Department of Mathematics

Mission, Purpose and Goals

Mission

The Department of Mathematics provides quality instruction, research and outreach programs in mathematics that produce independent learners equipped with problem solving and decision-making techniques necessary to meet the challenges of their chosen careers and function in the mainstream of the communities in which they live. The department provides comprehensive educational opportunities and advancements to enrich the life of the students.

The department will build a solid foundation of growth, skills, and knowledge of mathematics. Our passion for educating tomorrow's leaders is supported by our desire to provide a seamless education experience.

The Department of Mathematics trains competent prospective mathematicians, engineers, scientists, mathematics teachers, and other mathematics based and/or related professionals with the knowledge-base necessary to perform successfully in graduate and professional schools as well as the workforce. Undergraduate and graduate programs promote student use of innovation and entrepreneurship in their research endeavors.

Purpose

The Department of Mathematics offers an innovative and comprehensive undergraduate program in mathematics from which a major may select one of two concentrations: applied mathematics or mathematics teaching. Students are encouraged to be creative in putting together a course of study that will lead to the fulfillment of individual professional goals. The curricula are rigorous and demanding but flexible enough to allow students to sample several disciplines or to focus on a special interest within the major area. Faculty advisors are available to assist the students on a continual basis to ensure proper course selection toward graduation and relative to career goals.

Goals

The Department of Mathematics will help students develop an appreciate for the beauty and utility mathematics has in academic studies, in the professional workforce, and in everyday life. Inherent in this is a departmental goal of helping students see and appreciate the beauty of mathematics, having students be able to apply mathematics in various settings, teaching students how to perform advanced mathematical computations, and working with students to help them communicate mathematical ideas and content orally and in writing. Students will also develop critical thinking skills, become citizens of the local, regional, and global arenas who understand how they can positively impact society, and they will be aware of careers their mathematical training have prepared them for.

Academic Standards

Mathematics majors are expected to maintain high standards of academic achievement. Students must earn a "C" or higher in all major courses and a minimum grade of a "C" in all classes taken in their minor disciplines if any. Students must also earn a "C" or higher in all mathematics prerequisite courses.

Departmental Regulations for Placement and Academic Progress

Academic Placement

Mathematics majors and minors are placed in freshman mathematics courses according to scores earned on a mathematics-qualifying test. An entering student with a strong mathematics background is encouraged to take advanced placement tests, since high scores on these examinations may exempt students from certain freshman courses. The student is also encouraged to take the Calculus Readiness test in the Department of Mathematics so that they may be exempted from taking prerequisite courses for MATH 2413, Calculus with Analytic Geometry I. (Please note: a student does not receive any course credit from passing the Calculus Readiness test, but only a waiver, in order to take MATH 2413.)

Prerequisite Requirement

All mathematics prerequisite courses must be passed with a grade of a "C" or higher.

Requirements for a Minor in Mathematics

MATH 2413	Calculus with Analytic Geometry I	4
MATH 2414	Calculus with Analytic Geometry II	4
MATH 2305	Discrete Mathematics	3
MATH 2415	Calculus III	4
Approved 3000 or 4000-level Courses		12
Total Hours		**27**

Requirements for a Minor in Mathematical Finance

ACCT 2301	Principles of Accounting	3
ACCT 2302	Principles of Managerial Accounting	3
FINA 3310	Principles of Finance	3
MATH 4330	Introduction to Mathematical Finance	3
COMP 2315	Python Programming Language	3
MATH 3319	Introduction to MATLAB and PHYTHON	3
MATH 4335	Topics in Computational Finance	3
Total Hours		**21**

COMP 2315, MATH 3319, or other equivalent course is a prerequisite for MATH 4335.

Honor Societies and Club

***The Mathematics Club*.** Membership in The Mathematics Club is expected of all mathematics majors and is open to mathematics minors and any other students interested in enhancing their personal, interpersonal and academic growth. The Club promotes unity and support among members. During each club year, activities focus on leadership development, group study, research skills, and a continual update on pre-service, career opportunities in mathematics, and related areas.

***Beta Kappa Chi*.** The purpose of Beta Kappa Chi is to advance scientific education through original investigations, the dissemination of scientific knowledge, and the stimulation of scholarship in the pure and applied sciences. Membership is open to students in the upper fifth of their college class who have completed at least 45 semester credit hours of college work. Seventeen of these hours must be in one of the sciences recognized by the society, with a minimum grade point average of a “B” in the sciences and a minimum cumulative average of a “B”.

***Pi Mu Epsilon*.** Students eligible for membership in Pi Mu Epsilon, a national honor society, include sophomore honor students with a grade point average of 4.0 in mathematics (including two courses in calculus), juniors and seniors with a minimum grade point average of 3.0 in mathematics, and a cumulative grade point average of at least 2.8, and graduate students in the department.

Courses

MATH 0010 Mathematics Basics Lab: 0 semester hours.
This course is designed to improve the student skills involving basic arithmetic computations to include integers, fractions, decimals, and percents. There will be a strong emphasis on solving and graphing linear equations as well as basic polynomial manipulations.

MATH 0021 Mathematics Non-course Based Option I: 0 semester hours.
This non-course based option is designed to provide individualized developmental mathematics instructions to students who did not successfully complete MATH 0313.
Prerequisites: MATH 0313 or MATH 0133.

MATH 0030 Comp Math Skills: 0 semester hours.
This course will enhance the student's performance in college level mathematics. It improves skills in solving quadratic equations, manipulating polynomials, radicals and exponential expressions. It develops a basic understanding of the mathematical functions and concepts necessary for successfully completing the college level course.
Prerequisites: TSI Math with a score of 347.
Co-requisites: MATH 1314, MATH 1332, PSYC 2317.

MATH 0132 Comprehensive Math Skills for Contemporary Algebra: 1 semester hour.
This course will enhance the student’s performance in Contemporary College Algebra. It improves skills in solving linear and power equations, manipulating polynomial and exponential expressions, and graphing and interpreting two-variable equations. It develops an understanding of numeracy and the real number system; and the basic mathematical functions and concepts necessary for successfully completing the Contemporary College Algebra course. A co-requisite course for those students who have not passed TSIA Math, to be taken in conjunction with Contemporary College Algebra.
Co-requisite: MATH 1332.

MATH 0135 Comprehensive Math Skills for College Algebra: 1 semester hour.
This course will enhance the student’s performance in College Algebra. It improves skills in solving quadratic equations, manipulating polynomials, radicals and exponential expressions. It develops a basic understanding of the mathematical functions and concepts necessary for successfully completing the College Algebra course. A co-requisite course for those students who have not passed TSIA Math, to be taken in conjunction with College Algebra.
Co-requisite: MATH 1314.

MATH 0311 Comprehensive Math Skills for College Algebra: 3 semester hours.
This course is designed to present a careful and guided review of the basic mathematical concepts to improve and strengthen the student fundamental understanding of mathematics. The topics will include solving and graphing linear equations and inequalities, solving linear systems, determining the equation of a line and slope of lines. The course will also cover manipulation of polynomials to include factoring, ratios, solving rational equations and geometric applications.
Prerequisites: MATH 0010 or MATH 0100 or TSI Math with a score of 336.
Co-requisite: MATH 1314.

MATH 0312 Basic Math II: 3 semester hours.
This course is an introductory course to Algebra designed to make the transition to College Algebra more successful. It provides the student with background knowledge in fundamental algebra and skills in mathematics. It will concentrate on developing skills in solving and graphing linear equations, simplifying and factoring polynomials, solving quadratic equations and combining and simplifying rational expressions and exponents.

MATH 0313 Pre-Algebra: 3 semester hours.
This course is designed to make the transition to College Algebra more successful. Topics include advanced algebraic operations, factoring with an emphasis on rational, radical, and quadratic equations. Students will be introduced to functions with emphasis on function evaluation, graphs, composition, and inverse.
Prerequisites: MATH 0311 or MATH 0113 or (TSI Math with a score of 336 and TSI DIAG ElemAlg with a score of 06).

MATH 1001 College Algebra Retrack: 0 semester hours.
Linear and quadratic equations, inequalities, functions (quadratic, polynomials, and rational) and graphs of functions, exponential and logarithmic functions, systems of linear equations. Cannot receive credit for both MATH 1332/1103 and MATH 1314/1113.

MATH 1314 College Algebra: 3 semester hours.
Linear and quadratic equations, inequalities, functions (quadratic, polynomials, and rational) and graphs of functions, exponential and logarithmic functions, systems of linear equations. Cannot receive credit for both MATH 1332/1103 and MATH 1314/1113. (Prerequisite: Student must have TSIA math score of 350. In the case the student has a TSIA math score of 347-349, he/she must enroll in Math 0300, as corequisite.

MATH 1316 Trigonometry: 3 semester hours.
Trigonometric functions, radian, logarithms, functions of composite angles, identities, and trigonometric equations.
Prerequisites: MATH 1314 or MATH 1113.

MATH 1324 Finite Mathematics: 3 semester hours.
Linear equations and applications, linear forms and system of equations, matrix algebra and applications, linear programming (linear and simplex method), probability and applications, statistics.
Prerequisites: (MATH 1314 or MATH 1113) or (MATH 1332 or MATH 1103) or (MATH 1511 or MATH 1115).

MATH 1325 Calculus-Business, Life and Social Sciences: 3 semester hours.
Derivatives, curves, sketching, and optimization techniques for differentiation. Logarithms and exponential functions with applications, integral techniques and application of integrals, and multivariate calculus.
Prerequisites: MATH 1324 or MATH 1153.

MATH 1332 Contemporary College Algebra: 3 semester hours.
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. Cannot receive credit for both MATH 1332/1103 and MATH 1314/1113.

MATH 1342 Elementary Statistics: 3 semester hours.
An introduction to the concepts and methods of statistics, topics including probability, random variables, binomial and normal distributions, random sampling, statistical inference, estimation, testing hypothesis, linear regressions and correlation, problem solving, chi-square test and categorical data, and analysis of variance.
Prerequisites: (MATH 1314 or MATH 1113) or (MATH 1332 or MATH 1103) or (MATH 1511 or MATH 1115).

MATH 1511 College Algebra and Trigonometry: 5 semester hours.
A basic course in mathematics for students needing additional pre-calculus skills, including college algebra and trigonometry. Topics included are linear, quadratic, and higher degree polynomial functions and identities, determinants and systems of linear equations, inverse trigonometric functions, and trigonometric equations.

MATH 2001 Calculus with Analytic Geometry I Retrack: 0 semester hours.
Functions and graphs, limits, and continuity, derivatives of functions, Mean Value Theorem, applications of derivatives. Fundamental Theorem of Calculus and applications of integrals.
Prerequisites: ((MATH 1113 or MATH 1314) and (MATH 1123 or MATH 1316)) or ((MATH 1115 or MATH 1511)).

MATH 2305 Discrete Mathematics: 3 semester hours.
Designed to provide a bridge between computational mathematics and theoretical mathematics. Topics include induction and recursion, combinatorics, graph theory functions, proofs and logic.
Prerequisites: MATH 2413 or MATH 1124.

MATH 2316 Structure of Number System: 3 semester hours.
A logical approach to elementary mathematics, with emphasis on the powers and techniques of the axiomatic approach in mathematics. Topics include sets, logic, number theory, equivalence relations and mathematical proofs in developing the characteristics of number systems.
Prerequisites: (MATH 1314 or MATH 1113) or (MATH 1332 or MATH 1103).

MATH 2318 Informal Geometry: 3 semester hours.
A brief development of finite geometric systems from an advanced standpoint, with attention given to intuition and didactics. Topics include deductive reasoning, metric and non-metric geometry, transformational geometry, topological notions, graphs, and networks.
Prerequisites: (MATH 1314 or MATH 1113) or (MATH 1332 or MATH 1103).

MATH 2320 Differential Equations: 3 semester hours.
Ordinary differential equations with emphasis on first-order linear and higher order ordinary differential equations with constant coefficients and some non-constant coefficients. Applications.
Prerequisites: MATH 2414 or MATH 2024.

MATH 2412 Precalculus: 4 semester hours.
A basic course in mathematics for students needing additional precalculus skills, including algebra and trigonometry. Topics included are linear, quadratic, and higher degree polynomial functions, exponential and logarithmic functions, trigonometric functions and identities, inverse trigonometric functions, and trigonometric equations.

MATH 2413 Calculus with Analytic Geometry I: 4 semester hours.
Functions and graphs, limits and continuity, derivatives of functions, Mean Value Theorem, applications of derivatives. Fundamental Theorem of Calculus and applications of integrals.
Prerequisites: ((MATH 1113 or MATH 1314) and (MATH 1123 or MATH 1316)) or MATH 1115 or MATH 1511.

MATH 2414 Calculus with Analytic Geometry II: 4 semester hours.
Applications of integrals, integration techniques, inverse functions, indeterminate forms, improper integrals, parametric equations, polar coordinates, infinite series, power series, Taylor series.
Prerequisites: MATH 2413 or MATH 1124.

MATH 2415 Calculus III: 4 semester hours.
Calculus of functions of several variables, calculus of vector valued functions, partial differentiation, multiple integrals.
Prerequisites: MATH 2414 or MATH 2024.

MATH 3300 Mathematics in Elementary Schools: 3 semester hours.
A conceptual approach to introducing mathematics concepts and the integrating of content, pedagogy and assessment which include treatments of the nature of selective pre-algebra and discrete topics and the use of EC-4/4-8 TEKS Standards V-VI.
Prerequisites: MATH 2316 or MATH 2163.

MATH 3301 Modern Algebra: 3 semester hours.
Number theory, groups, rings, integral domains, and fields.
Prerequisites: MATH 2305 or MATH 2053.

MATH 3302 Probability and Statistics: 3 semester hours.
Counting problems, probability theory infinite sample spaces, random numbers and their usage, random variables, expectations, means, variances, binomial and normal distributions, random walk problems, point estimation, confidence limits, hypothesis testing, applications of Bayes' Theorem, sums of independent random variables, law of large numbers, and central limit theorem.
Prerequisites: MATH 2414 or MATH 2024.

MATH 3307 Linear Algebra: 3 semester hours.
Systems of linear equations, matrices, real vector spaces, linear transformations, change of bases, determinants, eigenvalues and eigenvectors, diagonalization and inner product spaces.
Prerequisites: MATH 2414 or MATH 2024.

MATH 3310 History of Mathematics: 3 semester hours.
The development of mathematical thought from ancient time to the present. Contributions by the great Greek, Roman, and German mathematicians, as well as by others.
Prerequisites: (MATH 2413 or MATH 1124) or (MATH 1325 or MATH 2153).

MATH 3316 Mathematics Understanding: 3 semester hours.
Basic concepts underlying algebra, geometry, trigonometry and calculus, mathematics problem solving and critical thinking assessments, mathematical concepts leading to vertically connected tasks that demonstrate how to build and connect mathematics tasks across teacher certification EC-6 and 4-8.
Prerequisites: MATH 2316 or MATH 2163.

MATH 3319 Introduction to MATLAB and PHYTHON: 3 semester hours.
Introduces the basic concepts of programming and problem-solving using MATLAB and Phython. Topics include data types, data input/output, control structures, functions, scripts, debugging, data visualization techniques, and symbolic computation, data simulation, and basic algorithms. Programming projects related to mathematical and statistical applications and elementary numerical methods.
Prerequisites: MATH 2413 or MATH 1124.

MATH 3361 Intro Biostatistics: 3 semester hours.
Descriptive statistics, data presentation, counting techniques, probability theory concepts, application of Bayes' theorem, random numbers, random variables, discrete and continuous random variables, binomial distribution, Poisson distribution, multinomial distribution, normal distribution, exponential distribution, lognormal distribution, the central limit theorem, covariance, correlation, point and internal estimation, hypothesis testing, p-values, simple linear regression, analysis of categorical data, applications in biology and biomedicine.
Prerequisites: MATH 2413 or MATH 1124.

MATH 3568 Math for Engineers: 5 semester hours.
Matrices are determinants, Vector Spaces, Eigenvalues and Eigenvectors, Power Series, Laplace Transform, Fourier Series and Orthogonal Functions; Multivariate Functions: Sample Space, Random Variables, Probability Distributions, Moments of a Random Variable, Sum of Independent Variables, Conditional Probability, Law of Large Numbers, Central limit Theorem, Inference Concerning Means, Variances and proportions, Analysis of Variance, Statistical Content of Quality Improvement Programs, Reliability, Probalistic Description of Stochastic Processes, Poisson Process, Simple Queuing Models in Engineering.
Prerequisites: MATH 2320 or MATH 2043.

MATH 3599 Independent Study: 1-5 semester hour.
Reading, research, and or field work on selected topics.

MATH 4100 Mathematics Colloquium: 1 semester hour.
Detailed reports on selected topics in both theoretical and applied mathematics. Mathematics majors are required to report individually on at least one topic of a moderate degree of difficulty as a demonstration of their resourcefulness, ability, and achievement in the field of mathematics.

MATH 4190 LaTeX for Mathematics and Science: 1 semester hour.
1 semester hour. This course is an introduction to the LaTeX software system, which is used for document preparation in mathematics, science, and engineering. Students will learn how to use LaTeX to typeset documents such has homework, articles, presentation slides, and an academic poster. Students will develop enough familiarity with LaTeX so that they are able to prepare many technical documents.
Prerequisites: MATH 2413 or MATH 1124.

MATH 4300 Mathematics Modeling and Applications: 3 semester hours.
Models for teaching and learning mathematics, which includes an integration of content, problem solving strategies, real world applications and use of technology.
Prerequisites: MATH 1316 or MATH 1123.

MATH 4305 Mathematics Teaching Capstone Course: 3 semester hours.
The course summarizes, evaluates and integrates college mathematics experiences and provides reviews of mathematical skills. Students must demonstrate that they have mastered their academic program goals.

MATH 4306 Numerical Analysis: 3 semester hours.
Linear and nonlinear systems, matrix inversions and eigenvalues, polynomial approximations, quadrature interpolation, least square, finite differences, including analyses of algorithms and solutions utilizing numerical methods.
Prerequisites: (MATH 3307 or MATH 3073) and (COMP 1315 or COMP 1013 or ELEG 1304 or ELEG 1043 or COMP 1336 or COMP 1213).

MATH 4308 Advanced Calculus I: 3 semester hours.
Number sequences, limits, sequential functions, properties of continuous functions, and mean value theorem and Riemann Integral.
Prerequisites: (MATH 2320 or MATH 2043) and (MATH 3401 or MATH 3014 or MATH 2415).

MATH 4317 Advanced Math for Engineers: 3 semester hours.
Matrices and determinants, vector spaces, systems of linear equations, eigenvalues and eigenvectors, power series, Laplace transforms, Fourier series and orthogonal functions, numerical solutions to ordinary differential equations.
Prerequisites: MATH 2320 or MATH 2043.

MATH 4325 Advanced Math for Business and Economics: 3 semester hours.
Review of differentiation and integration with applications. Introduction to differential and difference equations. Partial derivatives. Taylor expansions. Unconstrained and constrained optimization. The Lagrange multiplier approach with applications. Matrices and determinants. Eigenvalues and eigenvectors. Review of basic probability theory. Continuous random variables. Normal and lognormal random variables. Convergence of random variables. Conditional probability. Applications in business and economics.
Prerequisites: (MATH 1325 or MATH 2153).

MATH 4330 Introduction to Mathematical Finance: 3 semester hours.
Introduce students to the fundamental topics of mathematical finance. It will touch on stochastic processes and stochastic calculus and will discuss the Black-Scholes-Merton model for pricing European-style options. The course tries to keep a balance between rigorous mathematics (analysis of the financial models, stating explicitly the assumptions, and deriving the governing equations for the mathematical models) and developing understanding and intuition when the models can be applied in practice.
Prerequisites: (MATH 3302 or MATH 3023 or MATH 4325 or MATH 4173 or MATH 4317).

MATH 4335 Topics in Computational Finance: 3 semester hours.
This course expands students' knowledge about stochastic processes and stochastic differential equations (SDE) introduced in MATH 4330. Students will learn how to price options using Fourier Transformation and Monte Carlo methods. Students will complete several small projects programmed in Python. The projects will allow students to explore the covered topics further and in depth.
Prerequisites: MATH 4330.

MATH 4389 Mathematics Capstone Course: 3 semester hours.
This course is designed to ascertain that the mathematics major is proficient in the majority of the major requirements such as the Calculus sequence. Differential Equations, Linear Algebra, Abstract/Modern Algebra, Advanced Calculus, Probability, Statistics, and Numerical Analysis. Students will participate in class discussion, write summaries of readings, do group solving, give oral presentations, submit mini projects and complete a major project. This course will provide an integrated experience of the student's program. Its intensity will enhance the student's chances of success in the required major field test.

MATH 4599 Independent Study: 1-5 semester hour.
Reading, research, and/or field work on selected topics.

MATH 5399 Independent Study: 3 semester hours.
Course description will vary according to course chosen for independent study.