

Mathematics

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The major purposes of the mathematics department are to help students increase their knowledge and understanding of mathematical concepts, develop their reasoning ability and problem-solving skills, and improve their ability to apply mathematics in a variety of areas. The department prepares students to become teachers of mathematics; to enter careers in business, industry, and government; and to pursue graduate study in mathematics and related areas.

The student expecting to major in mathematics should have four years of high school mathematics, including two years of high school algebra, geometry, trigonometry and calculus. In the freshman year, students planning to major in mathematics and those preparing for scientific work, including engineering, should be qualified to begin with MAT 151 or MAT 230.

The department offers four majors: mathematics, mathematics/systems, mathematics education, and mathematics–interdisciplinary.

Each year the mathematics department offers at least four sanctioned events such as special lectures or colloquiums. All majors are required to attend a total of at least 12 sanctioned events before taking the MAT 493 course.

Mathematics (BA)

Designed for students planning to attend graduate school, the bachelor of arts degree with a major in mathematics requires two years of sequential college-level study in one foreign language and at least 46-49 major hours.

Major Requirements

MAT 180	3	Problem Solving
MAT 230	4	Calculus II
MAT 240	4	Calculus III
MAT 245	4	Linear Algebra
MAT 255	3	Justifications in Mathematics
MAT 340	4	Advanced Calculus
MAT 352	4	Mathematical Statistics
MAT 392	1	Mathematics Seminar
MAT 455	3	Abstract Algebra
MAT 461	3	Real Analysis
MAT 493	3	Senior Capstone

Select one course from the following:

MAT 251	4	Differential Equations
MAT 310	3	Mathematical Modeling with Numerical Analysis
MAT 330	3	Technology for Mathematics
MAT 382	3	Advanced Statistical Methods
MAT 385	3	Mathematics of Finance

Electives

Select three hours of mathematics electives—MAT 215 or higher.

Additional Major Requirements

Select one course in chemistry or physics from:

CHE 201	4	General Chemistry I
CHE 211	4	College Chemistry I
PHY 211	4	University Physics I
PHY 212	5	University Physics II

Mathematics/Systems (BS)

The bachelor of science degree with a major in mathematics/systems requires a minimum of 47 hours (42 math hours) in the major and curriculum requirements in systems analysis. *All systems curriculum courses must be completed with a grade of C- or better.*

Major Requirements

MAT 180	3	Problem Solving
MAT 230	4	Calculus II
MAT 240	4	Calculus III
MAT 245	4	Linear Algebra
MAT 255	3	Justifications in Mathematics
MAT 340	4	Advanced Calculus
MAT 352	4	Mathematical Statistics
MAT 382	3	Advanced Statistical Methods
MAT 392	1	Mathematics Seminar
MAT 393	3-4	Practicum
MAT 455	3	Abstract Algebra
MAT 493	3	Senior Capstone

Additional Major Requirements

Select one course in chemistry or physics from:

CHE 201	4	General Chemistry I
CHE 211	4	College Chemistry I
PHY 211	4	University Physics I
PHY 212	5	University Physics II

Electives

Select three hours of mathematics electives—MAT 215 or higher.

Systems Curriculum Requirements

COS 120	4	Introduction to Computer Science I
COS 121	4	Introduction to Computer Science II
IAS 330	3	Human Relations in Organizations
MAT 151	4	Calculus I
MAT 352	4	Mathematical Statistics
MAT 382	3	Advanced Statistical Methods
SYS 101	3	Introduction to Systems
SYS 390	3	Information Systems Analysis
SYS 392	1	Systems Seminar
SYS 394	3	Information Systems Design
MAT 393	3-4	Practicum

Select one course from the following:

*SYS 401	4	Operations Research
*SYS 402	4	Modeling and Simulation

Systems Electives

Select at least three hours of electives in addition to those required in the major or systems.

COS 265	3	Data Structures and Algorithms
COS 382	3	Language Structures
MAT 251	4	Differential Equations
SYS 214	3	Principles of Human Computer Interaction
SYS 310	3	E-Commerce
*SYS 401	4	Operations Research
*SYS 402	4	Modeling and Simulation
SYS 403	3	Operations Management

*Courses in both areas may count only once.

Mathematics Education (BS)

The bachelor of science degree in mathematics education requires 74-82 hours of professional education and major courses (50 hours of math). Secondary Education majors must complete specific general education requirements as outlined by the Education Department.

Professional Education

EDU 150	3	Education in America
EDU 210	3	Writing for Teachers
EDU 260	3	Educational Psychology
EDU 309	1	Teaching in Secondary, Junior High/Middle Schools— Special Methods
EDU 310	2	Discipline and Classroom Management
*EDU 332	3	The Junior High/Middle School
EDU 415	1	Student Teaching Seminar
EDU 431	15	Supervised Internship in Secondary Schools
*MAT 280	3	Mathematics in the Junior High/Middle School
MAT 309	2	Teaching Math in Secondary, Junior High/Middle Schools
SED 320	3	Exceptional Children

*For those seeking junior high and middle school education licensure, EDU 332 and MAT 280 are required.

Mathematics Requirements

MAT 180	3	Problem Solving
MAT 230	4	Calculus II
MAT 240	4	Calculus III
MAT 245	4	Linear Algebra
MAT 255	3	Justifications in Mathematics
MAT 312	4	College Geometry
MAT 340	4	Advanced Calculus
MAT 352	4	Mathematical Statistics
MAT 392	1	Mathematics Seminar
MAT 455	3	Abstract Algebra
MAT 493	3	Senior Capstone

Additional Major Requirements

Select one course from the following:

COS 120	4	Introduction to Computer Science I
MAT 251	4	Differential Equations
MAT 310	3	Mathematical Modeling with Numerical Analysis
MAT 330	3	Technology for Mathematics
MAT 370	3	Selected Topics (<i>topic must be approved by department</i>)
MAT 385	3	Mathematics of Finance
PHY 341	3	Math Methods in Physics and Engineering

Select six hours of mathematics electives—MAT 215 or higher.

Select one of the following chemistry or physics courses:

CHE 201	4	General Chemistry I
CHE 211	4	College Chemistry I
PHY 211	4	University Physics I
PHY 212	5	University Physics II

Mathematics—Interdisciplinary (BS)

The bachelor of science degree with a major in mathematics-interdisciplinary requires a minimum of 52-56 hours and the completion of a minor (or major) in accounting, biology, chemistry, computer engineering, environmental science, engineering physics, computer science, economics, finance or physics. Minor (or major) requirements are listed under the department offering the minor. The practicum may be in a supporting area (major or minor) instead of mathematics.

Major Requirements

MAT 180	3	Problem Solving
MAT 230	4	Calculus II
MAT 240	4	Calculus III
MAT 245	4	Linear Algebra
MAT 251	4	Differential Equations
MAT 255	3	Justifications in Mathematics
MAT 310	3	Mathematical Modeling with Numerical Analysis
MAT 352	4	Mathematical Statistics
MAT 382	3	Advanced Statistical Methods
MAT 392	1	Mathematics Seminar
MAT 393	2-4	Practicum
MAT 493	3	Senior Capstone

Select one course from the following:

MAT 340	4	Advanced Calculus
MAT 455	3	Abstract Algebra

Additional Major Requirements

COS 120	4	Introduction to Computer Science I
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Electives

Select three hours of mathematics electives—MAT 215 or higher.

Select one of the following chemistry or physics courses:

CHE 201	4	General Chemistry I
CHE 211	4	College Chemistry I
PHY 211	4	University Physics I
PHY 212	5	University Physics II

Mathematics Minor

A mathematics minor requires a minimum of 23-25 hours.

Minor Requirements

MAT 230	4	Calculus II
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Select one option from the following:

MAT 151	4	Calculus I
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†MAT 145 3 Introduction to Functions and Calculus

and

†MAT 146 3 Functions and Calculus

††MAT 145 & 146 count as one option

Select an additional 15 hours of mathematics elective hours above MAT 151. MAT 201 and 202 do not count toward the minor.

Mathematics Courses

MAT 100

1 hour

Mathematics Fundamentals

A study of the basic arithmetic operations, exponents, ratios, linear and quadratic equations, graphs, and story problems. This course is specifically designed to assist those students who need help for the mathematics proficiency examination. *Pass-fail only. Does not count toward a mathematics major or minor.*

MAT 110

3 hours

Finite Mathematics

A study of selected topics from set theory, matrices, systems of linear equations and inequalities, linear programming, counting and probability, statistics, and mathematics of finance. *Prerequisite: A good understanding of algebra. Does not count toward a mathematics major or minor. Meets general education mathematics requirement.*

MAT 120

3 hours

Investigations in Mathematics

A course designed to engage students in relevant college-level mathematics and its connection to the Christian faith and everyday life. Students will experience interesting questions and real-life applications of mathematics from a variety of contexts while using appropriate technology. Emphasis will be on thinking, reasoning, and exploring patterns as well as communicating mathematical ideas. Topics will be chosen from data analysis, modeling, probability, statistics, mathematics of finance, logic, infinity, geometric applications, and fundamentals of problem solving. *Does not count toward a mathematics major or minor. Meets general education mathematics requirement.*

MAT 140

3 hours

Fundamental Calculus for Applications

An introductory study of derivatives, series, and integrals with a wide range of applications, including maximum and minimum problems. *Prerequisite: A good understanding of algebra. Does not count toward a mathematics major or minor. Meets general education mathematics requirement.*

MAT 145

3 hours

Introduction to Functions and Calculus

The MAT 145/146 sequence aims to provide a deep understanding of topics from precalculus and calculus as well as a strong sense of their usefulness. Fundamental ideas of calculus, specifically rates of change, are introduced early and used to provide a framework for the study of mathematical modeling involving algebraic, exponential, and logarithmic functions. Applications to business, economics, and science are emphasized. *Meets general education mathematics requirement. MAT 145/146 may be taken as a two-semester substitute for MAT 151.*

MAT 146

3 hours

Functions and Calculus

MAT 146 is the second of a two-course sequence which begins with MAT 145, and continues the investigation of functions, including trigonometric functions, and their rate of change. Students are introduced to integrals and methods of integrations with applications. Further topics, such as infinite series and differential equations are included. *Prerequisite: MAT 145. MAT 145/146 may be taken as a two-semester substitute for MAT 151.*

MAT 151

4 hours

Calculus I

A study of functions, including algebraic and trigonometric functions. An introduction to the algebraic, numerical, and graphical approaches to calculus, including limits, continuity, derivatives, integrals, and applications. *Prerequisite: A good understanding of algebra and trigonometry. Meets general education mathematics requirement. MAT 145/146 may be taken as a two-semester substitute for MAT 151.*

MAT 170

1-4 hours

Selected Topics

A course offered on a subject of interest but not listed as a regular course offering. *May count toward the departmental major and general education requirements.*

MAT 180

3 hours

Problem Solving

An introduction to the mathematical sciences through the study of problem solving. An overview of various methods of problem solving to discover patterns, construct and modify conjectures and develop proofs of those conjectures. There will be an emphasis on developing creativity, confidence, and concentration. Content areas studied will include algebra, combinatorics, number theory and calculus, all from a problem-solving point of view. *Prerequisite: MAT 151 or one semester of high school calculus. Meets general education mathematics requirement.*

MAT 201

4 hours

Mathematics for Elementary Teachers I

First of a two-course integrated content-methods sequence for elementary teacher preparation. This course is a study of number systems, operations, and data analysis/probability, with special reference to teaching materials, laboratory methods, and pedagogy, including classroom use of manipulatives and technology. Each student is required to work with a MAT 202 student in a teaching team in the Taylor-Eastbrook Mathematics Project (TEMP). *Does not count toward a mathematics major or minor. Open to majors in early childhood and elementary education. Eight hours of MAT 201 and 202 meet the general education mathematics requirement.*

MAT 202

4 hours

Mathematics for Elementary Teachers II

The second of a two-course integrated content-methods sequence for elementary teacher preparation. Course topics emphasize the standards of geometry, measurement, problem-solving, communication, and reasoning. Each student is responsible each week for planning, teaching, and evaluating a mathematics lesson in a local school (TEMP). *Prerequisite: MAT 201. Does not count toward a mathematics major or minor. Open to majors in early childhood and elementary education. Eight hours of MAT 201 and 202 meet the general education mathematics requirement.*

MAT 210

4 hours

Introductory Statistics

A study of basic statistical methods with a focus on applied data analysis in a group setting using statistical software. Develops proficiency in the use of descriptive methods, sampling, linear regression and correlation, probability theory and distributions, statistical inference techniques for estimation and hypothesis testing and experimental design. *Meets general education mathematics requirement.*

MAT 215

3 hours

Discrete Mathematics for Computer Science

Discrete mathematics concepts are studied that are foundational for further study in computer science. Topics include propositional logic and quantifiers, proofs with emphasis on induction, design and optimization of combinatorial circuits, Boolean algebra, solution of certain classes of recurrence and equivalence relations and modulo arithmetic with application to RSA cryptography. *Prerequisites: COS 120, MAT 146 or 151 or equivalent.*

MAT 220

4 hours

Ways of Knowing

Topics studied include number, logic, Euclidean and non-Euclidean geometry, algebraic structures, dimension, and infinity. A study is made of the deductive method in mathematics and its relationship to ways of knowing in other areas. There is an emphasis on the beauty of mathematics and the relationship of mathematics to science and other forms of culture including the arts and religion. *Course is offered within the honors program. Meets general education mathematics requirement.*

MAT 230

4 hours

Calculus II

A study of analytic geometry, functions, limits and derivatives, differentiation and integration of algebraic functions and elementary transcendental functions, applications of the derivative, the definite integral, sequences, series, Taylor's formula, and special techniques of integration. *Prerequisite: MAT 146 or 151 or equivalent.*

MAT 240 4 hours
Calculus III
A study of parametric equations, polar coordinates, vectors, three-dimensional geometry, partial derivatives, multiple integration, and vector analysis. *Prerequisite: MAT 230 or equivalent. Offered fall semester.*

MAT 245 4 hours
Linear Algebra
A course on matrix theory, linear equations and linear dependence, vector spaces and linear transformations, characteristic equation, quadratic forms, and the singular value decomposition. *Prerequisite: MAT 240. Offered spring semester of even years.*

MAT 251 4 hours
Differential Equations
A course on the solution of differential equations of the first order and first degree, linear differential equations with constant coefficients, nonhomogeneous equations by undetermined coefficients and variation of parameters, systems of differential equations, nonlinear differential equations, and an introduction to series solutions. Numerical methods and qualitative analysis are also used. Differential equations are used to model physical problems, including vibration problems and electrical circuits. *Prerequisite: MAT 240. Offered spring semester.*

MAT 255 3 hours
Justifications in Mathematics
The focus of the course is for students to acquire the ability to create and express mathematical arguments through the exploration of mathematical ideas. In addition to gaining an understanding and appreciation for interesting mathematics, students will develop an ability to think creatively, to analyze critically, and to communicate appropriately mathematical reasoning and argumentation. Topics include proof techniques, logic, sets, functions, number theory, infinity, and graph theory. *Prerequisite: MAT 151 or equivalent. Offered fall semester.*

MAT 261 1 hour
Special Problems
Selected topics in mathematics. *Prerequisite: Consent of the department chair.*

MAT 262 1 hour
Special Problems-TEMP
Selected topics in mathematics.

MAT 270 1-4 hours
Selected Topics
A course offered on a subject of interest but not listed as a regular course offering. *May count toward the departmental major and general education requirements.*

MAT 280 3 hours
Mathematics in the Junior High/Middle School
An integrated content-methods course for middle school and introductory high school preparation. This course includes the mathematical strands of reasoning and algebra, rational numbers, geometry/measurement, and data analysis and probability, interwoven with the connections to appropriate pedagogical strategies for middle grades' teaching and learning. Includes a field-based teaching lab. *Math majors only or permission of the instructor.*

MAT 309 2 hours
Teaching Math in Secondary, Junior High/Middle Schools
This course is designed to assist teacher candidates in developing their pedagogical content knowledge in the area of mathematics. It addresses such topics as lesson planning, higher-order thinking, professional development, content-appropriate teaching strategies, standards-based instruction, assessment of student learning, educational technology, motivational techniques, and instructional resources. National and state math standards are examined as a basis for reflective teaching and best practices. This junior-level course should be taken the spring semester before student teaching. *Prerequisites: EDU 150, 260 and approval into the Teacher Education Program. Corequisite: EDU 309.*

MAT 310 3 hours
Mathematical Modeling with Numerical Analysis
An introduction to modeling and the methods, techniques, and pitfalls in scientific computing and numerical analysis. The course will emphasize projects, writing, technology, and applications. Topics include iterative and algorithmic processes, error analysis, numerical integration and differentiation, curve fitting, and numerical solutions to different equations. *Required for mathematics majors with a concentration in computer science and for computer science majors with a concentration in scientific computing. Fulfills elective requirements in the systems curriculum and for majors in mathematics in environmental science and mathematics in secondary education. Prerequisites: COS 120, MAT 240. Offered fall semester of even years.*

MAT 312 4 hours
College Geometry
Advanced Euclidean plane geometry with a brief survey of some of the non-Euclidean geometries and vector and transformational geometry. *Prerequisites: MAT 180 or 245. Offered spring semester of odd years.*

MAT 330 3 hours
Technology for Mathematics
A study of the use of software and graphing calculators in mathematics. Technological tools are used to explore various topics in mathematics including precalculus, business mathematics, probability and statistics, calculus, and linear algebra. *Prerequisites: MAT 180 and 240.*

MAT 340 4 hours
Advanced Calculus
An introduction to a rigorous development of the fundamental concepts of calculus. The real number system, sequences, series, limits, differentiation, and integration are developed rigorously. *Prerequisites: MAT 240; MAT 180 or 215. Offered spring semester of even years.*

MAT 352 4 hours
Mathematical Statistics
A theoretical, as well as applied, study of counting outcomes, probability, probability distributions, sampling distributions, confidence intervals, tests of hypotheses, linear regression, and correlation. *Corequisite: MAT 240. Offered fall semester.*

MAT 360 1-4 hours
Independent Study
An individualized, directed study involving a specified topic.

MAT 370 1-4 hours
Selected Topics
A course offered on a subject of interest but not listed as a regular course offering. *May count toward the departmental major and general education requirements.*

MAT 382 3 hours
Advanced Statistical Methods
Introduction to a variety of topics including nonparametric statistical methods and linear models, with simple linear regression, multiple regression, and analysis of variance as special cases of the linear model. The emphasis will be on translating applied questions into an appropriate statistical model, checking model assumptions, and interpreting analyses in applied contexts. *Prerequisites: MAT 210 or 352; and MAT 146 or 151.*

MAT 385 3 hours
Mathematics of Finance
This course is an introduction to the mathematical models used in finance and economics with particular emphasis on models for pricing derivative instruments such as options and futures. The goal is to understand how the models derive from basic principles of economics, and to provide the necessary mathematical tools for their analysis. A solid background in basic probability theory is necessary. Topics include risk and return theory, portfolio theory, capital asset pricing model, random walk model, stochastic processes, Black-Scholes Analysis, numerical methods and interest rate models. *Prerequisite: MAT 210 and MAT 230, or MAT 352 or permission of instructor. Offered fall semester of odd years.*

MAT 392 1 hour
Mathematics Seminar
Each student in the seminar researches a mathematical topic and makes a presentation to the entire group. *Prerequisite: MAT 240. Offered fall semester.*

MAT 393 1-4 hours
Practicum
Supervised learning involving a first-hand field experience or a project. Generally, one hour of credit is awarded for a minimum of 40 hours of practicum experience. *Offered primarily during the summer.*

MAT 450 1-4 hours
Directed Research
Investigative learning involving closely directed research and the use of such facilities as the library or laboratory.

MAT 455 3 hours
Abstract Algebra
The development of the postulates of group theory, rings, integral domains, and fields. Applications to cryptography. *Prerequisites: MAT 180 and 240. Offered spring semester of odd years.*

MAT 456 3 hours
Advanced Algebra
A continued study of Abstract and Linear Algebra. Topics include Galois Theory, cryptography, and field extensions. *Prerequisite: MAT 455.*

MAT 461 3 hours
Real Analysis
An advanced study of the real number system, topology, functions, sequences, limits, continuity, and the theory of differentiation and integration. *Prerequisite: MAT 340. Offered spring semester of odd years.*

MAT 480 1-4 hours
Seminar
A limited-enrollment course designed especially for upper-class majors with emphasis on directed readings and discussion.

MAT 490 1-2 hours
Honors
Individualized study or research of an advanced topic within a student's major. Open to students with a minimum GPA of 3.00 in the major field.

MAT 493 3 hours
Senior Capstone
An overview of mathematics with an emphasis on the integration of all areas in undergraduate mathematics with an exploration of the relationship between mathematics and the Christian faith. Open to senior status mathematics majors only. Offered during January interterm.