M.Sc Mathematics

2022-23

Programme Specific Outcomes (PSO)

On the successful completion of M.Sc. Mathematics, the students will be able to

1. Formulate Complete, Concise and Correct Mathematical Proofs
2. Frame Problems Using Multiple Mathematical Structures and Relationships And Solve Using Standard Techniques.
3. Develop an in-depth understanding of the fundamentals of Mathematics and create a foundation of lifelong learning to facilitate progressive careers in industry.
4. Recognize And Appreciate The Connections Between Theory and applications and Effectively Use Professional Level Technological Tools To Support The Study Of Mathematics
5. Clearly Communicate Quantitative and Theoretical Ideas In Mathematics

I Semester

MS1MTAGC-01-Algebra-I

Course Outcomes (CO)

On the completion of the course the student will be able to

1. Determine whether a given set and binary operation form a group by checking group axioms
2. Describe the symmetries of some bounded three-dimensional figures.
3. Write precise and accurate mathematical definitions of objects in ring theory;
4. Use mathematical definitions to identify and construct examples and to distinguish examples from non-examples
5. Use a combination of theoretical knowledge and independent mathematical thinking to investigate questions in group theory , ring theory and to construct proofs.

MS1MTRAC-02-Real Analysis

Course Outcomes (CO)

On the completion of the course the student will be able to

1. Recall and apply the concepts of continuity, discontinuity, compactness and connectedness in metric spaces.
2. Express the length of a curve as a (Riemann) sum of of linear segments, convert to definite integral form and compute its value.
3. Evaluate the integral of functions of a real variable in the sense of Riemann Stieltjes.
4. Identify and Classify the sequence of functions which are point wise convergence and uniform convergence.
5. Demonstrate the differentiation of functions of real variables.

MS1MTTC-03-Topology

Course Outcomes (CO)

On the completion of the course the student will be able to

1. Recall and construct various topologies on sets and compare them

2. Define basis and make use of bases to generate topology and justifyconnectedness in topological spaces

3. Classify and analyze the nature of compact topological spaces in particular on Real line

4. Define and Categorize separation axioms on different topological spaces

5. Interpret and extend the metrizable concepts of Topological spaces

MS1MTNAC-04-Numerical Analysis-I with MATLAB Programming

Course Outcomes (CO)

On the completion of the course the student will be able to

1. Solve system of linear algebraic equations
2. Explain Gaussian rules for Numerical integration
3. Make use of numerical techniques to find the derivative at a point and evaluate definite integrals
4. Illustrate the numerical solutions for Numerical interpolation linear and nonlinear system of eigen value problems
5. Basic Introduction and learning MATLAB codes for numerical methods

MS1MTDMA-01-Discrete mathematics

Course Outcomes (CO)

On the completion of the course the student will be able to

1. To learn the basic terminology and some of the theory associated with graphs.
2. Modern applications of graph theory will be explored.
3. Use these definitions and theorems from memory to construct solutions to problems and/or proofs.
4. Design a digital communication system by selecting an appropriate error correcting codes for a particular application.
5. Explain various methods of generating and detecting different types of error correcting codes

MS1MTCSA-02-Computational Statistics

Course Outcomes (CO)

On the completion of the course the student will be able to

1. Recall and apply a comprehensive set of Probability ideas

2. Improve data handling skills and summarize statistical computations

3. Find, interpret and analyze the measure of central tendencies, Moment Generating function and Characteristic function of random variables

4. Determine the relationship between quantitative variables and extend regression analysis

5. Relate, Analyze and Demonstrate the knowledge of using various distributions for statistical analysis

II Semester

MS2MTFAC – 05-Functional Analysis

Course Outcomes (CO)

On the completion of the course the student will be able to

1. Study continuous linear transformations and the Hahn-Banach theorem.
2. Understand the open mapping theorem and its applications.
3. Obtain orthogonal complements, orthonormal sets and conjugate space.
4. Understand the relevance of operator theory.
5. Discuss determinants and the spectrum of an operator.

MS2MTCAC – 06-Complex Analysis

Course Outcomes (CO)

On the completion of the course the student will be able to

1. Evaluate complex integrals using Cauchy-Goursat integral theorem.
2. Define the concepts of Taylors and Laurents series.
3. Gain knowledge of singularities and residues.
4. Apply the knowledge of residues in complex integration.
5. Apply the concept and consequences of analyticity and Cauchy-Riemann equations and of results on harmonic and entire functions including the fundamental theorem of algebra.

MS2MTODEC – 07-Ordinary Differential Equations

Course Outcomes (CO)

On the completion of the course the student will be able to

1. Understanding the existence and uniqueness of solutions of general linear differential equations.
2. Understanding of a very important method of solution technique called Green's function technique which has large scale applications.
3. Understanding different methods of solutions to solve linear differential equations of order two.
4. Problems related to methods of solutions is intended to help students in taking up these methods of solution and their application in real world problems.
5. Analyze real-world problems such as motion of a falling body, compartmental analysis, free and forced vibrations, etc.; use analytic technique to develop a mathematical model, solve the mathematical model and interpret the mathematical results back into the context of the original problem.

MS2MTA2 – 08-Algebra-II

Course Outcomes (CO)

On the completion of the course the student will be able to

1. Use computational techniques and algebraic skills essential for the study of systems of linear equations, matrix algebra, vector spaces, eigenvalues and eigenvectors, orthogonality and diagonalization. (Computational and Algebraic Skills).
2. Critically analyze and construct mathematical arguments that relate to the study of introductory linear algebra. (Proof and Reasoning).
3. Recall and construct extensions of a given field
4. Demonstrate understanding of inner products and associated norms.
5. Find the degree of the splitting field of a polynomial

MS2MTCMA – 04-Continuum Mechanics

Course Outcomes (CO)

On the completion of the course the student will be able to

1. Be familiar with linear vector spaces relevant to continuum mechanics and able to perform vector and tensor manipulations in Cartesian and curvilinear coordinate systems.
2. Treat general stresses and deformations in continuous materials.
3. Formulate and solve specific technical problems of displacement, strain and stress.
4. Numerically model and analyze the stresses and deformations of simple geometries under an arbitrary load in both solids and liquids.
5. Solve simple boundary value problems for fluids and solids.

III Semester

MS3MTDGC – 09-Differential Geometry

Course Outcomes (CO)

On the completion of the course the student will be able to

1. Understand the concept of curvature of a space curve and signed curvature of a plane curve.
2. Get introduced to the notion of Serret-Frenet frame for space curves and the involutes and evolutes of space curves with the help of examples.
3. Compute the curvature and torsion of space curves.
4. Introduced to the concept of a parameterized surface with the help of examples.
5. Understand geodesics as distance minimizing curves on surfaces.

MS3MTPDEC – 10-Partial Differential Equations

Course Outcomes (CO)

On the completion of the course the student will be able to

1. Use knowledge of partial differential equations (PDEs), modelling, the general structure of solutions, and analytic and numerical methods for solutions.
2. Understand analogies between mathematical descriptions of different (wave) phenomena in engineering.
3. Solve practical PDE problems with finite difference methods, implemented in code, and analyze the consistency, stability and convergence properties of such numerical methods.
4. Interpret solutions in a physical context, such as identifying travelling waves, standing waves, and shock waves.
5. Apply problem-solving using concepts and techniques from PDE's and Fourier analysis applied to diverse situations in physics, engineering, financial mathematics and in other mathematical contexts.

MS3FMC – 11-Fluid Mechanics

Course Outcomes (CO)

On the completion of the course the student will be able to

1. Describe the physical properties of a fluid.
2. Calculate the pressure distribution of incompressible fluids.
3. Describe the principles of motion of fluids.
4. Identify the derivation of basic equations of fluid mechanics and apply.
5. Use the dimensional analysis and derive the dimensionless numbers.

MS3MTGT – 12-Graph Theory

Course Outcomes (CO)

On the completion of the course the student will be able to

1. Know some important classes of graph theoretic problems;
2. Formulate and prove central theorems about trees, connectivity, colouring and planar graphs;
3. Apply the concepts of graph connectivity at appropriate points of graph theory and be able to describe and apply some basic algorithms for graphs;
4. Use digraph theory as a modelling tool.
5. Apply domination theory in installing common facility in appropriate points in Town planning

MS3MTNTIIA – 05-Numerical Analysis-II

Course Outcomes (CO)

On the completion of the course the student will be able to

1. Learn different numerical techniques to solve ordinary and partial initial and boundary value problems.
2. Learn the stability and convergence criteria of different numerical techniques.
3. Illustrate the numerical solutions of initial value problems
4. Solve ordinary and partial differential equations that arises in engineering problems.
5. Make use of numerical techniques to find the derivative at a point and evaluate definite integrals.

Open Elective:
MS3MTORMPOE – 01-Operations Research with MATLAB programming
Course Outcomes (CO)

On the completion of the course the student will be able to

1. Analyze Graphical Method, Use of Artificial variables and Inverting a Matrix usingSimplex method.
2. Formulate linear programming problems and find their solutions
3. Understand Test the optimality for Degeneracy by using Transportation Algorithms (MODI method).
4. Study Assignment Problem and its applications.
5. Basic Introduction and learning MATLAB codes for operations research.

IV Semester

MMA4MIEC-13- Measure and Integration
Course Outcomes (CO)

On the completion of the course the student will be able to

1. Understand the basic concepts of measure theory.
2. Learn different Lebesgue measures.
3. Learn Lebesgue integration and convergence.
4. Use abstract methods to solve problems.
5. Establish measurability and non-measurability of sets and functions.

MMA4MMEC-14-Mathematical Methods

Course Outcomes (CO)

On the completion of the course the student will be able to

1. Learn different integral transform techniques.
2. Solve variational problems and minimal surfaces
3. Learn asymptotic and perturbation technique
4. Solve different differential equations.
5. Solve Duffing's equation and Vander-Pol equation

MMA4OTEC-15-Optimization Techniques

Course Outcomes (CO)

On the completion of the course the student will be able to

1. Formulate linear programming problems and find their solutions
2. Solve linear programming problems using dualsimplex method
3. Solve integer programming and network flow algorithms.
4. Recognize, solve and interpret Transportation and Assignment problems
5. Interpret the principle of non-linear problems, dynamic and goal programming.