



## Mathematics (MTH)

**Professor J. Johnson**  
**Professor Masters**  
**Associate Professor Hart**  
**Assistant Professor Fairbanks**  
**Instructor Vertin**  
**Adjunct Instructor Dolezal**  
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The mathematics major provides students with a rigorous, balanced curriculum designed to develop their critical-thinking skills and deepen and broaden their understanding of both applications and theoretical aspects of the discipline. Students majoring in mathematics are sought by business and industry because of their problem-solving skills and ability to think clearly and logically. Some students combine the mathematics major with a second major, often one which applies mathematics. Our graduates enter careers in teaching (all levels, elementary through college), research, engineering, actuarial science, and a wide variety of positions in business, government, and industry. Many pursue advanced study in education, mathematics, engineering, computer science, the natural and social sciences, statistics, or other fields.

### Requirements for the Mathematics Major:

Complete 1 or 2.

1. Students not seeking secondary education certification in mathematics must complete the following:
  - a. A minimum of 38 credits in mathematics with a cumulative grade point average of 2.00 or above
  - b. Mathematics 235, 236, 237, 238, 250, and 303
  - c. Mathematics 403 or 433
  - d. Mathematics 496 and 497
  - e. Twelve additional credits in Mathematics at the 300-400 level (excluding Mathematics 326)
  - f. The cognate Information Science and Technology 145.
2. Students seeking secondary education certification in mathematics must complete the following:
  - a. A minimum of 42 credits in mathematics with a cumulative grade point average of 2.80 or above
  - b. Mathematics 218, 235, 236, 237, 238, 250, 303, 323, 324, 325, 326, 351, 355, 356, 403, 496, and 497
  - c. All requirements listed under the catalog section Secondary Education
  - d. The cognate Information Science and Technology 145

### Recommended 300-400 level electives:

- a. Graduate study (mathematics): 329, 403, 433, and as many additional 300-400 level mathematics courses as possible
- b. Graduate study (statistics): 331, 355, 356, 433
- c. Graduate study (computer science): 330, 331, 355, 356, 433

- d. Actuarial science: 329, 334, 355, 356, 433
- e. Pre-engineering: 329, 334, 355, 356, 433
- f. Math education: 329, 331, 347

**Requirements for the Mathematics Minor:**

Complete the following 20 credits in mathematics:

1. Mathematics 235, 236, 237
2. Nine credits in courses numbered above Mathematics 237 (excluding Mathematics 326)

**105 College Algebra (3)**

An introduction to problem solving using algebra as a tool. Students completing this course will have knowledge of rational expressions, exponents, factoring, equations, inequalities and functions, will be able to model a variety of real-world phenomena, and will be able to solve practical problems using algebra.

**115 Finite Mathematics (3)**

Matrices, systems of linear equations, linear programming using geometric and simplex methods, set theory, probability, Markov chains, and game theory. *Prerequisite: Two years of high school algebra or Mathematics 105.*

**125 Precalculus (4)**

A study of topics in algebra and trigonometry that are used in calculus. Topics include functions, advanced algebra, logarithmic and exponential functions, and trigonometry. Students who successfully complete this course will have the mathematics background needed to study calculus. *Prerequisite: Two years of high school algebra or Mathematics 105. Offered spring term.*

**217 Mathematics for Elementary Teachers (3)**

This course explores mathematics for elementary and middle grades teachers. Topics include sets, functions, logic, numeration, algorithms for basic computation, integers, rational numbers and their application, algebra concepts, probability and statistics. The course also introduces the NCTM standards and the Nebraska content standards for K-12 students. Upon successful completion, students will be able to present mathematics from a problem-solving perspective and integrate exploration and communication as methods of presenting mathematics to elementary and middle grades students. *Prerequisite: Junior standing or permission. Offered fall term.*

**218 Geometry for Teachers (3)**

A study of geometric topics encountered in middle school and high school mathematics. Topics include the van Hiele theory, measurement, congruence and similarity, fractals, polyhedra, coordinate geometry, transformational geometry, and applications. Students who successfully complete this course will be able to teach the geometric topics at all levels covered in public schools. *Prerequisite: Two years of high school algebra or Mathematics 105. Offered spring term.*

**235 Calculus and Analytic Geometry I (4)**

An introduction to the fundamentals of differentiation and integration with applications. *Prerequisite: High school precalculus (algebra and trigonometry) or Mathematics 125. (Mathematics 125 is recommended if ACT math score is 22 or lower.)*

**236 Calculus and Analytic Geometry II (4)**

A continuation of Mathematics 235. Topics include conic sections, the calculus of transcendental functions, methods of integration, and applications. *Prerequisite: Mathematics 235. Offered spring term.*

**237 Calculus and Analytic Geometry III (3)**

A continuation of Mathematics 236. Topics include parametric equations, polar coordinates, limits, indeterminate forms, and infinite series. *Prerequisite: Mathematics 236. Offered fall term.*

**238 Calculus and Analytic Geometry IV (3)**

A continuation of Mathematics 237. Topics include vectors, solid analytic geometry, partial derivatives, and multiple integrals. *Prerequisite: Mathematics 237. Offered spring term.*

**250 Foundations of Mathematics (3)**

An introduction to understanding and constructing the different types of mathematical proofs, inductive and deductive reasoning, functions, cardinality and the real number system. *Prerequisite: Mathematics 235. Offered spring term.*

**290, 390, 490 Directed Study (1-3) (1-3) (1-3)**

An opportunity for supervised, independent study of a particular topic based on the interest of the student and the availability and approval of the faculty.

Students desiring advanced course work in areas not regularly offered may do so by enrolling in a directed study. Topics could include, for example, actuarial mathematics, computer mathematics, topology, or advanced topics in abstract algebra, analysis, geometry, or mathematical statistics. Seniors planning to pursue graduate study in mathematics are especially encouraged to consider this option.

**303 Linear Algebra (3)**

Vector spaces, systems of linear equations, linear transformations, matrices, determinants, eigenvalues and eigenvectors. *Prerequisite: Sophomore standing, Mathematics 235 (may be taken concurrently). Offered fall term.*

**323 Teaching of Mathematics-Geometry (0)**

The beginning of the transition from student of mathematics to teacher of mathematics. Considers topics from traditional Euclidean geometry courses and topics in geometry which could be introduced at the junior high level. **Generally taken during the sophomore year. Offered spring term.**

**324 Teaching of Mathematics-Junior High (0)**

An examination of options and topics appropriate in seventh, eighth, and ninth grade mathematics courses. **Generally taken during the junior year. Offered spring term.**

**325 Teaching of Mathematics-Algebra (0)**

An examination of topics from beginning and advanced algebra and their relationship to further study in mathematics. Looks at the integration of algebra into other courses in a high school curriculum. **Generally taken during the junior year. Offered fall term.**

**326 Teaching of Mathematics (4)**

A selection of topics not covered in Mathematics 323, 324, or 325. Various teaching approaches and methods are examined. Changes that are continually occurring in mathematics education are discussed and appropriate techniques for the teaching of mathematics in the public schools are presented, including teaching from a constructivist point of view, becoming familiar with the vanHiele levels of learning geometry, observing master teachers, and utilizing and integrating technology. Many of the ideas are examined from the viewpoint of the National Council of Teachers of Mathematics. **Prerequisite: Mathematics 323, 324, and 325, enrolled in professional term, or permission. Offered fall term.**

**329 Differential Equations (3)**

First-order equations, linear differential equations, series solutions, systems of linear differential equations, Laplace transforms, applications. **Prerequisite: Mathematics 236.**

**330 Combinatorics (3)**

A study of the models of combinatorial mathematics including graphs, digraphs, trees, recurrence relations, and generating functions. Students who successfully complete this course will be able to use these models in solving problems. **Prerequisite: Mathematics 250. Offered alternate fall terms.**

**334 Complex Variables (3)**

Complex numbers, analytical functions, complex integration, residues and poles, and conformal mapping. **Prerequisite: Mathematics 237 and 250. Offered alternate fall terms.**

**347 Number Theory (3)**

Divisibility, congruences, primitive roots, quadratic residues, Diophantine equations, continued fractions. **Prerequisite: Mathematics 236 and 250. Offered alternate spring terms.**

**351 Geometries (3)**

Survey of Euclidean geometry, study of selected topics in non-Euclidean and other geometries. **Prerequisite: Sophomore standing. Mathematics 236 (may be taken concurrently) and 250. Offered alternate spring terms.**

**355 Probability (3)**

Random variables, conditional probability and independence, expectation, moment generating functions, special distributions. **Prerequisite: Mathematics 236 and 250. Offered fall term.**

**356 Statistics (3)**

A continuation of Mathematics 355. Sampling distributions, hypothesis testing, nonparametric methods, linear statistical models. *Prerequisite: Mathematics 355. Offered spring term.*

**358 Actuarial Mathematics (2)**

A review of topics included on the Course 1 Examination of the Society of Actuaries and the Casualty Actuarial Society. Topics include calculus, probability, and basic concepts of risk management and insurance. Course open only to students planning to take S.O.A. Course 1 Exam in May. *Prerequisite: Mathematics 238 and 355. Offered spring term.*

**403 Abstract Algebra (3)**

Introduction to properties of groups, rings, integral domains, and fields. *Prerequisite: Mathematics 250 and 303. Offered alternate spring terms.*

**421 Mathematics Internship (0-12)**

On-the-job experience in mathematics. *Prerequisite: Cooperative Education 205 or permission. (Pass/Fail)*

**433 Introductory Analysis (3)**

A study of the theoretical basis of elementary calculus. Topics include sequences, limits, differentiability, the Riemann integral, pointwise and uniform convergence. *Prerequisite: Mathematics 238 and 250. Offered alternate fall terms.*

**435 Mathematical Methods for Physics (4)**

A course designed to integrate mathematics into a coherent foundation for problem solving for upper-level physics and engineering courses. Topics include Laplace and Fourier transformations, Fourier series, vector operators, ordinary and partial differential equations, and orthogonal functions. Emphasis is given to the solution (analytical and numerical) of problems from both physics and engineering. Completion of the course allows the student to define important aspects of each mathematical topic, to describe the relevance of each topic to physics and engineering problems, and to work both formal and physics/engineering problems involving each topic. *Prerequisite: Physics 107, 108; Mathematics 235, 236, 237, 238. (Cross-referenced with Physics 435.)*

**496 Mathematics Seminar I (1)**

An introduction to research in a selected area of mathematics, mathematics education, or an application in mathematics. The course increases the students' abilities to communicate their explorations in mathematics. Each student explores possible topics and develops a plan of action for his/her Mathematics Seminar II project. The student also develops research, writing, and presentation skills to carry out an independent research project. *Prerequisite: Junior or senior mathematics major and 12 credits at the 300 level or above, or permission. Offered spring term.*

**497 Mathematics Seminar II (2)**

In consultation with a faculty member, the student executes the plan of action created in Mathematics Seminar I. The project culminates in a formal

paper and oral presentation demonstrating the student's ability to independently research a topic and effectively communicate mathematics. *Prerequisite: Mathematics 496 or permission. Offered every term.*

## **Military Science (MSI)**

Regularly enrolled, physically qualified male and female students are offered a four-year course of instruction in military science. Students unable to complete the four-year program may apply for the two-year Advanced Course by volunteering to attend the Basic Camp for ROTC between their sophomore and junior years. Upon successful completion of the Advanced Course of ROTC and upon recommendation by the military science faculty and the Vice President for Academic Affairs, students are awarded commissions. Army ROTC students are commissioned in the grade of Second Lieutenant, United States Army Reserve or Regular Army. Air Force ROTC students are commissioned in the grade of Second Lieutenant, United States Air Force.

All of the credits offered in military science courses are credited toward graduation.

### **ARMY**

#### **111 Foundations of Officership (1)**

Students are introduced to issues and competencies that are central to a commissioned officer's responsibilities. The course contents include understanding officership, leadership, Army values, and life skills, such as physical fitness and time management.

#### **111L Leadership laboratory (0)**

#### **121 Basic Leadership (1)**

Students learn the foundations of leadership, such as problem solving, communication, military briefings, effective writing, goal setting, physical well-being, techniques for improving listening and speaking skills, and counseling.

#### **121L Leadership Laboratory (0)**

#### **212 Individual Leadership Studies (2)**

Introduction to identifying and replicating successful leadership characteristics, through observations during experiential learning exercises. Students record these characteristics, discuss them in small group settings, and use them in subsequent activities. Students also practice communication skills necessary for leadership roles, especially in military environments.

#### **212L Leadership Laboratory (0)**

#### **222 Leadership and Teamwork (2)**

Students learn how to build successful teams, methods to influence group actions, effective communication within groups, creativity in problem solving,