

# DEPARTMENT OF MATHEMATICS

The Department of Mathematics offers the Master of Science program in Mathematics with the accelerated Master of Science program in Mathematics (5-year BS to MS). The Master of Science in Mathematics is a thirty-hour program, and it is designed to be completed with or without a thesis. The MS in Mathematics graduate program prepares students for two-year college teaching, careers in industry or government, and preparation for doctoral study.

## Aims and Objectives

The Department of Mathematics considers three factors in planning its program: (1) the mathematics activities in the academic mainstream of the United States; (2) the philosophy, aims and objectives of the University; and (3) the past experiences of the students enrolled. In its graduate program, the Department seeks to accomplish the following objectives:

1. Provide mathematical training for elementary and secondary teachers, particularly those in urban schools.
2. Provide mathematical training for personnel in industry, government, and institutions of higher learning where higher mathematics is needed.
3. Provide graduate students in mathematics an opportunity to engage in research on new teaching methodologies, the development of new teaching materials, preparation of expository papers, and the development of new fundamental results.

The ultimate aim of the faculty in the Department of Mathematics is to prepare graduate students who are competent practitioners of mathematics and capable of serving as researchers, teachers, or applied mathematicians in various programs of industrial business and government.

## Admissions Requirements

In addition to meeting the general requirements for admission to the Graduate School, students entering the graduate program are expected to have the following admission requirements:

- Students must complete twenty-seven (27) semester hours of mathematics, including at least twelve (12) hours of Calculus and at least 15 hours from the following list of courses (or courses equivalent to these): MATH 250, 251, 331, 336, 439 and 473.
- Students must have a minimum accumulated grade point average of 2.75/4,
- Students must have a minimum cumulative GPA of 3.0 in mathematics major courses

Applications cannot be evaluated until these requirements are met and the Graduate School receives the completed application. The entire admission process will be under the direction of the Graduate Faculty Committee in the Department of Mathematics and the Graduate Council in the Graduate School at the University.

- Mathematics, Masters of Science (<https://catalog.tsu.edu/graduate/schools-colleges/science-engineering-technology/mathematics/mathematics-ms/>)

## Advanced Undergraduate/Graduate

### MATH 430 The History Of Mathematics (3 Credits)

**Lecture:** 3, **Lab:** 0

The History of Mathematics (3) General view of the development of the elementary branches of mathematics; growth of higher mathematics in the eighteenth and nineteenth centuries. Three hours of lecture per week. Prerequisite: Twelve credits of college mathematics.

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Mathematics

### MATH 433 Concepts Structure Of Math (3 Credits)

**Lecture:** 3, **Lab:** 0

Concepts and Structure of Mathematics (3) Structure of the number system, elements of set theory, properties of real numbers, and basic concepts of mathematical systems. Presented for nonmajors. Three hours of lecture per week. Prerequisite: Consent of the instructor.

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Mathematics

### MATH 437 A Surv of Math Ideas (3 Credits)

**Lecture:** 3

Contemporary Mathematics and Its Applications (3) Applications of various mathematical topics and mathematical needs of people in some of the trades, professions, and scientific disciplines. Three hours of lecture per week. Prerequisite: MATH 314 or consent of the instructor.

**Prerequisite(s):** MATH 243

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Mathematics

### MATH 439 Introduction to Analysis (3 Credits)

**Lecture:** 3, **Lab:** 0

Introduction to Analysis (3) The real number system; elementary point set theory; sequences and series; continuity; possibly topics from differentiation and integration. Three hours of lecture per week. Prerequisites: MATH 243 and MATH 331.

**Prerequisite(s):** (MATH 243 and MATH 331)

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Mathematics

### MATH 460 Intro To Complex Analysis (3 Credits)

**Lecture:** 3, **Lab:** 0

Introduction to Complex Analysis (3) Complex numbers and complex geometry; limits, continuity, derivatives, and the Cauchy-Riemann equations; analytic and harmonic functions; Cauchy's Integral Theorem and its consequences. Three hours of lecture per week. Prerequisites: MATH 314 and MATH 331.

**Prerequisite(s):** (MATH 243 and MATH 331)

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Mathematics

### MATH 462 Intro To Topology (3 Credits)

**Lecture:** 3, **Lab:** 0

Introduction to Topology (3) Topics include metric spaces, connectedness, and compactness. The topology of Euclidean spaces discussed in detail as well as its generalization to nonmetric topological spaces. Three hours of lecture per week. Prerequisites: MATH 314 and MATH 331.

**Prerequisite(s):** (MATH 243 and MATH 331)

**College/School:** Col of Science, Engr & Tech

**Department:** Department of Mathematics

**MATH 471 Topics In Math I (3 Credits)****Lecture:** 3, **Lab:** 0

Topics in Mathematics I (3) New developments and trends in mathematics discussed. Three hours of lecture per week. Prerequisite: Consent of the instructor.

**College/School:** Col of Science, Engr & Tech**Department:** Department of Mathematics**MATH 473 Probability & Statistics I (3 Credits)****Lecture:** 3, **Lab:** 0

Probability and Statistics I (3) Introduction to probability and statistical inference making use of the calculus developed in MATH 241 and MATH 242. Three hours of lecture per week. Prerequisite: MATH 242.

**Prerequisite(s):** MATH 242 or MATH 2414**College/School:** Col of Science, Engr & Tech**Department:** Department of Mathematics**MATH 474 Probability & Statistics II (3 Credits)****Lecture:** 3, **Lab:** 0

Probability and Statistics II (3) Moments of distributions and Stieltjes integral; joint density functions; conditional means; moment generating functions; sequences of random variables; distribution theory; and hypothesis testing. Three hours of lecture per week. Prerequisite: MATH 473.

**Prerequisite(s):** MATH 473**College/School:** Col of Science, Engr & Tech**Department:** Department of Mathematics**MATH 475 Abstract Algebra (3 Credits)****Lecture:** 3, **Lab:** 0

Abstract Algebra (3) Group theory; Lagrange's Theorem; Isomorphism Theorem; Cayley's Theorem; rings and fields. Three hours of lecture per week. Prerequisite: MATH 336.

**Prerequisite(s):** MATH 336**College/School:** Col of Science, Engr & Tech**Department:** Department of Mathematics**MATH 490 Independent Study Undergrad (3 Credits)****Lecture:** 3, **Lab:** 0

Independent Study: Undergraduate (3) Intensive study of a topic in mathematics under the direction of a faculty member. Prerequisites: Senior standing and consent of the instructor.

**College/School:** Col of Science, Engr & Tech**Department:** Department of Mathematics**MATH 499 Seminar (3 Credits)****Lecture:** 3, **Lab:** 0

Seminar (3) Various topics in mathematics discussed. Three hours of lecture per week. Prerequisite: Consent of the instructor.

**College/School:** Col of Science, Engr & Tech**Department:** Department of Mathematics

## Graduate

**MATH 532 Intr to Number Systems (3 Credits)****Lecture:** 3

INTRODUCTION TO NUMBER SYSTEMS (3) Background concepts and terminology in sets, relations, mapping. Cartesian products; equivalence relations; elementary properties of the counting numbers; numeration systems; arithmetic in base 10 and bases other than 10; divisibility and primes; Euclidean Algorithm; Fundamental Theorem of Arithmetic consequences; the ring of integers modulo  $m$ ; Fermat's Theorem, elementary properties of the rational numbers; existence of irrational numbers.

**College/School:** Col of Science, Engr & Tech**Department:** Department of Mathematics**MATH 536 Geom For Tchrs (3 Credits)****Lecture:** 3, **Lab:** 0

GEOMETRY FOR TEACHERS (3) Foundations of geometry, nature of proof, coordinate systems, Euclidean, non-Euclidean and projective geometry.

**College/School:** Col of Science, Engr & Tech**Department:** Department of Mathematics**MATH 577 Fourier Series (3 Credits)****Lecture:** 3, **Lab:** 0

FOURIER SERIES (3) Study of approximations of functions by orthogonal systems of functions; Fourier series; orthonormal systems and generalized Fourier series, applications to boundary value problems. (Prerequisites: MATH 314 and 333)

**Prerequisite(s):** (MATH 314 and MATH 333)**College/School:** Col of Science, Engr & Tech**Department:** Department of Mathematics**MATH 578 Laplace Transforms (3 Credits)****Lecture:** 3, **Lab:** 0

LAPLACE TRANSFORMS (3) Definitions and elementary properties; transform of discontinuous functions; inverse transformations; convolution theorems, application to ordinary differential equations. (Prerequisite: MATH 439)

**Prerequisite(s):** (MATH 439)**College/School:** Col of Science, Engr & Tech**Department:** Department of Mathematics**MATH 599 Research & Conferences (3 Credits)****Lecture:** 3, **Lab:** 0

RESEARCH AND CONFERENCE (3) May not be repeated for graduate credit. (Prerequisite: Graduate standing and twelve [12] hours of senior undergraduate or graduate mathematics)

**College/School:** Col of Science, Engr & Tech**Department:** Department of Mathematics**MATH 631 Intro To The Found Of Math (3 Credits)****Lecture:** 3, **Lab:** 0

INTRODUCTION TO THE FOUNDATIONS OF MATHEMATICS (3) Evolution of Mathematical ideals and methods, relations to logic; the axiomatic method; the infinite paradoxes; contradictions. (Prerequisite: Graduate standing)

**College/School:** Col of Science, Engr & Tech**Department:** Department of Mathematics

**MATH 633 Theory Functions Real Variable (3 Credits)****Lecture:** 3, **Lab:** 0

THEORY OF FUNCTIONS OF REAL NUMBERS (3) The fundamental part of the theory of functions of a real variable; the topology of the real line, limit, continuity, differentiation, Lebesgue measure, the Lebesgue integral. (Prerequisite: MATH 439)

**Prerequisite(s):** (MATH 439)**College/School:** Col of Science, Engr & Tech**Department:** Department of Mathematics**MATH 634 Theory Functions Complex Var (3 Credits)****Lecture:** 3, **Lab:** 0

THEORY OF FUNCTIONS OF COMPLEX VARIABLES (3) The fundamental part of the theory of functions of a complex variable; complex number system, limits continuity, derivatives of complex functions, integration in the complex domain. (Prerequisite: MATH 460 or consent of instructor)

**Prerequisite(s):** (MATH 460)**College/School:** Col of Science, Engr & Tech**Department:** Department of Mathematics**MATH 636 Point Set Topology (3 Credits)****Lecture:** 3, **Lab:** 0

TOPOLOGY (3) Introduction to the study of point set topology: topological spaces, metric space, the topology of the real line and real plane, continuous functions, homeomorphisms, product spaces, compactness, connectivity, separation theorems. (Prerequisites: MATH 462 and MATH 439 or instructor's consent)

**Prerequisite(s):** (MATH 439 and MATH 462)**College/School:** Col of Science, Engr & Tech**Department:** Department of Mathematics**MATH 637 Functional Analysis (3 Credits)****Lecture:** 3, **Lab:** 0

FUNCTIONAL ANALYSIS (3) Introduction to functional analysis: finite and infinite dimensional vector spaces norms and inner products, Banach space, Hilbert space, L-space, linear operators. (Prerequisites: MATH 636 and MATH 633 or instructor's consent)

**Prerequisite(s):** (MATH 636 and MATH 633)**College/School:** Col of Science, Engr & Tech**Department:** Department of Mathematics**MATH 638 Partial Differential Equations (3 Credits)****Lecture:** 3, **Lab:** 0

PARTIAL DIFFERENTIAL EQUATIONS (3) Definitions of equations and their solutions: method of Jacobi and Monge, solutions by quadrature, existence theorems, separation of variables, elliptic, parabolic and hyperbolic systems, and operational methods. (Prerequisites: MATH 376 and MATH 333)

**Prerequisite(s):** (MATH 333 and MATH 376)**College/School:** Col of Science, Engr & Tech**Department:** Department of Mathematics**MATH 732 Theory Of Numbers (3 Credits)****Lecture:** 3, **Lab:** 0

THEORY OF NUMBERS (3) Elementary properties of integers, the theorems of Fermat and Wilson the theory of congruencies, quadratic residues, the reciprocity theorem, Diophantine equations, definite and indefinite binary quadratic forms, ternary quadratic forms, regular and irregular forms. (Prerequisite: MATH 331)

**Prerequisite(s):** (MATH 331)**College/School:** Col of Science, Engr & Tech**Department:** Department of Mathematics**MATH 733 Abstract Algebra (3 Credits)****Lecture:** 3, **Lab:** 0

ABSTRACT ALGEBRA (3) Advanced topics in modern algebra: generally the topics will be in one or more of the areas: group theory, theory of rings and fields, homological algebra. (Prerequisite: MATH 475)

**Prerequisite(s):** (MATH 475)**College/School:** Col of Science, Engr & Tech**Department:** Department of Mathematics**MATH 790 Independent Study Grad (3 Credits)****Lecture:** 3, **Lab:** 0

INDEPENDENT STUDY: Graduate standing / approval of advisor.

**College/School:** Col of Science, Engr & Tech**Department:** Department of Mathematics**MATH 831 Theory Of Probability (3 Credits)****Lecture:** 3, **Lab:** 0

THEORY OF PROBABILITY (3) Theory of expectation, dependent and independent variables, Chebycheff's inequality, the probability integral applications to statistical theory. (Prerequisite: MATH 473 and 474)

**Prerequisite(s):** (MATH 473 and MATH 474)**College/School:** Col of Science, Engr & Tech**Department:** Department of Mathematics**MATH 832 Finite Differences (3 Credits)****Lecture:** 3, **Lab:** 0

FINITE DIFFERENCES (3) Tables of differences, difference formulas, finite integration with applications, interpolation, approximate integration, beta and gamma functions, difference equations.

**College/School:** Col of Science, Engr & Tech**Department:** Department of Mathematics**MATH 833 Mathematical Statistics (3 Credits)****Lecture:** 3, **Lab:** 0

MATHEMATICAL STATISTICS (3) Moments, distributions of functions of random variable, interval estimation, limiting distributions, sufficient statistics, point estimation, and statistical hypothesis. (Prerequisite: MATH 474)

**Prerequisite(s):** (MATH 474)**College/School:** Col of Science, Engr & Tech**Department:** Department of Mathematics**MATH 861 Research Problems (3,6 Credits)****Lecture:** 0, **Lab:** 0

RESEARCH PROBLEMS (3) Investigation by the student of a specific problem in mathematics. (Prerequisite: Approval of the department chairperson)

**College/School:** Col of Science, Engr & Tech**Department:** Department of Mathematics**MATH 5331 Intro to Analysis I (3 Credits)****Lecture:** 3, **Lab:** 0

An introduction to real analysis. Topics covered in this course are real numbers, sequences, limits, continuity, and differentiation. This course is intended to be an introduction to real analysis. Student Learning outcomes: After successfully completing the course students should be familiar with epsilon-delta notation, Weierstrass Theorem, Heine Borel Theorem, Compactness, Differentiability, Continuity, Uniform Continuity, The Mean Value Theorem. (Prerequisite: MATH 331 (MATH 3331) and MATH 243).

**Prerequisite(s):** (MATH 3331 or MATH 331) and MATH 243**College/School:** Col of Science, Engr & Tech**Department:** Department of Mathematics

**MATH 5332 Intro to Analysis II (3 Credits)****Lecture:** 3

This is the second part of a two-semester course in Introduction to Real Analysis. Topics include real number system; sequences and series; limit, continuity and differentiation; the Riemann integral; sequences and series of functions; elementary metric space theory including compactness, connectedness and completeness; differentiation and integration of functions of several variables. (Prerequisite: MATH 5331)

**Prerequisite(s):** MATH 5331**College/School:** Col of Science, Engr & Tech**Department:** Department of Mathematics**MATH 6332 Graph Theory (3 Credits)****Lecture:** 3

This course is intended for graduate students and will prepare you for further study in mathematics, science, technology, engineering, and business courses. (Prerequisite: MATH 2318 (formerly MATH 250) & MATH 331) or Department/Instructor Consent.

**Prerequisite(s):** (MATH 2318 or MATH 250) and MATH 331**College/School:** Col of Science, Engr & Tech**Department:** Department of Mathematics**MATH 6337 Abstract Algebra II (3 Credits)****Lecture:** 3

This course is intended for graduate students to expand their understanding of mathematical proofs in modern algebra: generally the topics will be in one or more of the areas: group theory, theory of rings and fields, homological algebra. (Prerequisite: MATH 733 or MATH 6336).

**Prerequisite(s):** (MATH 733 or MATH 6336)**College/School:** Col of Science, Engr & Tech**Department:** Department of Mathematics**MATH 6364 Numerical Analysis (3 Credits)****Lecture:** 3

This course is intended for graduate students core areas of numerical analysis and scientific computing along with basic themes such as solving nonlinear equations, interpolation and splines fitting, curve fitting, numerical differentiation and integration, initial value problems of ordinary differential equations, direct methods for solving linear systems of equations, and finite-difference approximation to a two-points boundary value problem. This is an introductory course and will be a mix of mathematics and computing. (Prerequisite: MATH 251 (MATH 2320)) or Department Consent.

**Prerequisite(s):** MATH 251 or MATH 2320**College/School:** Col of Science, Engr & Tech**Department:** Department of Mathematics**MATH 6377 Advanced Linear Algebra I (3 Credits)****Lecture:** 3

This course is intended for graduate students to expand their understanding of mathematical proofs in Linear systems of equations, matrices, determinants, vector spaces and linear transformations, eigenvalues and eigenvectors. (Prerequisite: MATH 2318 (formerly MATH 250) and MATH 631) or Department Consent.

**Prerequisite(s):** (MATH 2318 or MATH 250) and MATH 631**College/School:** Col of Science, Engr & Tech**Department:** Department of Mathematics**MATH 6378 Advanced Linear Algebra II (3 Credits)****Lecture:** 3

This course is intended for graduate students as a continuation of MATH 6377 to Determinants, eigenvalues, eigenvectors, and diagonalization, canonical forms, and inner product and norm, Gram-Schmidt process. (Prerequisite: MATH 6377) or Department Consent.

**Prerequisite(s):** MATH 6377**College/School:** Col of Science, Engr & Tech**Department:** Department of Mathematics