

Postgraduate Department of Mathematics

B.Sc. Mathematics

Programme Outcomes

PO1	Provides a more complete and logic framework in almost all areas of basic Mathematics and creates an aptitude in higher Mathematics.
PO2	The students attain a foundation in basic Mathematics and other relevant subjects to complement the core for their higher studies.
PO3	Introduces powerful tools for tackling a wide range of topics in Calculus, Theory of Equations and Geometry.
PO4	Familiarize with additional relevant mathematical techniques and other applied branches of the subject to complement the core.
PO5	A wide range of topics in almost all areas of Mathematics will be covered by the three years of graduation.

Programme Specific Outcomes

PSO1	Digest the basic concepts and techniques of logic, set theory, calculus in other areas of Mathematics and increase aptitude in higher studies and research.
PSO2	Familiarize the applications of the subject in real life situations and solve the problems logically.
PSO3	Familiarize with abstract structures and analysis which are relevant in other disciplines of Mathematics, Theory of Equations, Geometry, Number Theory and Logic.
PSO4	Develop analytic brain, logical thinking and problem solving skill.
PSO5	Understand Mathematics of nature and create a positive attitude about the environment. Awareness of the basic ideas of Human Rights.

Course Outcomes

Core Courses for B.Sc. Mathematics

Sl. No	Course Code	Course Title	Course Outcomes	
SEMESTER 1				
1	MM1CRT01	Foundations of Mathematics	CO1	Familiarize sets and functions;
			CO2	Familiarize basic concepts of logic
			CO3	Analyze truth values of statements, mathematically.
			CO4	Construct simple proofs for statements.
			CO5	Familiarize mathematical Symbols and standard methods of proofs.
SEMESTER 2				
2	MM2CRT01	Analytic Geometry, Trigonometry and Differential Calculus	CO1	Find the equation to tangent, normal at a point on a conic
			CO2	Understand polar equation of a line, circle, tangent and normal to conics
			CO3	Familiarize real and imaginary parts of a circular and hyperbolic functions of a complex variable
			CO4	Finding the higher order derivative of the product of two functions
			CO5	Familiarize with limits of indeterminate forms
SEMESTER 3				
3	MM3CRT01	Calculus	CO1	A deeper knowledge of Taylor's and Maclaurin's series, points of Inflexion and Curvature.
			CO2	Conceivment of the concept of asymptotes and envelopes
			CO3	Deeper knowledge on partial derivatives and its applications.

			CO4	Application skills on finding the area and volume of solids of revolution and arc length of curves using integration.
			CO5	Attainment of techniques for finding area and volume by double and triple integration .
SEMESTER 4				
	MM4CRT01	Vector Calculus, Theory of Numbers and Laplace Transform	CO1	A basic knowledge in differentiation of vector valued functions and techniques to find arc length and unit tangent vector, curvature and the unit normal vector, tangential and normal components of acceleration.
			CO2	Understanding of directional derivatives, gradient vectors, tangent planes and normal lines
			CO3	A deep knowledge on line integrals and surface integrals and applications of Green's theorem, Stokes' theorem and Divergence theorem.
			CO4	Familiarize with congruence and its properties
			CO5	Familiarize with congruence ,properties of congruence and Phi-function
			CO6	Conceive the concept of Laplace transform and its properties and apply Laplace transforms for solving differential equations
SEMESTER 5				
5	MM5CRT01	Mathematical Analysis	CO1	Familiarize with the algebraic and order properties of \mathbb{R} , the absolute value of a real number and the Completeness Property of \mathbb{R}
			CO2	Familiarize with sequences and their Limits
			CO3	Understand series and familiarize tests for convergence and absolute convergence
			CO4	Find limits of functions, both finite and infinite.

6	MM5CRT02	Differential Equations	CO1	Obtain an integrating factor which may reduce a given differential equation into an exact one and eventually provide its solution.
			CO2	Identify and obtain the solution of Clairaut's equation.
			CO3	Find the complementary function and particular integrals of linear differential equations.
			CO4	Familiarize the orthogonal trajectory of the system of curves.
			CO5	Methods of Solutions of Differential Equations $dx/P = dy/Q = dz/R$
			CO6	Describe the origin of the partial differential equation and distinguish the integrals of first order linear partial differential equation into complete, general and singular integrals.
			CO7	Use Lagrange's method for solving the first order linear
7	MM5CRT03	Abstract Algebra	CO1	Familiarize with binary operations, Isomorphic binary structures, group and subgroups, elementary properties of groups, permutations and properties of permutations.
			CO2	Know how to construct group tables and subgroup diagrams.
			CO3	Identify different types of groups- normal subgroup, simple group, cyclic group, alternating group
			CO4	Study Cayley's Theorem, Theorem of Lagrange, Fundamental homomorphism Theorem.
			CO5	Understand the concepts of Homomorphism and Isomorphism.
			CO6	Conceive the concepts of Rings, Fields, Integral Domains, Ideals and Factor Rings and their basic properties.

8	MM5CRT04	Human Rights and Mathematics for Environmental Studies	CO1	Encourage students to research, investigate how and why things happen, and make their own decisions on complex environmental issues. By developing and enhancing critical & creative thinking skills, it helps to foster a new generation of informed consumers, workers, as well as policy or decision makers.
			CO2	Understand how their decisions and actions affect the environment, builds knowledge and skills necessary to address complex environmental issues, as well as ways we can take action to keep our environment healthy and sustainable for the future, encourage character building, and develop positive attitudes and values.
			CO3	Develop the sense of awareness among the students about the environment and its various problems and to help the students in realizing the inter-relationship between man and environment for protecting nature and natural resources.
			CO4	Acquire the basic knowledge about environment and to inform the students about the social norms that provide unity with environmental characteristics and create positive attitude about the environment

SEMESTER 6

9	MM6CRT01	Real Analysis	CO1	Familiarize with Continuous Functions and Uniform continuity of functions
			CO2	Learn to apply Mean Value Theorem, L' Hospital Rule and Taylor's Theorem
			CO3	Understand the Riemann Integral and Riemann Integrable Functions
			CO4	Get a preliminary idea of sequence and series of functions
			CO5	Familiarize Point wise and Uniform Convergence, Interchange of Limits.

10	MM6CRT02	Graph Theory and Metric Spaces	CO1	Understand the basic concepts of graph theory and able to represent graphs in matrix form
			CO2	Conceive the ideas of trees and Connectivity
			CO3	Familiarize with Euler graphs and Hamiltonian graphs and application of graph theory in real life problems
			CO4	Conceive the concepts of Metric Spaces, Open sets and Closed Sets
			CO5	Extend the concepts like limit, convergence and continuity of analysis to Metric Spaces
11	MM6CRT03	Complex Analysis	CO1	Conceivment of the concept of analytic and harmonic functions.
			CO2	Familiarize with the elementary complex functions and their properties
			CO3	A deep understanding on the theory and techniques of complex integration.
			CO4	Familiar with the theory and application of the power series expansion of analytic functions.
			CO5	A deep knowledge of the theory and applications of residues in complex integration and calculation of indefinite integrals.
12	MM6CRT04	Linear Algebra	CO1	Solve systems of linear equations using matrices
			CO2	Understand the theory and concepts of matrices in a broader sense
			CO3	Familiarize with vector spaces, subspaces, linear combination of vectors, spanning set, linear independence and basis.
			CO4	Conceive the concepts of Linear transformations and Linear isomorphism.
			CO5	Understand the application of matrices in vector spaces
			CO6	Familiarise with Eigen values, Eigenvectors and Eigen space.

Choice Based Core Course (Semester 6)

1	MM6CBT01	Operations Research	CO1	Define a Euclidean space, a vector space and its basis.
			CO2	Write a given LPP in standard form and in a canonical form
			CO3	Identify a feasible solution, a basic feasible solution, and an optimal solution using simplex method.
			CO4	Identify the Transportation Problem and formulate it as an LPP and hence solve the problem
			CO5	Determine that an Assignment problem is a special case of LPP and hence solve by Hungarian method.
			CO6	Familiarise with Concepts of Game theory.

Open Course (Semester 5)

1	MM5GET02	Applicable Mathematics	CO1	Prepare students of all streams, particularly from arts and commerce background for their higher studies.
			CO2	Solve logical problems for competitive examinations
			CO3	Solve problems related to interest computing, time and work, work and wages, time and distance.
			CO4	Understand the basic concepts of trigonometry, exponential and logarithmic series
			CO5	Solve problems on elementary mensuration and elementary algebra
			CO6	Understand the basic concepts of differential calculus, and find derivatives using basic formulas, product rule, quotient rule and function of function rule

Complementary Courses (to B.Sc. Physics/Chemistry)

SEMESTER 1				
1	MM1CMT01	Partial Differentiation Matrices, Trigonometry and Numerical Methods	CO1	Familiarise functions of several variables and find domain and range of functions
			CO2	Apply chain rule to find partial derivatives
			CO3	Conceive the basic concepts of matrices such as rank of a matrix, Characteristic equation, Characteristic roots, and characteristic vectors of a square matrix
			CO4	Solve system of Linear equations using Matrices
			CO5	Determine expansion of Trigonometric functions, summation of infinite series and identify real and imaginary parts
			CO6	Use numerical methods to solve higher order algebraic equations and transcendental equations
SEMESTER 2				
2	MM2CMT01	Integral Calculus and Differential Equations	CO1	Use the tools of integration to find volume of solid of revolution , arc length and area of surface of revolution
			CO2	Ability to find the area of a bounded region and volume of a closed bounded region by applying the techniques of double and triple integrals
			CO3	Recognize and solve the Ordinary Differential Equations like variable separable, Exact , Homogenous, Linear and Bernoulli equations.
			CO4	Method of Solutions of Differential Equations $dx/P = dy/Q = dz/R$
			CO5	Generate first order Partial Differential Equations and develop the ability to use Lagrange's method for solving the first order linear partial differential equation

SEMESTER 3				
3	MM3CMT01	Vector Calculus, Analytic Geometry and Abstract Algebra	CO1	Differentiate vector valued functions
			CO2	Find arc length and unit tangent vector, curvature and the unit normal vector, tangential and normal components of acceleration
			CO3	Find directional derivatives, gradient vectors, tangent planes and normal lines
			CO4	Familiarize line integrals and surface integrals
			CO5	Find work, circulation and flux, conservative fields and potential functions
			CO6	Apply Green's theorem, Stokes' theorem and Divergence theorem
			CO7	Understand the concept of Conic sections and solve problems
			CO8	Familiarize basic concepts of Abstract Algebra like Groups, Subgroups, Cyclic groups and Homomorphism
SEMESTER 4				
4	MM4CMT01	Fourier Series, Laplace Transform and Complex Analysis	CO1	Understand and apply Fourier series of functions
			CO2	Solve problems involving Fourier Series and Legendre polynomials
			CO3	Apply Power series method to solve differential equations
			CO4	Familiarize Laplace transform and its properties
			CO5	Apply Laplace transforms to solve differential equations
			CO6	Conceivment of the concept of analytic and harmonic functions.
			CO7	Familiarizing with the theory and techniques of complex integration

Complementary Courses in Statistics (to B.Sc. Mathematics)

SEMESTER 1				
1	ST1CMT01	Descriptive Statistics	CO1	Introducing Different aspects of data, and its collection.
			CO2	Concepts of a statistical population and sample.
			CO3	Different methods of sampling - simple random sample, systematic, stratified and cluster.
			CO4	Central tendency, Dispersion, skewness and kurtosis.
			CO5	Data graphics - Ogives and Box plot.
			CO6	Index Numbers - Laspeyer's, Paasche's and Fisher's Index Numbers.
			CO7	Time-Reversal and Factor-Reversal tests for index numbers.
			CO8	Cost of living index numbers.
SEMESTER 2				
2	ST2CMT01	Probability Theory	CO1	Probability theory which includes basic concepts and important properties.
			CO2	Random Variables - discrete and continuous and its properties.
			CO3	Bivariate Random Variables - discrete and continuous and its properties.
			CO4	Correlation - scatter diagram, Karl Pearson's and Spearman's rank correlation coefficients.
			CO5	Regression - fitting of polynomial equations of degree one and two.
			CO6	Identification of regression equations
SEMESTER 3				
3	ST3CMT01	Probability Distributions	CO1	Mathematical Expectation and its important properties.
			CO2	Probability Distributions (discrete/continuous) such as Uniform, Bernoulli, binomial, Poisson, geometric,

				hyper-geometric, exponential, gamma- one and two parameter(s), beta(type I and type II), Normal and its properties.
			CO3	Law of Large Numbers and Central Limit Theorem.
			CO4	Sampling Distributions including t, F, Chi-square.
SEMESTER 4				
4	ST4CMT01	Statistical Inference	CO1	Concepts of Estimation, Estimators, and Estimates.
			CO2	Point and interval estimation.
			CO3	Properties of good estimators.
			CO4	Methods of Estimation.
			CO5	Cramer-Rao inequality.
			CO6	Testing of Hypotheses – basic concepts, Statistical hypotheses, null and alternate hypotheses, simple and composite hypotheses, type-I and type-II errors, size, and power of a test, p-value, Neyman-Pearson approach.
			CO7	Large Sample Tests using Neyman-Pearson approach.
			CO8	Small Sample Tests.