**B.Sc. Mathematics s**

|  |  |  |
| --- | --- | --- |
| Semester | Course | Course outcomes |
| 1 | MTS1B01- Basic logic and Number theory | * Understand the foundations of mathematics and the importance of logic
* Be able to prove results involving divisibility, greatest common divisor, least common multiple and identify some applications
* Understands the theory and method of solutions of LDE
* Solves linear congruent equations, learn classical theorems in Number theory
 |
| 2 | MTS2B02- Calculus of one variable – 1 |

|  |
| --- |
| * Get fundamental ideas of limit, continuity and differentiability
 |
| * Understands basic theorems and applications of differential calculus
 |
| * Applies of differential calculus in real life situations
* Learn fundamental theorems of Integral Calculus
 |
|  |

 |
| 3 | MTS3B03– Calculus of Single variable - 2  | * Understands Exponential and Logarithmic functions and its applications
* Learn improper integrals their convergence and evaluation.
* Understand convergence of a series and become able to apply various tests to check the convergence
* Learn about plane and space curves and applies vectorsin dealing with the problems involving geometry of lines, curves, planes and surfaces in space and acquire the ability to sketch curves in plane and space given in vector form
 |
| 4 | MTS4B04 – Linear Algebra  | * Get idea of linear systems of equations,
* vector spaces, and linear transformations.
* Understand various methods for solving a system of linear equations
* Establish the connection between Matrices and linear transformations
* Learn a few fundamental results involving diagonalization and eigenvalues which enable them to check whether diagonalization is possible
* Study spectral decompositionof a symmetric matrix
* Understand Gram-Schmidt process
 |
| 5 | MTS5 B05 - Abstract Algebra  | * Understands the abstract notion of a group, with several examples
* Learns to check whether an algebraic system forms a group or not and some fundamental results of group theory.
* Establish the importance of permutation groups
* Explores the idea of structural similarity, the notion of cyclic group, permutation group , various examples and fundamental results in the areas O
* Observe the connectionemerging between classical algebra and modern algebra.
 |
| 6 | MTS5 B06 - Basic Analysis  | * Get basic ideas an methods of real and complex analysis
* Understand axiomatic approach to learn real number system
* Learn to prove Archimedean property, density theorem, existence of irrational numbers
* Study about basic topological properties of real number system such as the concept of open and closed sets, their properties and their characterization
* Understands algebraic, geometric and topological structures of complex number system, functions of complex variable, their limit and continuity
 |
| 7 | MTS5 B07- Numerical Analysis  | * Learn several methods like bisection method, fixed point iteration method, regulafalsi method etc. to find out the approximate numerical solutions of algebraic and transcendental equations with desired accuracy
* Understand the concept of interpolation and also learn some well known interpolation techniques
* Master a few techniques for numerical differentiation and integration and also realizes their merits and demerits.
* Apply numerical approximations to solutions of initial value problems and also to understand the efficiency of various methods.
 |
| 8 | MTS5 B08 - Linear Programming  | * Solve linear programming problems geometrically
* Understand the drawbacks of geometric methods
* Solve LP problems more effectively using Simplex algorithm via. the use of condensedtableau of A.W. Tucker
* Convert certain related problems, not directly solvable by simplex method, into a form thatcan be attacked by simplex method.
* Understand duality theory, a theory that establishes relationships between linearprogramming problems of maximization and minimization
* Understand game theory
* Solve transportation and assignment problems by algorithms that take advantage of the simpler nature of these problems
 |
| 9 | MTS5 B09 - Introduction to Geometry and Theory of Equations | * Recognise and classify conics
* Understand Kleinian view of Euclidean geometry
* Understand affine transformations, the inherent group structure, the idea of parallel projections and the basic properties of parallel projections
* Learns the relationship between the roots and coefficients of an 𝑛𝑡ℎ degree polynomial and an upper and lower limit for the roots of such a polynomial.
* Derive formulae for the solutions of third and fourth degree polynomial equations given by Carden and Ferrari
* Locate the region of solutions for a general polynomial
* Learns methods to find out integral and rational roots of a general 𝑛𝑡ℎ degree polynomial with rational coefficients
 |
| 10 | MTS6 B10 - Real Analysis  | * Explore the study on continuous functions, formulate sequential criteria for continuity and proves or disproves continuity of functions using this criteria.
* Understand the significance of uniform continuity
* Learn Riemann integrability of real valued functions
* Formulates Cauchy criteria for integrability and use it to prove the non integrability of certain functions.
* Understand two forms of fundamental theorem of calculus and their significance in the practical problem of evaluation of an integral
* Understand the difference between pointwise and uniform convergence of sequences and series of functions
* Learns the properties of and relationship between improper integrals namely beta and gamma functions that frequently appear in mathematics, statistics, science and engineering
 |
| 11 | MTS6 B11- Complex Analysis  | * Understand the difference between differentiability and analyticity of a complex function and construct examples
* Learn necessary and sufficient condition for checking analyticity
* Understand definition of complex integral, its properties, evaluation and applications
* Understand and apply Cauchy’s integral formula and a few consequences of it such as Liouville’s theorem, Morera’s theorem and its applications
* Understand how Laurent’s series expansion lead to the concept of *residue,* which in turn provide another fruitful way to evaluate complex integrals
* Learn application of residue theory in locating the region of zeros of an analytic function.
 |
| 12 | MTS6 B12 - Calculus of Multivariable  | * Understands several contexts of appearance of multivariable functions and their representation using graph and contour diagrams
* Understands the notion of partial derivative, their computation and interpretation
* Calculate the extreme values of a multivariable function using second derivative test and Lagrange multiplier method.
* Understand the idea of line integral and surface integral and their evaluations
* Learn three major results viz. Green’s theorem,Gauss’s theorem and Stokes’ theorem of multivariable calculus and their uses in several areas and directions
 |
| 13 | MTS6 B13- Differential Equations  | * Identifiy a number of areas where modelling process results in a differential equation
* Learn to solve DEs that are in linear, separable and in exact forms and also to analyse the solution
* Realise the basic differences between linear and non linear DEs and also basic results that guarantees a solution in each case
* Become familiar with the theory and method of solving a second order linear homogeneous and nonhomogeneous equation with constant coefficients
* Acquire the knowledge of solving a differential equation using Laplace method
* which is especially suitable to deal with problems arising in engineering field
* Learn the technique of solving partial differential equations using the method of separation of variables
 |
| 14 | MTS6 B14 (E01)- Graph Theory  | * Learn the definition of a graph, Graphs as models, Vertex degrees, Sub graphs, Paths and Cycles, Matrix representation of a graph
* Understand Bridges, Spanning Trees Cut Vertices and Connectivity and applies in solving problems
* Learn and apply Euler Tour, Hamiltonian Graphs,Plane and Planar graphs and Euler’s Formula
 |
| 15 | MTS5 D04 – Mathematics for Decision Making | * Get an overview of Data collection, Data Classification and Experimental Design
* Learn frequency distributions and their graphs
* Study on Measures of Central Tendency, Measures of Variation and Dispersion
* Learn Concepts of Probability and Counting
* Understand probability distributions
 |
| 16 | MTS 1 C01 - Mathematics | * Understand concepts of limits, continuity, derivative and linear approximation of curves
* Learn basic theorems of differentiation and integration
* Apply the concepts in solving optimisation problems in real life
* Understand the concepts of maximum and minimum values of functions using graphs and find the extreme values
* Learn to draw graphs of functions
* Apply integral calculus to find area, surface area, volume of solids etc..
 |
| 17 | MTS 2 C02 - Mathematics | * Understand the concepts of polar coordinates, trigonometric functions, hyperbolic functions, inverse hyperbolic functions
* Learn parameterisation of curves and apply the concept of polar coordinates in finding areas, arc length and area between curves
* Understand the ideas of improper integrals, their convergence, convergence of series and Taylor’s formula
* Understand the concepts of vector space
* Apply the concepts of eigen values and eigen vectors in diagonalisation
 |
| 18 | MTS3 C03 - Mathematics | * Learn fundamental ideas of limits, continuity, differentiability of vector valued functions
* Understand the concepts of curl and divergence of vectors
* Apply the concepts of multiple integrals in finding surface area, volume, flux
 |
| 19 | MTS4 C04 | * Understands the ODE, its solutions, Initial value problem and different types of ODE.
* Apply Laplace transforms and inverse transform for solving ODE
* Understand the concepts of Fourier series and its convergence
* Learn the methods of solving partial differential equations.
 |