge in the fundamental subjects of pure and applied mathematics.
PO2	Explain the mathematical concepts with good understanding and clarity.
PO3	Conduct research independently with strong mathematics background.
PO4	Crack lectureship/fellowship exams like CSIR – NET/JRF, GATE, NBHM, SET, TRB etc.
PO5	Apply the acquired mathematical techniques to solve the socioeconomic and industrial problems
PO6	Obtain career in the field of education/research/industry

PROGRAMME SPECIFIC OUTCOMES OF PG COURSES (2021 ONWARDS)

Name of the Programme: M.Sc. Mathematics	
PSO1	Provide a systematic understanding of the concepts and theories of mathematics and their application in the real world – to an advanced level, and enhance career prospects in a huge array of fields.
PSO2	Develop proficiency in the analysis of complex physical problems and the use of mathematical or other appropriate techniques to solve them.
PSO3	Demonstrate engagement with current research and developments in the subject.
PSO4	Recognize the need to engage in lifelong learning through continuing education and research.
PSO5	Communicate effectively by oral, written, computing and graphical means.



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Name of the Programme: M.Sc. Mathematics		
Course Code & Course Title	Course Outcome	
SEMESTER - I		
21PMA01 LINEAR ALGEBRA	CO1	To describe a diagonalizable operator T in a language of invariant direct sum decompositions (projections which commute with T).
	CO2	To find the minimal polynomials, Jordan forms and the rational forms of real matrices.
21PMA02 REAL ANALYSIS – I	CO1	To give the definition of concepts related to metric spaces, such as continuity, compactness, completeness and connectedness that will help for further studies within topology and functional analysis.
	CO2	To demonstrate an understanding of limits and how they are used in sequences, series, continuity and differentiation.
	CO3	To construct rigorous mathematical proofs of basic results in real analysis.
21PMA03 ORDINARY DIFFERENTIAL EQUATIONS	CO1	To solve the differential equations by using various methods.
21PMA04 MECHANICS	CO1	The students will understand the formation of differential equations which will help to study the dynamics of mechanical systems.



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<p>21PMAE01 ELECTIVE- I – DISCRETE MATHEMATICS</p>	CO1	Express a logic sentence in terms of predicates, quantifiers and logical connectives.
	CO2	Apply the rules of inference and methods of proof including direct and indirect proof forms, proof by contradiction and mathematical induction.
	CO3	Solve mathematics problems that involve computing permutations and combinations of a set, fundamental enumeration principles.
	CO4	Evaluate Boolean functions and simplify expressions using the properties of Boolean algebra.

SEMESTER - II

<p>21PMA05 ABSTRACT ALGEBRA</p>	CO1	To find the number of Sylow subgroups.
	CO2	To find the splitting field, Galois group of the given polynomial.
	CO3	To find the number of non-isomorphic abelian groups.
	CO4	To check whether the given polynomial is solvable by radicals or not.
<p>21PMA06 REAL ANALYSIS – II</p>	CO1	find the integrals of a bounded function on a closed bounded interval
	CO2	understand sequences and series of functions and its convergence
	CO3	find the derivative of functions of several variables.
	CO1	be familiar with the modeling assumptions and derivations that lead to PDE's.



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21PMA07 PARTIAL DIFFERENTIAL EQUATIONS	CO2	recognize the major classification of PDEs and the qualitative difference between the classes of equations.
	CO3	be competent in solving linear PDEs using classical methods.
21PMAE03 ELECTIVE II- NUMERICAL ANALYSIS	CO1	learn the principles for designing numerical schemes for differential equations.
	CO2	be able to analyze the consistency, stability and convergence of a numerical scheme.
	CO3	be able to know, for each type of differential equations, what kind of numerical methods are best suited for and the reasons behind these choices?
	CO4	be able to make a connection between the mathematical equations or properties and the corresponding physical meanings.
	CO5	be able to use a programming language or mathematical software to implement and test the numerical schemes.
21PSTED03 EDC - STATISTICAL METHODS	CO1	calculate Mean, Median and Mode in series of individual observations.
	CO2	find Discrete series, Continuous series.
	CO3	calculate the first and the second fundamental forms of surface.
	CO4	calculate the Range, Quartile deviation, Mean deviation about an average, Standard deviation and coefficient of variation for individual, discrete and continuous type data.
	CO1	Understand the historical growth of the idea of human rights.



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21PHR01 HUMAN RIGHTS	CO2	Demonstrate an awareness of the international context of human rights.
	CO3	Position of human rights in the UK prior to 1798
	CO4	Demonstrate an awareness of the importance of the Human Rights Act 1798.
	CO5	Students will be able to analyze and evaluate concepts and ideas.

SEMESTER - III

21PMA08 COMPLEX ANALYSIS	CO1	be familiar with the modeling assumptions and derivations that lead to Complex Analysis
	CO2	recognize the major classification of analytic functions, harmonic functions, conformal mappings and the qualitative difference between the complex integration & Real integration.
21PMA09 TOPOLOGY	CO1	to understand various concepts of Topology.
21PMA10 MEASURE THEORY AND INTEGRATION	CO1	To get the knowledge of Measure and Outer measure, generalization of integrals with help of measures.
21PMA11 GRAPH THEORY	CO1	to identify the graphs of connectivity and tree.
	CO2	to find the Independent set and cycle graph.
	CO3	to understand graph coloring.
	CO4	to check planarity.



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21PMAE06 ELECTIVE III - FLUID DYNAMICS	CO1	Recognize and find the values of fluid properties and relationship between them and understand the principles of continuity, momentum, and energy as applied to fluid motions.
	CO2	Identify these principles written in form of mathematical equations.
	CO3	Apply dimensional analysis to predict physical parameters that influence the flow in fluid mechanics.
21PMAAOC01 ADVANCED LATEX	CO1	Create and typeset a LaTeX document
	CO2	Typeset a mathematical document
	CO3	Draw pictures in LaTeX
	CO4	Create beamer presentations
	CO5	Prepare the projects or dissertations in LaTeX

SEMESTER - IV		
21PMA12 FUNCTIONAL ANALYSIS	CO1	Understand the relationship between metric space, normed space, inner product space
	CO2	understand properties of continuous linear functionals on Banach space
	CO3	understand various types of operators on Hilbert space.
	CO4	know Regular elements, singular elements, spectrum of Banach algebra & its ideals



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21PMA13 PROBABILITY THEORY	CO1	to get the knowledge of Random variables and Random events.
	CO2	to understand characteristic of function and Properties of characteristic function.
21PMA14 CALCULUS OF VARIATIONS AND INTEGRAL EQUATIONS	CO1	to know different types variational problems and finding their extremals.
	CO2	to find solution of Fredholm & Volterra integral equations through different methods.
21PMAE08 ELECTIVE IV - NUMBER THEORY	CO1	apply the Law of Quadratic Reciprocity and other methods to classify numbers as primitive roots, quadratic residues and quadratic non-residues.
	CO2	formulate and prove conjectures about numeric patterns and
	CO3	produce rigorous arguments centered on the material of number theory, most notably in the use of Mathematical induction and the Well-Ordered principle in the proof of theorems.
21PMAPR1 PROJECT WORK AND VIVA-VOCE	CO1	Inculcate a taste for research in Mathematics.
	CO2	Develop oral and written presentation skills.



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