DEPARTMENT OF MATHEMATICS

B.Sc. Mathematics

Course Outcomes

On the successful completion of the course, students will be able to

Course Code	Course Name	Course Outcome
20UMAC1	Part-III – Core I- Calculus I	CO1: Recall and understand the concepts of successive differentiation
		CO2: Understand and apply the concept of derivatives for higher order and implicit function.
		CO3: Applying the concepts of derivative to find the maxima and minima functions of two variables
		CO4: Acquire knowledge about finding the angle between the radius vector and the tangent and Radius of curvature in polar Co-ordinates
		CO5: Examine the Cartesian formula and parametric formula for Radius of Curvature

20UMAC2	Part-III – Core II-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
20UMASQC1	Part-IV-Skill Based I - Theory of Equations with MATLAB - Practical	CO1: Get acquainted with Fundamental Operations in Matrices using MATLAB
		CO2: Know Matrix Factorization and Gaussian elimination by MATLAB.
		CO3: Acquire knowledge to find Eigen Values, Eigen Vectors & Determinants in MATLAB.
		CO4: Apply MATLAB and familiar with Polynomial Factorization and Roots of the Polynomial
		CO5: Apply MATLAB to solve problems on Horner's Method & Newton's Method
20UMAC3	Part-III-Core III – Analytical Geometry and Trigonometry	CO1: Know the basic concepts of analytical geometry
		CO2: Understand the concepts of polar equations of straight line, circle and conic
		CO3: Understand the concepts of circular, hyperbolic and inverse hyperbolic functions
		CO4: Understand and apply the concepts of logarithm of complex numbers and gregory series
		CO5: Find the sum of different types of trigonometry series

20UMAC4	Part-III – Core IV - Analytical Solid Geometry	CO1: Assimilate the basic concept of Direction Ratios and Direction Cosine, Planes in 3D
		CO2: Understand the concepts of Straight Lines, Symmetrical Form and Co-planarity of Straight Lines and solve related problems
		CO3: Learn about Angle between two Planes, Shortest distance between two Skew Lines, Foot of the common perpendicular, Lines of Intersection of Three Planes and solve related problems
		CO4: Acquire knowledge about Sphere and solve relevant problems
		CO5: Analyse the concepts of Cone, Cylinder and Conicoids
20UMASQC2	Part-IV-Skill Based-II Analytical Geometry With Geogebra- Practical	CO1: Know the basic concepts of lines, Parabola, Ellipse and Hyperbola.
		CO2: Get knowledge of quadratic equations and learn to trace the conic when its equation is given
		CO3: Acquire knowledge about reflection property of Parabola, Ellipse and Hyperbola.
		CO4: Use Geogebra to trace Spheres and Cylindrical surfaces.
		CO5: Use Geogebra for Graphing quadratic surfaces
20USTAC1	Part-III- Allied Mathematics I (For Computer Science)	CO1: Acquire knowledge about the rank of a matrix, characteristic roots and characteristic vectors.
		CO2: Recall the basic concepts and understand the relation between the roots and coefficients of an equation.
		CO3: Understand transformation of equations and apply Horner's method and Newton's method for solving the equations.

		CO4: Solve algebraic and transcendental equations by Numerical methods.

		CO5: Understand and analyse Numerical differentiation and Integration.
19USTAC1	Part-III-Allied Mathematics - I (For Statistics)	CO1: Understand the relation between the roots and coefficients, symmetric functions of the roots, reciprocal equation and solve the related problems
		CO2: Gain knowledge of transformation, multiplying and diminishing the roots of an equation and also acquire knowledge about Horner's and Newton's method and solve the related problems
		CO3: Understand the concept of angle between the radius vector and the tangent, radius of curvature and pedal equation and apply the concept to solve the Problems
		CO4: Recall the concepts of second order differential equations and acquire knowledge to find the Particular integral for different types of functions .
		CO5: Analyse the different types of solutions for Partial differential equations.
20UCSAC2	Allied Mathematics II (For Computer Science)	CO1: Define and use propositional logic for expressions involving the logical Connectives
		CO2: Identify and apply fundamentals of sets and its operations
		CO3: Evaluate Boolean functions and simplify expressions using properties of Boolean Algebra
		CO4: Understand the fundamental ideas of LPP and apply graphical and simplex method for solving LPP.
		CO5: Apply MODI method for solving transportation problems and finding the shortest way to the travelling salesman problem

20USTAC2	Part-III-Allied Mathematics - II (For Statistics)	CO1: Acquire knowledge to find characteristic vectors of a matrix, Cayley Hamilton theorem and its applications
		CO2: Understand the expansions of trigonometric functions and solve the related Problems
		CO3: Grasp the concept of multiple integrals and its evaluations
		CO4: Learn the Laplace transform of elementary functions and study its applications.
		CO5: Acquire knowledge of inverse Laplace transforms and solve differential equations using it.
19UMAC5	Part-III-Core V - Calculus II	CO1: Recall and understand the concepts of integration using reduction formula
		CO2: Applying integration in Beta and Gamma functions
		CO3: Learn to solve problems in double and triple integrals
		CO4: Applying double and triple integrals to area, volume and centroid
		CO5: Applying integration in the concepts of Fourier series

19UMAC6	Part-III-Core VI - Vector Analysis and Theory of Numbers	CO1: Gain the knowledge on the concept of divergence, curl and integration of vector point functions.
		CO2: Understand and work with the problems related to ordinary integrals of vectors, line integrals surface and volume integrals
		CO3: Solve the problems related to Gauss Stroke's and Green's theorems
		CO4: Understand the basic concepts of number theory and gain the ability to solve the problems related to them.
		CO5: Understand the concept of Fermat's theorem, generalisation of Fermat's, Wilson's and Lagrange's theorem and gain the ability to solve the problems related to them
19UMAAC3	Part-III-Allied II - Mathematical Statistics	CO1: Recall the concepts of random variables ,marginal probability distribution and conditional probability distribution.
		CO2: Acquire the knowledge about moment generating functions and characteristic functions.
		CO3: Learn to solve problems using correlation coefficient and regression coefficient.
		CO4: Gain knowledge about different types of distributions.
		CO5: Eradicate the consequences of confusion in decision making.
19UMASQC3	Part-IV-Skill Based III – Data Analytics with R - Practical	CO1: Understand the operations on vectors using R
		CO2: Understand basic operations on matrices using R
		CO3: Apply commands on data frames to understand various operations on it

		using R
		CO4: Analyse the operations on Big Data tables using R
		CO5: Evaluate Correlation problems using R
19UMANEC1	Part-IV-Non Major Elective-I-Basic Mathematics	CO1: Understand the operations on Numbers
		CO2: Understand to find the H.C.F and L.C.M of numbers
		CO3: Applying the operations of numbers to find the percentage
		CO4: Evaluate the problems related to Area
		CO5: Evaluate volume and surface Area
19UMAC7	Part-III-Core VII - Differential Equations and Laplace Transforms	CO1: Understand the basic concepts associated with Ordinary Differential Equations and solve problems.
		CO2: Discuss the methods in solving Second Order Linear Differential Equations with Constant and Variable Coefficients
		CO3: Learn to solve PDE using Charpit's Method and Lagrange's Methods
		CO4: Assimilate knowledge about Laplace Transforms and Inverse Laplace Transforms and solve related problems
		CO5: Know the Applications of Laplace Transforms and solve Biological Problems using Differential Equations and Laplace Transforms
19UMAEC1	Part-III-Elective I – Operations Research	CO1: Formulate and solve L.P.P by using Simplex, Big M and two Phase simplex methods.
		CO2: Acquire the knowledge on solving transportation problems and analyse the concepts of assignment problems.

		CO3: Acquire the knowledge on inventory models
		CO4: Understand project scheduling by PERT and CPM.
		CO5: Recall the basic concepts and acquire the knowledge on Games & Strategies.
19UMAESC1	Part-III-Elective I – Number Theory	CO1: Recall the basic concepts in number theory
		CO2: Understand the concepts of divisibility theory in integers, the division algorithm, Euclidean algorithm and Diophontine equation $ax + by = c$
		CO3: Solve the problems using the Fundamental theorem of arithmetic
		CO4: Understand the basic properties of congruence and solve the problems on congruence
		CO5: Gain knowledge about the Fermat's factorization method, the Little theorem & Wilson's theorem and acquire knowledge to apply them
19UMAAC4	Part-III-Allied II - Discrete Mathematics	CO1: Understand the concept of connectives and inference theory of predicate Calculus
		CO2: Classify the various type of functions and make them to use in practical applications related to computer science
		CO3: Gain knowledge about the Algebraic system and group codes
		CO4: Understand the concept of Boolean Algebra and its application to sequential Machines

		CO5: Examine about the grammar and language and apply to finite state machine

19UMASQC4	Part-IV-Skill Based IV – Optimization Techniques with Tora-Practical	CO1: Understand the basic concepts of TORA software
		CO2: Solving L.P.P by using Simplex, Big M and two Phase simplex methods through Tora.
		CO3: Acquire the knowledge on solving transportation problems and assignment problems by using Tora.
		CO4: Understand and apply Tora for solving problems on project scheduling by PERT and CPM.
		CO5: Apply Tora for solving problems on Games & Strategies.
19UMANEC2	Part-IV-Non Major Elective II Mathematics for Competitive Examinations	CO1: Understand to find the Averages of Numbers
		CO2: Understand to find the Profit and Loss
		CO3: Gain knowledge about the Ratio and Proportion
		CO4: Evaluate the Simple interest and Compound interest to problems
		CO5: Evaluating the problems of Odd man out and series
19UCOAC3	Part-III-Allied - Business Mathematics	CO1: Gain essential foundation in the areas of business calculus and financial mathematics.
		CO2: Learn and apply methods of Differentiation in business problems.
		CO3: Get knowledge of integration and its specific uses in economics.
		CO4: Get familiarity of Linear Programming techniques and identifying the need of LPP in Business and economic context.
		CO5: Connect acquired knowledge and skills with transportation and assignment

		problems in economic practice.
19UPHAC3	Part III - Allied Mathematics I (For Physics)	CO1: Understand the relations between the roots and coefficients of an equation and solve reciprocal equations
		CO2: Examine the existence of roots of an equation and obtain the roots by Newton's and Horner's methods
		CO3:Compute the radius of curvature using Cartesian formula, Parametric formula and in Polar coordinates
		CO4: Obtain the general solution of second order linear differential equations with constant coefficients
		CO5: Form the partial differential equations and obtain the solutions of some standard types of partial differential equations.
19UCHAC3	Part-III-Allied Mathematics - I (For Chemistry)	CO1: Recall the concepts of matrix and understand concepts of the characteristic equation, vectors of a matrix
		CO2: Understand the relations between the roots and coefficients of an equation and solve the reciprocal equations
		CO3: Examine the existence of roots of an equation and find the roots of an equation by Newton's and Horner's method
		CO4: Acquire knowledge on Newton's forward and backward difference formulae, Lagrange's Formula and their applications
		CO5: Find the angle between the radius vector and the tangent and the Radius of

		Curvature and Cartesian coordinates

19UPHAC4	Part-III-Allied Mathematics-II (For Physics)	CO1: Create reasonable comprehension and familiarity with trigonometric Functions
		CO2: Compute double and triple integrals efficiently and can also change a double integral into polar coordinates whenever necessary
		CO3: Calculate the Fourier transform of elementary functions and recognise even, odd functions to use the final reduction for Fourier transforms
		CO4: Find the Laplace transform of exponential, cosine, sine functions and also for integrals
		CO5: Comprehend solving differential equations using inverse Laplace transform
19UCHAC4	Allied Mathematics II (For Chemistry)	CO1: Recall the basic concepts and understand the expansions of trigonometric functions ,Hyperbolic and Inverse hyperbolic functions.
		CO2: Acquire knowledge on Integral calculus.
		CO3: Solve second order differential equations and linear homogeneous equations.
		CO4: Acquire knowledge on Laplace transforms.
		CO5: Understand Inverse Laplace transform and solve differential equations using Laplace transform.
18UMAC8	Part-III-Core VIII - Algebraic Structures I	CO1: Understand the concept of various subgroups and their applications
		CO2: Acquire knowledge about the concept of homomorphisms, isomorphisms and automorphisms
		CO3: Gain knowledge about the concept of rings, fields, subrings and subfields
		CO4: Analyse the concept of ideals, types of ideals, integral domain and unique

		factorization domain
		CO5: Evaluate the properties of polynomial rings
18UMAC9	Part-III-Core IX- Complex Analysis - I	CO1: Present the central ideas of Cauchy – Riemann equations and decide the analyticity of a complex function.
		CO2: Develop an insight on contour integration and present the emphasis of Cauchy- Goursat theorem in simply and multiply connected domains.
		CO3: Evaluate a contour integral using Cauchy's integral formula and be accomplished in implementing the Liouville's theorem, and the maximum modulus principle.
		CO4: Explain the concepts of linear transformation and linear fractional transformation in a complex space.
		CO5: Exhibit the comprehension of conformal mappings like w = sinz, w = cosz, w = sinhz, w = coshz and preservation of angles.
18UMAC10	Part-III-Core X - Real Analysis I	CO1: Know the basic concepts and understand the concepts of real numbers, countable sets, lub and glb
		CO2: Understand the concept of sequences, nature of sequences and subsequences
		CO3: Understand the notions of cauchy sequences and infinite series
		CO4: Apply various tests of convergence to test the convergence of series
		CO5: Know the concepts of metric spaces and continuous function and gain knowledge to analyze the properties of continuous functions on different types of metric spaces

18UMAC11	Part-III-Core XI – Dynamics	CO1: Know the basic concepts of velocity and acceleration of a Particle moving on a curve, velocity and acceleration components in Cartesian and polar coordinates
		CO2: Understand the concepts of simple harmonic motion and impulsive forces.
		CO3: Gain ability to solve and analyse problems in a systematic and logical manner.
		CO4: Know the principles of projectiles, central force, moment of inertia and gain ability to analyze the practical problems
		CO5: Solve dynamics problems and determine which concepts to apply for finding an appropriate solution.
18UMAEC2	Part-III-Elective II- Bio Mathematics	CO1: Understand the basics of modeling and difference equations and to get an introduction on MATLAB
		CO2: gather knowledge on the modeling of first order homogeneous and non homogenous difference equations
		CO3: Apply the notion of Gauss – Jordan Elimination method for matrices in modeling
		CO4: Analyse and Evaluate the Eigenvalues and Eigenvectors of Models using MATLAB
		CO5: Compute the solutions of the difference equations of Nonlinear systems.
18UMAESC2	Part-III-Elective II - Number Theory	CO1: Recall the basic concepts in number theory
		CO2: Understand the concepts of divisibility theory in integers, the division

		algorithm, Euclidean algorithm and Diophontine equation ax + by =c
		CO3: Solve the problems using the Fundamental theorem of arithmetic
		CO4: Understand the basic properties of congruence and solve the problems on Congruence
		CO5: Gain knowledge about the Fermat's factorization method, the Little theorem & Wilson's theorem and acquire knowledge to apply them
18UMANSQC1	Non Major Skill Based I - Industrial Mathematics with R Programming – PRACTICAL	CO1: Understand the basic matrix operations and solving the same with the aid of R studio
		CO2: Interpret and solve Linear Programming Problems and Dual Linear Programming Problem using R Studio
		CO3: Analyse and solve North West Corner Method and Least Cost Method faster using R studio
		CO4: Solve Vogel's Approximation Method more quickly with the aid of R studio
		CO5: Analyse and compute the solutions of Assignment problems using R Studio.
18UMAC12	Part-III-Core XII - Algebraic Structures II	CO1: Understand the concept of vector spaces, subspaces, basis and dimension of a vector space
		CO2: Gain knowledge about the concept of inner product spaces and homomorphisms between vector spaces
		CO3: Learn the concept of linear transformation
		CO4: Compute the matrix of linear transformation relative to basis and obtain the triangular form of the matrix of a linear transformation

		CO5: Determine the solution of a system of linear equations using matrix and Determinant
18UMAC13	Part-III-Core XIII: Complex Analysis II	CO1: Understand the concept of sequences and series with respect to the complex numbers system and establish whether a given series/ sequences is convergent/ divergent at a specified point or interval using Taylor's and Laurent's theorem.
		CO2: Define continuity of sums of power series, determine whether the series is convergent/divergent and compute various operations on power series.

		CO3: Use the Cauchy's residue theorem to find residues and find the behaviour of functions near isolated singular points.
		CO4: Recognize and apply properties of Fourier analysis.
		CO5: Understand the idea of indented paths and integrals involving sines and cosines and its applications on argument principle and Rouche's theorem.
18UMAC14	Part-III-Core XIV - Real Analysis II	CO1: Know the notions of open sets, closed sets and discontinuous functions on R^1
		CO2: Understand the concepts of connectedness and completeness in a metric space and gain knowledge to give examples
		CO3: Understand the notions of compactness and uniform continuity
		CO4: Gain knowledge of Rolle's theorem, Mean Value Theorem and Fundamental theorems and develop the knowledge to apply these theorems to evaluate the derivatives of a function at a point
		CO5: Analyze the properties of Riemann integral
18UMAC15	Part-III-Core XV- Numerical Methods And Programming In C	CO1: Recall basic concepts and acquire knowledge on solving algebraic and transcendental equations by Numerical methods.
		CO2: Gain knowledge on direct methods for solving simultaneous linear algebraic equations and on numerical differentiation and integration.
		CO3: Acquire knowledge on finding numerical solution of ordinary differential equations.
		CO4: Know about Data types Operators and Expressions
		CO5: Understand Decision making statements and loop structures in C

18UMAEC3	Part-III-Elective III – Operations Research	CO1: Formulate and solve L.P.P by using Simplex, Big M and two Phase simplex methods.
		CO2: Acquire the knowledge on solving transportation problems and analyse the concepts of assignment problems.
		CO3: Recall the basic concepts and acquire the knowledge on Games & Strategies.
		CO4: Understand project scheduling by PERT and CPM.
		CO5: Understand the Probability Considerations in PERT and CPM.
18UMAESC3	Part-III-Elective III – Graph Theory	CO1: Know the basic concepts in Graph Theory
		CO2: Understand the concepts of Connectedness in Graph
		CO3: Know about Eulerian and Hamiltonian Graphs and Examples of the same
		CO4: Obtain the knowledge about Trees
		CO5: Acquire the concepts of Directed Graphs and analyse the classifications of Directed Graphs and Matrices