DEPARTMENT OF MATHEMATICS

Program Specific Outcomes (B.Sc Mathematics)

PSO1:	Be familiar with different areas of Mathematics .
PSO2:	Be prepared to use Mathematics, not only in the discipline of Mathematics, but also in other disciplines and in their future endeavours.
PSO3:	Develop the skills necessary to formulate and understand proofs and to provide justification.
PSO4:	Acquire good knowledge and understanding in advanced areas of mathematics and statistics, chosen by the student from the given courses
PSO5:	Be able to solve problems using a broad range of significant mathematical techniques
PSO6:	Be a life-long learner who is able to independently expand his/her mathematical or statistical expertise when needed

Course outcome

SEMESTER	COURSE CODE	COURSE NAME	COURSE OUTCOMES
1	MTS1 BO1	BASIC LOGIC & NUMBER THEORY	• CO1:Prove results involving divisibility, greatest common divisor, least common multiple and a few applications
			• CO2: Understand the theory and method of solutions of LDE.
			• CO3: Understand the theory of congruence and a few applications.
			• CO4: Learn three classical theorems viz. Wilson's theorem, Fermat's little theorem and Euler's theorem and a few important consequences.

2	MTS2 BO2	CALCULUS OF SINGLE VARIABLE-1	• CO1: Introduces fundamental ideas of limit, continuity and differentiability and also to some basic theorems of differential calculus
			• CO2: Deal with the other branch of calculus viz. integral calculus. Historically, it is motivated by the geometric problem of finding out the area of a planar region
			• CO3: Discuss the definite integral not only solves the area problem but is useful in finding out the arc length of a plane curve, volume and surface areas of solids and so on
			• CO4: Solve problems in a range of mathematical applications using the derivative or the integral;
3	MTS3 BO3	CALCULUS OF SINGLE VARIABLE-2	• CO1:Get the idea of parameterization of curves, they learn how to calculate the arc length, curvature etc
			• CO2:Introduced into other coordinate systems which often simplify the equation of curves and surfaces and the relationship between various coordinate systems
			• CO3: Enables them to directly calculate the arc length and surface areas of revolution of a curve whose equation is in polar form

			• CO4: Will be able to handle vectors in dealing with the problems involving geometry of lines, curves, planes and surfaces in space and have acquired the ability to sketch curves in plane and space given in vector valued form.
4	MTS4BO4	LINEAR ALGEBRA	• CO1: Deals with A number of methods for solving a system of linear equations are discussed
			• CO2: Understand the modern view of a matrix as a linear transformation.
			• CO3: Familiarity of the students with planar vectors and their algebraic properties under vector addition and scalar multiplication will make them realize that the idea of a general vector space is in fact an abstraction of what they already know.
			• CO4: The idea of a subspace, spanning vectors, basis and dimension are discussed and fundamental results in these areas are explored.
			• CO5: Practical method of finding out the eigen values from the characteristic equation and the corresponding eigenvectors are also discussed
			• CO6: In this process, students realise that every symmetric matrix is diagonalizable and that this diagonalization can be done in a

			special way ie., by choosing an orthogonal matrix to perform the diagonalization.
5	MTS5BO5	THEORY OF EQUATIONS AND ABSTRACT ALGEBRA	• CO1: Explain different methods like Descartes Method, Cardan's method, Ferrari's method in theory of equations
			• CO2: Demonstrate understanding of and the ability to verify relationships between operations satisfying various properties (e.g. commutative property)
			• CO3: Extend group structure to finite permutation groups (Cayley's Theorem).
			• CO4: Acquire the basic knowledge and the structure of Group, Subgroup and Cyclic Groups
			• CO5: Use Lagrange's Theorem to analyse the cyclic subgroups of a group
			• CO6: Describe the characteristics of a ring, quotient rings and ideals and also Familiarize with Rings, Integral Domains, Fields and Divisors of Zero
5	MTS5 BO6	BASIC ANALYSIS	• CO1:Have the knowledge of real functions-limits of functions and their properties.
			• CO2:Studying the notion of continuous functions and their properties.
			• CO3: Studying the differentiability of real functions and related theorems.

			• CO4:Can flexibly apply mathematical methods of fundamental component areas of mathematics and are able to transfer the findings obtained to other component areas or applications.
			• CO5:Determine the Riemann integrability and the Riemann-Stieltjes integrability of a bounded function and prove a selection of theorems concerning integration,
			• CO6: Ability to prove the limit of a sequence, to determine whether a sequence converges or not, to prove the limit of a function, to determine whether or not a function is continuous
			• CO7: Ability to handle abstract ideas of Mathematics and Mathematical proofs
5	MTS5 BO7	NUMERICAL ANALYSIS	• CO1: Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problems.
			• CO2: Apply numerical methods to obtain approximate solutions to mathematical problems.
			• CO3: Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear

			equations, and the solution of differential equations.
			• CO4: Analyse and evaluate the accuracy of common numerical methods.
6	MTS6B1O	REAL ANALYSIS	• CO1: Have the knowledge of basic properties of the field of real numbers.
			• CO2: Have the knowledge of the series of real numbers and convergence.
			• CO3: Determine the Riemann inerrability and the Riemann-Stieltjes inerrability of a bounded function and prove a selection of theorems concerning integration,
			• CO4: Studying the basic topological properties of the real numbers
			• CO5:Ability to use tests of convergence to determine whether or not a series converges, determine whether a power series converges and also determine its radius of convergence
			• CO6: Provide a rigorous development of the fundamental ideas of Calculus
5	MTS5 BO9	INTRODUCTION TO GEOMETRY	• CO1: Understand several basic facts about parabola, hyperbola and ellipse (conics) such as their equation in standard form, focal length properties, and reflection properties, their tangents and normal.

			• CO2:Understand affine transformations, the inherent group structure, the idea of parallel projections and the basic properties of parallel projections and fundamental theorem of affine geometry, its use in the proof of Median theorem, Ceva's theorem, Menelaus' theorem etc.
			• CO3: Understand the idea of homogeneous coordinate of a point in projective plane and write down the equation of a line in projective plane passing through two homogeneous coordinates
			• CO4: Appreciate the advantage of interpreting a Euclidean theorem as a projective theorem by learning a simpler proof for Desargues and Papua's theorem
6	MTS6B1O	REAL ANALYSIS	• CO1: Have the knowledge of basic properties of the field of real numbers.
			• CO2: Have the knowledge of the series of real numbers and convergence.
			• CO3:Determine the Riemann integrability and the Riemann-Stieltjes integrability of a bounded function and prove a selection of theorems concerning integration,
			• CO4: Studying the basic topological properties of the real numbers

			• CO5:Ability to use tests of convergence to determine whether or not a series converges, determine whether a power series converges and also determine its radius of convergence
			• CO6: Provide a rigorous development of the fundamental ideas of Calculus
6	MTS6 B11	COMPLEX ANALYSIS	• CO1: Demonstrate understanding of the basic concepts underlying complex analysis.
			• CO2: Introduce elementary complex functions and Find all integral roots and all logarithms of nonzero complex numbers
			• CO3: Understand the significance of differentiability for complex functions and be familiar with the Cauchy-Riemann equations
			• CO4:Apply the concept and consequences of analyticity and the Cauchy-Riemann equations and of results on harmonic and entire functions including the fundamental theorem of algebra
			• CO5: Evaluate integrals along a path in the complex plane and understand the statement of Cauchy's Theorem and Use Cauchy's integral theorem and formula to compute line integrals

			• CO6: Represent functions as Taylor, power and Laurent series, classify singularities and poles, find residues and evaluate complex integrals using the residue theorem
6	MTS6 B12	CALCULUS OF MULTI VARIABLE	• CO1: Understand several contexts of appearance of multivariable functions and their representation using graph and contour diagrams.
			• CO2: Understand the notion of partial derivative, their computation and interpretation and Understand chain rule for calculating partial derivatives.
			• CO3:Get the idea of directional derivative, its evaluation, interpretation, and relationship with partial derivatives. · Understand the concept of gradient, a few of its properties, application and interpretation.
			• CO4:See a few applications of double and triple integral in the problem of finding out surface area, mass of lamina, volume, centre of mass and so on.
			• CO5: Learn three major results viz. Green's theorem, Gauss's theorem and Stokes' theorem of multivariable calculus and their use in several areas and directions.

6	MTS6 B13	DIFFERENTIAL EQUATIONS	• CO1:Identify, analyse and subsequently solve physical situations whose behaviour can be described by ordinary differential equations and Understand the order, degree and various standard forms of differential equations
			• CO2: Determine solutions to second order linear homogeneous differential equations with constant coefficients
			• CO3: Determine solutions to second order linear non-homogeneous differential equations with constant coefficients, Evaluate and apply linear differential equations of second order (and higher)
			• CO4: Describe the origin of partial differential equation and distinguish the integrals of first order linear partial differential equation into complete, general and singular integrals
			• CO5: Be competent in solving linear PDEs using classical solution methods
6	MTS6 B14 (EO1)	GRAPH THEORY	• CO1: Acquire a basic idea of graph, various terms associated and matrix representations of graphs
			• CO2: Familiarize with different types of graphs, connectivity and properties
			• CO3:Identify vertices, edges and paths with specific properties such as cut vertices, bridges, Eulerian, etc

Complimentary Courses

SEMESTER	COURSE CODE	COURSE NAME	COURSE OUTCOMES
1	MTS1 C01	MATHEMATICS-1	• C01: Introduces fundamental ideas of limit, continuity and differentiability and also to some basic theorems of differential calculus
			• C02: Discuss the definite integral not only solves the area problem but is useful in finding out the arc length of a plane curve, volume and surface areas of solids and so on
			• C03: Be able to graph the function using the properties of y' and y''
2	MTS2 C02	MATHEMATICS-2	• C01:To learn conversion from cartesian to polar coordinates and vice versa. Graphing in polar coordinates
			• C02:Study hyperbolic function and inverse hyperbolic functions. Learn to find arc length and surface area, area between two curves.
			• C03:Study improper integrals, numerical integration, sequences and series and various methods to test their convergences
			• C04:Define power series, Maclaurin series and Taylor series and study their convergence and estimate error
			• C05:Learn concept of vector spaces, solving systems of linear equations by different methods, to learn matrices and its various properties

3	MTS3 C03	MATHEMATICS - 3	• C01:To learn about vector functions, partial derivatives and directional derivatives, curl and divergence
			• C02:Familiarize with line integrals
			• C03: Study Double integral and its applications
			• C04: Study Triple integrals
			• C05:Learn basic concepts in complex analysis
4	MTS4 C04	MATHEMATICS-4	• C01:To learn Ordinary differential equations and their solutions
			• C02:Study different methods to solve linear differential equations.
			• C03: Study Laplace transforms and Fourier series
			• C04:Learn basics of Partial differential equations and familiarize with some of its applications
			• C05:Learn concept of vector spaces, solving systems of linear equations by different methods, to learn matrices and its various properties