

## Course Outcomes

### B.Sc. Mathematics (H)

Semester	Course Code	Course Outcomes
Sem-I (H)	MTMACOR01T	CO-1. To trace curve in two dimensional Cartesian and polar coordinates. CO-2. Able to work with higher order derivatives, and concavity, inflection points, envelopes, asymptotes of a curve and to calculate their arc length, area and surface of revolution. CO-3. To construct Reduction formulae, derivations and illustrations of reduction formulae. CO-4. To solve several ODEs. CO-5. To solve the problems related to two and three dimensions.
	MTMACOR02T	CO-1. To aware with polar representation of complex numbers, n-th roots of unity, De Moivre's theorem with its application. CO-2. Able to apply Descarte's rule of signs and to solve cubic and biquadratic equations, $AM \geq GM \geq HM$ in inequality. CO-3. To familiar with equivalence relations, well-ordering property of positive integers, Division algorithm, principles of mathematical induction. CO-4. To find rank of a given matrix, and to solve systems of linear equations CO-5. To find out Eigen values, Eigen Vectors, inverse of a matrix though Cayley-Hamilton theorem.
Sem-II (H)	MTMACOR03T	CO-1. To understand some elementary concepts in set theory. CO-2. To understand the concepts of countability and uncountability. CO-3. To apply Archimedean property and its application to find limit points of a set. CO-4. To recognize bounded, convergent, divergent, Cauchy and monotonic. CO-5. To apply the ratio, root, alternating series and limit comparison tests for convergence and absolute convergence of an infinite series of real numbers.
	MTMACOR04T	CO-1. To use Picard's theorem to test existence of unique solution of 1st order ODE. CO-2. To learn some more technique to solve ODEs including Euler's equation, Bernoulli's equation. CO-3. To able to solve ODEs through the method of undetermined coefficients and method of variation of parameters. CO-4. To calculate power series solution of a differential equation. CO-5. Able to test continuity, differentiability and integrability of vector functions.

Sem-III (H)	MTMACOR05T	<p>CO-1. To understand limits of functions including through their definition, continuous functions and uniform continuity theorem.</p> <p>CO-2. Aware about differentiability of a function.</p> <p>CO-3. To familiar with several mean value theorems and their applications.</p> <p>CO-4. Able to express Taylor's and Maclaurin's series expression of several functions.</p> <p>CO-5. Able to apply Taylor's theorem to convex functions and inequalities.</p>
	MTMACOR06T	<p>CO-1. To understand various types of groups, order of an element of a group, subgroups and their product.</p> <p>CO-2. To familiar with cyclic group and their classification, permutation on group and cosets.</p> <p>CO-3. To prove Lagrange's theorem and its application to prove Fermat's little theorem.</p> <p>CO-4. To understand external direct product of a finite number of groups and other familiar groups.</p> <p>CO-5. To learn group homomorphisms and their properties.</p>
	MTMACOR07T	<p>CO-1. To learn algorithms of various numerical methods including their convergences and error.</p> <p>CO-2. To find root of a algebraic an transcendental equation and matrix inverse by various numerical methods.</p> <p>CO-3. To learn various types of interpolation methods and finite differences, and their application on numerical differentiation.</p> <p>CO-4. To integrate numerically by several rules, and power method for determining eigen values.</p> <p>CO-5. To solve ordinary differential equations by Euler's method and Runge-Kutta methods.</p>
	MTMACOR07P	<p>CO-1. To learn algorithms of various programing problems.</p> <p>CO-2. Able to write C-programming of various methods to solve transcendental and algebraic equations.</p> <p>CO-3. Able to write C-programming of various methods to solve system of linear equations and ODEs.</p> <p>CO-4. Able to write C-programming for numerical integration and differentiation.</p> <p>CO-5. Able to write C-programming of various methods to fitting a polynomial functions, Power method to find eigen values.</p>
	MTMSSEC01M	<p>CO-1. Learn basic of high-level programming languages.</p> <p>CO-2. To know about some arithmetic operators and logical operators to construct flowchart.</p> <p>CO-3. Able to use for loop, while loop and do-while loop in C-programming.</p> <p>CO-4. Able to use arrays and multi-dimensional arrays in C-programming.</p> <p>CO-5. Capable to write programming by using functions.</p>

Sem-IV (H)	MTMACOR08T	<p>CO-1. To find Riemann integrable functions and to apply the fundamental theorems of integration.</p> <p>CO-2. To test integrability of improper integrals, convergence of beta and gamma functions.</p> <p>CO-3. To learn some properties of sequence and series and their convergency test.</p> <p>CO-4. To express function through Fourier series.</p> <p>CO-5. To work with power series, radius of convergence, differentiation and integration including some theorems.</p>
	MTMACOR09T	<p>CO-1. To understand limit, continuity and differentiability of functions of two or more variables and partial differentiation.</p> <p>CO-2. To verify the total differentiability of a function and existence of directional derivatives, and to apply method of Lagrange multipliers to solve optimization problem.</p> <p>CO-3. To calculate double and triple integration over rectangular region and non-rectangular region.</p> <p>CO-4. Able to work with vector field, divergence, curl and application of line integration.</p> <p>CO-5. Able to apply Green's theorem, Stoke's theorem and Divergence theorem in computing surface integral.</p>
	MTMACOR10T	<p>CO-1. To know the fundamental concepts in ring theory such as the concepts of ideals, ideal generated by a subset of a ring, factor rings, operations on ideals.</p> <p>CO-2. To learn about ring homomorphism and field of quotients.</p> <p>CO-3. To understand the concepts of vector spaces, subspaces, bases, dimension and their properties.</p> <p>CO-4. To get concepts on linear transformations and its representation by a matrix.</p> <p>CO-5. To learn about isomorphism.</p>
	MTMSSEC02M	<p>CO-1. To learn the syntax of first-order logic and semantics of first-order languages.</p> <p>CO-2. Able to understand the propositional logic and basic theorems like compactness theorem, meta theorem and post-tautology theorem.</p> <p>CO-3. To learn about sets and subsets.</p> <p>CO-4. To learn several operations on sets.</p> <p>CO-5. To learn relation, partitions, equivalence relations, partial ordering relations, n-ary relations on sets including congruence modulo relation.</p>

Sem-V (H)	MTMACOR11T	<p>CO-1. To conceptualize basic concepts of PDE, and able to solve different types of first order PDE.</p> <p>CO-2. To classify second order linear PDE and transform into their canonical forms.</p> <p>CO-3. To find out the solution of different types of initial and boundary value problems.</p> <p>CO-4. To find solution of Cauchy problems of first order PDE including the method of separation of variables.</p> <p>CO-1. To apply some application of ODE on particle dynamics like Central force, planetary motion, etc.</p>
	MTMACOR12T	<p>CO-1. To conceptualize some advance theoretical results like automorphism, inner automorphism, etc. on group and cyclic group.</p> <p>CO-2. To know about characteristic subgroup, Commutator subgroup and its properties.</p> <p>CO-3. To understand the direct product of groups and use it to prove fundamental theorem of abelian groups.</p> <p>CO-4. To apply concepts and results of group actions to prove generalized Cayley's theorem and index theorem.</p> <p>CO-5. To realize the beauty of Sylow's theorem and its applications to find simplicity of alternating group.</p>
	MTMADSE01T	<p>CO-1. To analyze and solve linear programming models of real life situations.</p> <p>CO-2. To provide several methods for solving LPP including the concept of convex set and extreme points.</p> <p>CO-3. To understand the theory of the transportation problem, assignment problems etc.</p> <p>CO-4. To know about the relationships between the primal and dual problems.</p> <p>CO-5. To learn about the applications to two-person zero-sum game problems.</p>
	MTMADSE03T	<p>CO-1. To understand the basic concepts of classical probability.</p> <p>CO-2. To learn probability distribution and density function, and their properties with example.</p> <p>CO-3. To understand Chebyshev's inequality and central limit theorem and their applications.</p> <p>CO-4. To conceptualize random samples, sampling distributions and estimation of parameters.</p> <p>CO-5. Able to solve the real life data-based problems by testing of hypothesis.</p>

Sem-VI (H)	MTMACOR13T	<p>CO-1. To understand fundamental idea of metric spaces including Cantor's theorem and completeness.</p> <p>CO-2. To learn about continuity, uniform continuity, compactness, homeomorphism of metric space, Banach fixed point theorem and its application to ordinary differential equation.</p> <p>CO-3. To know about limits, continuity, Cauchy-Riemann equation and differentiability of complex valued function.</p> <p>CO-4. To familiar with analytic functions and to evaluate Contour integrals and learn about Cauchy integral formula.</p> <p>CO-5. To aware with fundamental theorem of algebra using Liouville theorem, Laurent series expansion with its examples, absolute and uniform convergence of power series.</p>
	MTMACOR14T	<p>CO-1. To familiar with Polynomial rings, division algorithm and consequences.</p> <p>CO-2. To know about Eisenstein criterion of irreducibility test, divisibility in integral domains, unique factorization domains and Euclidean domains.</p> <p>CO-3. To find dual spaces, dual basis and transpose of a linear transformation.</p> <p>CO-4. To aware with Eigen spaces of a linear operator, Cayley-Hamilton theorem and canonical forms.</p> <p>CO-5. To work with inner product spaces, Gram-Schmidt orthogonalisation process, Bessel's inequality, Orthogonal projections and Spectral theorem.</p>
	MTMADSE04T	<p>CO-1. To familiar with General properties of polynomials including General properties of equations.</p> <p>CO-2. Able to apply Descartes's rule of signs positive and negative rule and to compute relation between the roots and the coefficients of equations.</p> <p>CO-3. To familiar with symmetric functions of the roots and its application including transform the equations.</p> <p>CO-4. Capable to solve reciprocal equations, binomial equations, cubic and biquadratic equations.</p> <p>CO-5. Able to apply Sturm's theorem for determining the conditions for reality of the roots of an equation.</p>
	MTMADSE06T	<p>CO-1. To understand the basic law of forces, coplanar forces, equilibrium, friction and these types of topic used in classical mechanics.</p> <p>CO-2. To evaluate equations of motion referred to a set of rotating axes and Motion of a projectile in a resisting medium.</p> <p>CO-3. Able to find motion of a body/ point mass in different types of path under inverse square law of force.</p> <p>CO-4. To calculate degree of freedom, moments and products of inertia of a system.</p> <p>CO-5. To find motion of Compound pendulum and motion of a rigid body in two dimensions under finite and impulsive forces.</p>

## Course Outcomes

### B.Sc. Mathematics (G)

Semester	Course Code	Course Outcomes
Sem-I (G)	MTMGCOR01T	CO-1. Learn $\varepsilon$ and $\delta$ definition of limit and continuity of a real-valued function. CO-2. Apply Leibnitz's theorem to derive successive differentiation. CO-3. Concept of Euler's theorem and its application on homogeneous function. CO-4. Able to find out tangents, normals, curvature, asymptotes, singular points of any curves. CO-5. To understand Rolle's theorem and several mean value theorems and their applications including the problems related to maxima minima and indeterminate form.
	MTMHGEC01T	
Sem-II (G)	MTMGCOR02T	CO-1. To solve first order first degree ODEs including exact and non-exact equations and higher-order ODEs including properties of Wronskian. CO-2. To solve linear homogenous and non-homogeneous ODEs including Cauchy-Euler equation. CO-3. To solve simultaneous and total differential equations. CO-4. Able to form first order partial differential equations, to solve PDE by Lagrange's method and Charpit's method. CO-5. To classify second order partial differential equations.
	MTMHGEC02T	
Sem-III (G)	MTMGCOR03T	CO-1. Understand some properties of sets in $\mathbb{R}$ . CO-2. Able to solve problems related with real sequence. CO-3. Learn about infinite series and their tests of convergence. CO-4. To understand about sequences and series of functions. CO-5. Able to find radius of convergence of power series.
	MTMHGEC03T	
Sem-III (G)	MTMSSEC01M	CO-1. Learn high-level programming languages. CO-2. Able to construct flowchart. CO-3. To know about some arithmetic operators and logical operators. CO-4. Able to use for loop, while loop and do-while loop in C-programming. CO-5. Capable to write programming for finding out maximum, minimum of a given set of numbers.
Sem-IV (G)	MTMGCOR04T	CO-1. To understand equivalence relations and partitions of a set. CO-2. To know about group, general linear group, permutation group, cyclic, general linear group and quaternion group. CO-3. To understand subgroup, cyclic subgroups, normal subgroup, quotient group, Lagrange's theorem and its application. CO-4. To define and understand rings and subrings. CO-5. To conceptualize with ideals, integral domains and fields.
	MTMHGEC04T	
Sem-IV (G)	MTMSSEC02M	CO-1. To learn propositions and precedence of logical operators. CO-2. Able to apply propositional equivalence, CO-3. To apply predicates and quantifiers. CO-4. To aware with sets and subsets. CO-5. Able to understand standard operations on sets.

Sem-V (G)	MTMGDSE01T	<p>CO-1. To form vector space and subspace over <math>\mathbb{R}</math> and to find their standard basis.</p> <p>CO-2. To conceptualize translation, dilation, rotation, reflection in a point, line and plane (in matrix form) and able to interpret eigen values and eigen vectors of these transformations including eigen spaces.</p> <p>CO-3. Able to calculate rank of matrices, to reduce in normal form and to solve linear homogeneous and non-homogeneous equations.</p> <p>CO-4. Able to reduce matrices to diagonal form through eigen values and eigen vectors.</p> <p>CO-5. Capable to applying elementary row operations to compute matrix rank and inverses, and to solve system of linear equations.</p>
	MTMSSEC01M	<p>CO-1. To understand arrays and multi-dimensional arrays.</p> <p>CO-2. Able to use arrays and multi-dimensional arrays in C-programming.</p> <p>CO-3. To understand about functions.</p> <p>CO-4. Capable to write programming by using functions.</p> <p>CO-5. Able to write programming C languages like n!, nCr, etc.</p>
Sem-VI (G)	MTMGDSE03T	<p>CO-1. To understand the algorithm and convergence of numerical methods to solve algebraic equations through bisection, Newton, regular falsi, fixed point iteration methods.</p> <p>CO-2. Able to find matrix inverse by LU decomposition, Gauss-Jacobi and Gauss-Siedel methods.</p> <p>CO-3. To determine the function value through Lagrange and Newton interpolation formulae.</p> <p>CO-4. Capable to apply Euler's method for solving ordinary differential equations.</p> <p>CO-5. Able to calculate Integration by trapezoidal rule and, Simpson's rule.</p>
	MTMSSEC02M	<p>CO-1. To learn several operations on sets, like difference, identities, etc.</p> <p>CO-2. To understand relation on sets including its types.</p> <p>CO-3. To learn partitions, equivalence relations including congruence modulo relation.</p> <p>CO-4. To know partial ordering relations.</p> <p>CO-5. To aware about n-ary relations on sets.</p>