

B. Sc. General in Mathematics

Programme specific outcomes (PSO)

After the end of the program students will be learn:

- Analysis, solved complex problem easily step by step, many techniques.
- Constitutes independent verdict and analysis, test, and explain technical arguments.
- Construct abstract models using appropriate mathematical and statistical tools.
- Collect and organize the qualitative and quantitative information such as related problems, example and counter example.
- Construct abstract models using appropriate mathematical and statistical tools.
- Students prepare for different competitive exam, corporate sector, and government agency.

Course Outcomes (CO)

Course code: MTMGCC01

Course name: Differential Calculus

Outcomes:

- Students will know about concepts about Limit and Continuity (ϵ and δ definition), Types of discontinuities, Differentiability of functions, Successive differentiation, Leibnitz's theorem, Partial differentiation, and Euler's theorem on homogeneous functions.
- Students can solve problems on Tangents and normals, Curvature, Asymptotes, Singular points,
- Students can trace various curves and are able to understand about Parametric representation of curves and tracing of parametric curves, Polar coordinates, and tracing of curves in polar coordinates.
- Students will be expert on Rolle's theorem, Mean Value theorems, and Lagrange and Cauchy theorems. Taylor's theorem with Lagrange's and Cauchy's forms of the remainder, Power series and its convergences. Taylor's series, Maclaurin's series of $\sin x$, $\cos x$, e^x , $\log(1+x)$, $\log(1+x)^m$, Maxima and Minima, and Indeterminate forms.

Course code: MTMGCC02

Course name: Differential Equation

Outcomes:

- Students will be able to solve 1st order exact differential equations, 1st order higher degree equations solvable for x , y , p , higher-order differential equations, Linear homogeneous equations with constant coefficients, Linear non-homogeneous equations, the Cauchy-Euler equation, Simultaneous differential equations, and Total differential equations.

- Students will know about integrating factors, rules to finding an integrating factor, methods for solving Basic theory of linear differential equations, Wronskian, and its properties. Solving a differential equation by reducing its order.
- Students will be able to solve differential equations by the method of variation of parameters.
- Students will expart on the order and degree of partial differential equations, the concept of linear and non-linear partial differential equations, the formation of firstorder partial differential equations, linear partial differential equations of the first order, Lagrange's method, Charpit's method.
- Students can classification of second-order partial differential equations into elliptic, parabolic, and hyperbolic.
- Students will be able to find the power series solution of a differential equation.

Course code: MTMGCC03

Course name: Real Analysis

Outcomes:

- Students will know about sets, suprema, and infima of sets, completeness property of \mathbb{R} , Archimedean property of \mathbb{R} , intervals, and cluster points.
- Students will gather knowledge about the Real Sequence, the Infinite series, the sequences, the series of functions, and the power series and their properties.

Course code: MTMGCC04

Course name: Algebra

Outcomes:

- Students will know the definition and examples of abelian and non-abelian groups.
- Students will learn about these special groups like i) The group \mathbb{Z}_n of integers under addition modulo n , ii) The group $U(n)$ of units under multiplication modulo n . iii) complex roots of unity, iv)

circle group, v) the general linear group $GL_n(\mathbb{R})$, vi) groups of symmetries of an isosceles triangle, an equilateral triangle, a rectangle, and a square, vii) the permutation group, viii) Group of quaternions.

- Students can solve problems on Cyclic groups from number systems, subgroups, cyclic subgroups, the concept of a subgroup generated by a subset and the commutator subgroup of the group, and examples of subgroups including the center of a group.
- Students will learn about cosets, the order of an element, and Normal subgroups, Quotient groups.
- Students can learn definitions and properties of Rings, Fields, Subring, Sub Field, Integral Domain, and Ideals.
- Students can gather knowledge about number systems, \mathbb{Z}_n the ring of integers modulo n , the ring of real quaternions, rings of matrices, polynomial rings, and rings of continuous functions.

Course code: MTMGSE01

Course name: Theory of equation

Outcomes:

- Students will learn on General properties of polynomials, Graphical representation of polynomials, maximum and minimum values of a polynomial, General properties of equations, Descartes's rule of signs positive and negative rule, Relation between the roots and the coefficients of equations. Symmetric functions, Applications of symmetric function of the roots, Transformation of equations, Solutions of reciprocal and binomial equations. Algebraic solutions of the cubic and biquadratic equations.

Course code: MTMGSE02

Course name: Graph theory

Outcomes:

- Students learn about definition, examples and basic properties of graphs, pseudo graphs, complete graphs, bipartite graphs isomorphism of graphs.
- Student will know about Eulerian circuits, Eulerian graph, semi-Eulerian graph, theorems, Hamiltonian cycles, theorems Representation of a graph by matrix, the adjacency matrix, incidence matrix, weighted graph,
- Student will expert on Travelling salesman's problem, shortest path, Tree and their properties, spanning tree, Dijkstra's algorithm, Warshall algorithm.

Course code: MTMGSE03

Course name: Number theory

Outcomes:

- Student will know about Linear diophantine equation, prime counting function, statement of prime number theorem, Goldbach conjecture, linear congruences, complete set of residues. Chinese remainder theorem, Fermat's little theorem, Wilson's theorem.
- Students will learn about Number theoretic functions, sum and number of divisors, totally multiplicative functions, definition and properties of the Dirichlet product, the Mobius Inversion formula, the greatest integer function, Euler's phi-function, Euler's theorem, reduced set of residues, some properties of Euler's phi-function.
- Student will improve their concepts on order of an integer modulo n , primitive roots for primes, composite numbers having primitive roots, Euler's criterion, the Legendre symbol and its properties, quadratic reciprocity, quadratic congruences with composite moduli. Public key encryption, RSA encryption and decryption, the $x^2 + y^2 = z^2$, Fermat's Last theorem.

Course code: MTMGSE04

Course name: Probability and Statistics

Outcomes:

- Student will learn about Sample space, Probability axioms, Real random variables (discrete and continuous), cumulative distribution function, probability mass/density functions, mathematical expectation, moments, moment generating function, characteristic function, discrete distributions: uniform, binomial, Poisson, geometric, negative binomial, continuous distributions: uniform, normal, exponential.
- Students can solve problems on Joint cumulative distribution function and its properties, joint probability density functions, marginal and conditional distributions, the expectation of a function of two random variables, conditional expectations, independent random variables, bivariate normal distribution, correlation coefficient, joint moment generating function and calculation of covariance, linear regression for two variables.
- Students will learn about Chebyshev's inequality, (weak) law of large numbers and strong law of large numbers, the Central limit theorem for independent and identically distributed random variables with finite variance, Markov chains, ChapmanKolmogorov equations, and classification of states.
- Students can solve problems on Random Samples, Sampling Distributions, Estimation of parameters, and Testing of hypotheses.

Course code: MTMGDS01

Course name: Probability and Statistics

Outcomes:

- Students will learn on R, R^2, R^3 as vector spaces over R , Standard basis, Linear Independence and examples of different bases. Subspaces of R^2, R^3 ,

- Students will know about Translation, Dilation, Rotation, Reflection in a point, line and plane, Matrix form of basic geometric transformations , eigen values and eigenvectors ,eigen spaces as invariant subspaces, Matrices in diagonal form, matrix inverses using elementary row operations, Rank of matrix, Solutions of a system of linear equations using matrices.

Course code: MTMGDS02

Course name: Linear programming

Outcomes:

- Students will know about the definition and formation of a linear programming problem,
- Students can find various types of solutions an LPP by graphical approach, simplex method, two-phase method, and Big-M method.
- Students will expert on the convex sets, duality, formulation of the dual problem, primal- dual relationships, economic interpretation of the dual