

PROGRAMS AVAILABLE

BACHELOR OF ARTS IN MATHEMATICS MATHEMATICS MINOR TEACHING LICENSURE

MATHEMATICS MAJOR PROGRAM

The Department of Mathematics offers a four-year program leading to a Bachelor of Arts in Mathematics. The program fosters insights and solutions to a variety of problems through symbolic or numerical analysis. The practice of the discipline requires and engenders precise modes of thinking. The use of calculus, numerical methods, probability, statistics, and logic is basic to the quantitative methods needed throughout society today. Students graduating with a degree in mathematics will be able to:

- C demonstrate awareness of cultural and historical aspects of mathematics;
- C communicate mathematical ideas and procedures through written and oral discussion;
- C apply mathematical ideas and procedures through reasoning to the various disciplines;
- C pursue mathematical careers or enter graduate and professional schools;
- C function as independent learners;
- C apply technology in the study of mathematics.

Mathematics Major Requirements

MATH 220	Calculus I	3 cr
MATH 240	Introduction to Set Theory and Mathematical Logic	3 cr
MATH 261	Linear Algebra	3 cr
MATH 320	Calculus II	3 cr
MATH 330	Calculus III	3 cr
MATH 430	Calculus IV	3 cr

One course in each of the following areas:

<u>Area I</u>		3 cr
MATH 360	Number Theory	
MATH 362	Algebraic Structures I	

<u>Area II</u>		3 cr
MATH 380	Differential Equations	
MATH 390	Numerical Analysis	
MATH 455	Complex Variables	
MATH 460	Real Analysis I	

<u>Area III</u>		3 cr
MATH 281	Linear Programming	
MATH 331	Probability Theory	
MATH 332	Statistical Analysis	
MATH 444	Operations Research	

<u>Area IV</u>		3 cr
MATH 340	Graph Theory	
MATH 344	Geometry	
MATH 440	Topology	

Two computer science courses, one of which is CSCI 153. The second must have CSCI 153 as a prerequisite. 6 cr

Four additional mathematics courses 300-level or above 12 cr

Eight credits in one of the introductory laboratory science sequences: 8 cr

BIOL 150 Foundations in Biology plus one course that requires BIOL 150 as a prerequisite
 CHEM 150-152 Introduction to Chemistry I and II
 PHYS 151-152 Introduction to Physics I and II

TOTAL MATHEMATICS MAJOR REQUIREMENTS 56

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MATHEMATICS

MATH 250 Discrete Mathematics

3 cr

Provides a foundation in mathematical topics central to the study of computer science, emphasizing mathematical reasoning and algorithms. Topics include propositional logic, Boolean algebra, mathematical proofs and induction, computer arithmetic, elementary combinatorics, recursion, graphs and trees, matrices and relations, functions, sequences and summation.

Prerequisite: Completion of math competency or instructor approval

MATH 261 Linear Algebra

3 cr

Investigates the theory of vector spaces, linear equations, linear transformations, determinants, inner product spaces, eigenvalues, and eigenvectors.

Prerequisite: MATH 220 and MATH 240

MATH 281 Linear Programming

3 cr

Examines the solution of linear programming problems using graphical methods, the simplex algorithm, and the computer. Additional topics may include duality theory and applications chosen from the transportation problem, the personnel assignment problem, and two-person, zero-sum games.

Prerequisite: MATH 261

MATH 286 Topics in Mathematics

3 cr

Examines sophomore level topics in mathematics that complement departmental offerings in mathematics or math competency courses. Emphasis is on the nature of mathematical thought and applications of mathematics.

Prerequisite: Completion of math competency or instructor approval

MATH 300 How to Teach Mathematics

3 cr

Gives students a unique opportunity to experiment through service learning with innovations in course content and teaching methods for elementary, middle school, and high school mathematics, based on the use of technology.

Prerequisite: Completion of Tier I Quantitative Reasoning

MATH 320 Calculus II

3 cr

Studies antiderivatives, the definite integral, transcendental functions, techniques and applications of integration, an introduction to improper integrals. The second of a four-part sequence.

Prerequisite: MATH 220

MATH 328 Interest Theory

3 cr

Treats topics from the mathematical theory of compound interest. Problems dealing with annuities, amortized schedules, sinking funds, and bonds will be analyzed.

Prerequisite: MATH 320

MATH 330 Calculus III

3 cr

Studies infinite series, plane curves, polar coordinates, vectors, vector-valued functions, and analytic geometry in three-dimensional space. The third of a four-part sequence.

Prerequisite: MATH 320

MATH 331 Probability Theory

3 cr

Examines probability laws, discrete and continuous random variables and their probability distributions, expectation, moments and moment generating functions, sequences of random variables, and Markov chains.

Prerequisite: MATH 330

MATH 332 Statistical Analysis

3 cr

Examines functions of random variables, sampling distribution, limit theorems, estimation, hypothesis testing, linear regression, correlation, analysis of variance, and analysis of enumerative data.

Prerequisite: MATH 331

MATH 340 Graph Theory

3 cr

Investigates definitions and examples of graphs, graph isomorphism, paths and circuits, connectivity, trees, planar graphs, Euler's formula, graph coloring, four and five color theorems, and applications.

Prerequisite: MATH 240 or MATH 261

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- MATH 344 Geometry** **3 cr**
Studies geometries from an advanced standpoint. Some of the topics that may be covered are non-Euclidean geometry, geometry of the complex plane, affine geometry, or projective geometry.
Prerequisite: MATH 240
- MATH 345 Game Theory** **3 cr**
Introduces game theory terminology, zero-sum, two-person games, minimax theorem, optimal mixed strategies, and applications to economics.
Prerequisite: MATH 261
- MATH 360 Number Theory** **3 cr**
Introduces the basic concepts of number theory: the Euclidean algorithm, primes, divisibility theorems, Mersenne and Fermat numbers, linear Diophantine equations, congruences, unique factorization, and quadratic reciprocity.
Prerequisite: MATH 261
- MATH 362 Algebraic Structures I** **3 cr**
Introduces the study of algebraic structures with a detailed examination of groups; their properties, isomorphic and homomorphic mappings. Cyclic, symmetric, and quotient groups; groups of permutations and cosets. Normal subgroups. The Fundamental Homomorphism Theory.
Prerequisite: MATH 261
- MATH 364 Linear Algebra II** **3 cr**
Examines the study of transformation relative to different bases and their relationship to matrices. Topics will include orthogonal matrices, similar matrices, and applications to differential equations.
Prerequisite: MATH 261
- MATH 372 History of Mathematics** **3 cr**
Examines the historical development of mathematics and its impact from ancient to modern times.
Prerequisite: MATH 320
- MATH 380 Differential Equations** **3 cr**
Examines first- and second-order differential equations with particular emphasis on nth order equations with constant coefficients, differential operators, systems of equations, series solutions, and Laplace transforms.
Prerequisite: MATH 330 and CSCI 153
- MATH 390 Numerical Analysis** **3 cr**
Studies the approximation of polynomials at points and over intervals; numerical solutions of algebraic and transcendental equations in one unknown using geometric and arithmetic methods; numerical differentiation; and integration.
Prerequisite: MATH 320
- MATH 430 Calculus IV** **3 cr**
Concludes the four-semester sequence of calculus with the study of functions in two or more variables, their derivatives and partial derivatives, multiple integrals, line and surface integrals, Green's Theorem, and Stoke's Theorem.
Prerequisite: MATH 330
- MATH 440 Topology** **3 cr**
Covers various topological spaces. Continuity, connectedness, and compactness are analyzed and compared. Applications of continuity will be applied to the contraction mapping principle. Analysis of product spaces and quotient spaces. Alternate topics may be discussed.
Prerequisite: MATH 430
- MATH 444 Operations Research** **3 cr**
Covers various interrelated topics such as linear programming, network analysis, game theory, probability and queuing theory, and optimization theory.
Prerequisite: MATH 430

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MATHEMATICS

MATH 455 Complex Variables

3 cr

Studies the basic theory of functions of a complex variable including complex numbers and their algebra; analytic functions; Cauchy-Riemann conditions; and the differential and integral calculus of analytic functions.

Prerequisite: MATH 430

MATH 460 Real Analysis I

3 cr

Examines the basis of calculus with a rigorous exploration of the function concept from both a set-theoretic and topological viewpoint with particular attention to the completeness of the real number system, limits, continuity and convergence of sequences and series.

Prerequisite: MATH 430

MATH 486 Special Topics in Mathematics

3 cr

Introduces theory that is an extension of various upper-division mathematics courses. Special topics may explore, but are not restricted to: analysis, geometry, and theory related to modern technology.

Prerequisite: To be determined by instructor

MATH 500 Independent Study

1-3 cr

Open to juniors and seniors who wish to read in a given area or to study a topic in depth. Written reports and frequent conferences with the advisor are required.

Prerequisite: Junior/senior status; department approval

MATH 540 Internship in Mathematics

3-15 cr

Qualified students may be placed as interns in mathematically oriented positions. The internship is designed to supplement and apply classroom study.

Prerequisite: Junior/senior standing and department approval

MATH 580 Special Topics in Math

1-4 cr

Examines topics in mathematics that complement departmental offerings. Emphasis is on topics and pedagogy related to Elementary and/or Middle School Mathematics. Topics offered will vary based on demand. Not open to math majors.

Prerequisite: Tier I Quantitative Reasoning or instructor approval; not open to math majors