

Mathematics

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Mathematics Web Site (<http://www.tamuc.edu/academics/colleges/scienceEngineeringAgriculture/departments/mathematics/>)

America desperately needs more students to major in mathematics. There are plenty of good jobs for math graduates. The Department of Mathematics offers the Bachelor of Science degree with a major in Mathematics. This major prepares graduates for careers in industry, government, business, and employment in scientific and technological fields, computing and information science, actuarial work, and education. A graduate with a major in mathematics should possess the following competencies: calculus, discrete mathematics, and abstract algebra, as well as advanced electives.

The Bachelor of Science degree with a major in Mathematics with teacher certification also is offered by the department. A student may select a broadfield major or select a field outside mathematics as a minor. This major prepares graduates for careers in teaching at the secondary level. A graduate with a major in mathematics should possess the following competencies: calculus, discrete mathematics, geometry, abstract and linear algebra, history of mathematics, and number theory.

Students seeking a bachelor's degree in this major must complete:

1. degree requirements for a Bachelor Science degree, and
2. Core Curriculum Requirements (<http://coursecatalog.tamuc.edu/undergrad/core-curriculum-requirements/>) (refer to those sections of this catalog).

In addition, courses in the major must be completed as shown below.

Teacher Education Programs

Students seeking a bachelor's degree in a teacher education program must complete:

1. degree requirements for a Bachelor of Science degree (refer to the bachelor's degree requirements section of this catalog),
2. Core Curriculum Requirements (<http://coursecatalog.tamuc.edu/undergrad/core-curriculum-requirements/>) (refer to that section of this catalog),
3. requirements for admission to and retention in the Teacher Education Program (refer to the Center for Educator Certification and Academic Services section of this catalog), and
4. professional development courses (refer to the appropriate departmental section in this catalog, i.e. Department Curriculum & Instruction).

In addition, courses in the major must be completed as shown below.

Guide for Initial Enrollment in Mathematics

The Texas Higher Education Coordinating Board has ruled that a mathematics course taught in a college or university may count toward the baccalaureate degree requirements only if it has a prerequisite of high school Algebra II. Generally, students not taking Algebra II in high school will need remediation in college. A diagnostic test will be given to each entering student for initial placement in mathematics courses. (See "Basic Skills Policy")

Mathematics B.S. (<http://coursecatalog.tamuc.edu/undergrad/colleges-and-departments/college-of-science-and-engineering/mathematics/mathematics-ba-bs/>)

Mathematics Minor (<http://coursecatalog.tamuc.edu/undergrad/colleges-and-departments/college-of-science-and-engineering/mathematics/mathematics-minor/>)

Mathematics Second Major (<http://coursecatalog.tamuc.edu/undergrad/colleges-and-departments/college-of-science-and-engineering/mathematics/mathematics-second-major/>)

Mathematics, 7-12 Teacher Certification B.S. (<http://coursecatalog.tamuc.edu/undergrad/colleges-and-departments/college-of-science-and-engineering/mathematics/mathematics-8-12-teacher-certification-ba-bs/>)

MATH 1314 - College Algebra

Hours: 3

This course covers an in-depth study and applications of quadratics, polynomial, rational, exponential and logarithmic functions, and systems of equations. Additional topics such as arithmetic and geometric progressions; sequences and series; and matrices and determinants are included. In order to take this course, students must meet or exceed the benchmark determined by the state for the TSI assessment, or have one of various TSI exemptions, or be concurrently enrolled in MATH 131 in the co-requisite model.

MATH 1324 - Math for Business Applications I

Hours: 3

Linear equations, quadratic equations, functions, inequalities, mathematics of finance, linear programming, matrices and determinants, systems of linear equations, probability. Applications to management, economics, and business. In order to take this course, students must meet or exceed the benchmark determined by the state for the TSI assessment, or have one of various TSI exemptions, or be concurrently enrolled in MATH 131 in the co-requisite model.

MATH 1325 - Mathematics for Business Applications II

Hours: 3

This course is the basic study of limits and continuity, differentiation, optimization and graphing, and integration of elementary functions, with emphasis on applications in business, economics, and social sciences. This course is not a substitute for MATH 2413, Calculus I. Prerequisites: MATH 1314 or 1324 with a minimum grade of C.

MATH 1332 - Contemporary Mathematics

Hours: 3

Intended for Non STEM (Science, Technology, Engineering, and Mathematics) majors. Topics include introductory treatments of sets and logic, financial mathematics, probability and statistics with appropriate applications. Number sense, proportional reasoning, estimation, technology, and communication should be embedded throughout the course. Additional topics may be covered. In order to take this course, students must meet or exceed the benchmark determined by the state for the TSI assessment, or have one of various TSI exemptions, or be concurrently enrolled in MATH 120 in the co-requisite model.

MATH 1342 - Elementary Statistical Methods

Hours: 3

Collection, analysis, presentation and interpretation of data, and probability. Analysis includes descriptive statistics, correlation and regression, confidence intervals and hypothesis testing. Appropriate technology will be used. In order to take this course, students must meet or exceed the benchmark determined by the state for the TSI assessment, or have one of various TSI exemptions, or be concurrently enrolled in MATH 120 in the co-requisite model.

MATH 1350 - Mathematics for Teachers I

Hours: 3

This course is intended to build or reinforce a foundation in fundamental mathematics concepts and skills. It includes the conceptual development of the following: sets, functions, numeration systems, number theory, and properties of the various number systems with an emphasis on problem solving and critical thinking. Prerequisites: "C" or better in MATH 1314.

MATH 1351 - Mathematics for Teachers II

Hours: 3

This course is intended to build or reinforce a foundation in fundamental mathematics concepts and skills. It includes the concepts of geometry, measurement, probability, and statistics with an emphasis on problem solving and critical thinking. Prerequisites: MATH 1350 with a minimum grade of C AND MATH 1314 with a minimum grade of C.

MATH 2305 - Discrete Mathematics

Hours: 3

A course designed to prepare math, computer science, and engineering majors for a background in abstraction, notation, and critical thinking for the mathematics most directly related to computer science. Topics include: logic, relations, functions, basic set theory, countability and counting arguments, proof techniques, mathematical induction, combinatorics, discrete probability, recursion, sequence and recurrence, elementary number theory, graph theory, and mathematical proof techniques Prerequisites: MATH 2413 Calculus I with a minimum grade of C.

MATH 2312 - Pre-Calculus

Hours: 3

In-depth combined study of algebra, trigonometry, and other topics for calculus readiness. Prerequisites: MATH 1314 with a minimum grade of C or Math 141 with a minimum grade of C.

MATH 2318 - Linear Algebra

Hours: 3

Introduces and provides models for application of the concepts of vector algebra. Topics include finite dimensional vector spaces and their geometric significance; representing and solving systems of linear equations using multiple methods, including Gaussian elimination and matrix inversion; matrices; determinants; linear transformations; quadratic forms; eigenvalues and eigenvector; and applications in science and engineering. Prerequisites: MATH 2414 with a minimum grade of C or Math 192 with a minimum grade of C.

MATH 2320 - Differential Equations

Hours: 3

Ordinary differential equations, including linear equations, systems of equations, equations with variable coefficients, existence and uniqueness of solutions, series solutions, singular points, transform methods, and boundary value problems; application of differential equations to real-world problems. Prerequisites: MATH 2414 with a minimum grade of C.

MATH 2413 - Calculus I

Hours: 4

Limits and continuity; the Fundamental Theorem of Calculus; definition of the derivative of a function and techniques of differentiation; applications of the derivative to maximizing or minimizing a function; the chain rule, mean value theorem, and rate of change problems; curve sketching; definite and indefinite integration of algebraic, trigonometric, and transcendental functions, with an application to calculation of areas. Prerequisites: MATH 2312 Pre-Calculus with grade of "C" or higher.

MATH 2414 - Calculus II

Hours: 4

Differentiation and integration of transcendental functions; parametric equations and polar coordinates; techniques of integration; sequences and series; improper integrals. Prerequisites: MATH 2413 with a minimum grade of C.

MATH 2415 - Calculus III

Hours: 4

Advanced topics in calculus, including vectors and vector-valued functions, partial differentiation, Lagrange multipliers, multiple integrals, and Jacobians; application of the line integral, including Green's Theorem, the Divergence Theorem, and Stokes' Theorem. Prerequisites: MATH 2414 with a minimum grade of C.

MATH 100 - TSI

Hours: 0

MATH 120 - Foundations of Mathematics for Non-STEM Non-Algebra Majors

Hours: 3

Intended for Non STEM (Science, Technology, Engineering, and Mathematics) majors. In particular, students who are majoring in fields considered to be in the "liberal arts" (students who will not be continuing in an Algebra-intensive math pathway), and who are not TSI complete, will take this course. Course topics include: sets, Venn diagrams, basic arithmetic/algebra operations, rational expressions, exponents and radicals, evaluating formulas, Fundamental Counting Principles, Summation and subscript notation, dimensional analysis, graphing, and the beauty of mathematics. The course helps prepare students for further study in first year college level non-STEM math courses. This course is considered developmental and may not be used to satisfy any mathematics or degree requirements.

MATH 131 - Intermediate Algebra

Hours: 3

May not be used to satisfy any mathematics or degree requirements. Basic algebraic operations, equations and inequalities, polynomials, functions, rational expressions, exponents and radicals, quadratic equations, graphing and geometry in the plane, sequences and series. This course is to prepare students for further study at the level of college mathematics. In particular, this course is considered a "STEM" course, preparing students for further study in the STEM fields. Successfully passing this course meets the TSI standard for college-readiness.

MATH 189 - Independent Study

Hours: 0-4

Independent Study. One to four semester hours. Individualized instruction/research at an advanced level in a specialized content area under the direction of a faculty member. May be repeated when the topic varies. Prerequisite: consent of department head.

MATH 289 - Independent Study

Hours: 0-4

MATH 297 - Special Topics

Hours: 0-4

MATH 301 - Introductory Geometry

Hours: 3

Topics will include plane and solid Euclidean geometry, including the properties of parallels, perpendiculars, triangles, and circles along with perimeter and formulas for area of plane regions and for the surface area and volume of solids. Prerequisites: "C" or better in MATH 351 or 1351 or MATH 2414 or 192.

MATH 316 - Mathematical Methods in Physics & Engineering

Hours: 3

Mathematical techniques from the following areas: infinite series; integral transforming; applications of complex variables; vectors, matrices, and tensors; special functions; partial differential equations; Green's functions; perturbation theory; integral equations; calculus of variations; and groups and group representatives. Prerequisites: MATH 2415 Calculus III or Math 314 with "C" or higher, or consent of instructor.

MATH 317 - Numerical Analysis

Hours: 3

(Same as CSCI 317) Computer algebra systems will be introduced. Topics include methods for approximate solutions of equations in one variable, polynomial approximation methods, numerical calculus, numerical solutions to ordinary differential equations, linear systems of equations, and difference equations. Prerequisites: CSCI 151 or COSC 1436 or equivalent and MATH 192 or MATH 2414 with a minimum grade of "C".

MATH 321 - College Geometry

Hours: 3

Advanced treatment of standard topics in Euclidean geometry for teachers and others using informal and axiomatic approaches. Includes proofmaking techniques, traditional and transformational geometry, finite geometries, and a brief introduction to other geometries. Prerequisites: MATH 332 or 2305 with grade of "C" or higher.

MATH 325 - Partial Differential Equations

Hours: 3

This course studies the general theory of partial differential equations with emphasis on linear equations and the basic techniques for solving initial boundary value problems involving one unknown function and one independent variable. In addition, this course will help student understand how to model the world in terms of partial differential equations, and how to solve those equations and interpret the solutions. Topics may include transport equation, Laplace's equation, heat equation, wave equation, application of Sturm-Liouville's theory, Fourier series/transforms, Green's functions, method of characteristics, Duhamel's principle, and maximum principle. Prerequisites: "C" or higher in MATH 2320 or 315.

MATH 326 - Applied Mathematics

Hours: 3

This course introduces current techniques in mathematical modeling, computer simulations, and the applications of algorithmic programming. Topics may include continuous and discrete models, modeling with graphs, difference equations and differential equations, elements of dynamical systems, graph theory, and simulating with Monte Carlo algorithms. Case studies from biology, atmospheric sciences, ecology, engineering, social science and economics may be discussed in detail. Prerequisites: "C" or higher in MATH 2320 or 315.

MATH 332 - Methods of Mathematical Proofs

Hours: 3

This course trains students on mathematical proof to deepen and broaden the knowledge of various aspects of discrete mathematics that will lay a foundation for further study of many fields in mathematics including topology, analysis, number theory, abstract algebra, probability, and computer science. Topics may include: functions and relations on sets, equivalence relations and partitions of sets, mathematical theorems and proofs, Peano Axiom and natural numbers, Cardinality and Cantor's theorem, the barber's Paradox and the Axiom of Choice, Countably infinite sets and Hilbert's infinite hotel paradox, algebraic, metric and topological structures on a set. Prerequisites: MATH 2414 or Math 192 with grade of "C" or higher.

MATH 333 - Advanced Linear Algebra

Hours: 3

Covers real and complex vector spaces, subspaces, linear operators, eigenvalues and eigenvectors, inner product spaces, operators on inner product spaces, singular value decomposition and pseudo-inverse, canonical forms. Prerequisites: "C" or higher in MATH 2305 and 2414 or 331 or MATH 2318 or 335 or MATH 332.

MATH 334 - Abstract Algebra

Hours: 3

Properties of the integers, permutations, groups, rings, integral domains and fields. Prerequisites: MATH 332 or MATH 2305 or 331 with grade of "C" or higher. Crosslisted with: MATH 550.

MATH 361 - Mathematical Modeling of Science for Middle School I

Hours: 3

Mathematics will serve as the basis of the course and the following topics will be covered: Mathematical modeling, transformation of functions, data analysis skills, linear models, exponential growth and decay, logarithmic functions, logistic models, power and polynomial models, inverse and direct variation, periodic models and trigonometric functions. Prerequisites: "C" or better in MATH 1350 or 350.

MATH 362 - Mathematical Modeling of Science for Middle School II

Hours: 3

Mathematics will serve as the basis of the course and the following topics will be covered: Trigonometric functions and relationships, rate of change, derivative concepts, extrema and points of inflection, accumulating change, concepts of the definite integral, finite difference equations. Technology will be a vital part of the course. Prerequisites: "C" or better in MATH 361.

MATH 371 - Science and Math Education Theory and Practice

Hours: 1

Learning theory and teaching practices for science learning assistants. Topics include questioning strategies, conceptual development, formative assessment, argumentation, metacognition, and nature of science. Prerequisites: Instructor permission. Crosslisted with: PHYS 371, CHEM 371, BSC 371.

MATH 372 - Mathematics Structures and Applications

Hours: 3

A study of the algebraic processes, polynomials, equations, inequalities, functions, graphs, and mathematics of finance. Prerequisites: "C" or better in MATH 1351 or 351 or MATH 2414 or 192.

MATH 380 - Mathematics History

Hours: 3

A survey of the history of mathematics; attention will be given to the origin, development and importance of mathematical ideas. Prerequisite: MATH 301.

MATH 389 - Independent Study

Hours: 1-4

Independent Study. One to four semester hours. Individualized instruction/research at an advanced level in a specialized content area under the direction of a faculty member. May be repeated when the topic varies. Prerequisite: consent of department head.

MATH 397 - Special Topic

Hours: 1-4

Special Topics. One to four semester hours. Organized class. May be repeated when topics vary

MATH 401 - Intro to Math Statistics

Hours: 3

Classical probability theory; discrete and continuous random variables; distribution functions; expectation; law of large numbers; central limit theorem; applications; random sampling; estimation of parameters; hypothesis testing; and other topics as time allows. Prerequisite: Math 192 or 2414 with a minimum grade of "C".

MATH 402 - Mathematical Probability

Hours: 3

A calculus-based course in classical probability theory. Topics covered include probability axioms and properties, discrete and continuous random variables, joint distributions, conditional distributions, expectation and variance, covariance and correlation, moment generating functions, central limit theorem. Prerequisites: MATH 2415 Calculus III or Math 314 or three semesters of calculus with grade of "C" or better.

MATH 403 - Mathematical Statistics

Hours: 3

A calculus-based course in classical statistical inference. Topics covered include: estimation, hypothesis testing, linear regression and ANOVA, nonparametric methods and other topics as time allows. Prerequisites: MATH 2414, or Math 192 Calculus II, with grade of "C" or better.

MATH 426 - History of Mathematics

Hours: 3

Selected topics in the history of mathematics; the growth of algebra, trigonometry, geometry, and the calculus; the contribution of different cultures; selected biographies of mathematicians. Prerequisites: MATH 2414 or 192 with a minimum grade of C or consent of Instructor.

MATH 436 - Real Analysis

Hours: 3

Sequences; limits; functions; continuity; differentiation; integration. Prerequisites: MATH 2305 and 2414, or 331 with grade of "C" or higher. Crosslisted with: MTE 505.

MATH 437 - Number Theory

Hours: 3

Mathematical induction, divisibility, prime numbers, congruences, factorization, arithmetic functions, quadratic reciprocity, primitive roots, diophantine equations. Prerequisites: MATH 332 or 331 or 2305 with grade of "C" or higher.

MATH 438 - Complex Analysis

Hours: 3

The complex numbers; elementary functions and their mappings; complex limits and power series; analytic functions; conformal mapping and boundary value problems; Contour integrals; Cauchy's Theorem; Taylor and Laurent expansions; residues; Liouville's Theorem. Prerequisites: MATH 2415 or 314 with a minimum grade of "C". Crosslisted with: MTE 504.

MATH 440 - Topology

Hours: 3

Topological spaces, topology of the real line, metric spaces, connectedness, compactness, separation axioms, mappings, continuity, homeomorphisms, product spaces. Prerequisites: MATH 332 or 331 with grade of "C" or higher. Crosslisted with: MTE 540.

MATH 453 - Essentials of Statistics

Hours: 3

Techniques of statistical applications concerning descriptive statistics, tests of hypothesis, regression and analysis of variance. Prerequisites: MATH 1314 or above, Min Grade C.

MATH 460 - Math for Secondary Teachers

Hours: 3

Mathematics for Secondary Teachers. Three semester hours. Exploration of problems in algebra, trigonometry, analytic geometry, calculus, Euclidean geometry, probability, statistics and discrete mathematics using technology. The course is intended as a capstone study for prospective secondary teachers of mathematics. Graphing calculators and computers will be employed to illustrate and encourage conjecturing and problem solving with an emphasis on applications. In addition, a brief survey will be made of major documents and resources pertinent to secondary mathematics teachers, such as the NCTM Standards. Prerequisites: MATH 332 or 331 with grade of "C" or higher.

MATH 489 - Independent Study

Hours: 1-4

Independent Study. One to four semester hours. Individualized instruction/research at an advanced level in a specialized content area under the direction of a faculty member. May be repeated when the topic varies. Prerequisite: consent of department head.

MATH 490 - H Honors Thesis

Hours: 3

H Honors Thesis Hours: 6 Individualized instruction/research at an advanced level in a specialized content area under the direction of a faculty member. Prerequisite Consent of head. Note May be repeated when the topic varies.

MATH 491 - H Ind Honors Readings

Hours: 3

Hours: One to four - Organized class Note May be graded on a satisfactory (S) or unsatisfactory (U) basis. May be repeated when topics vary

MATH 497 - Special Topics

Hours: 0-4

Special Topics. One to four semester hours. Organized class. May be repeated when topics vary.