

## Mathematics (MATH)

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The overall goal of the department of mathematics is to equip its students for a lifetime of learning and service via God's gift of mathematical thought and practice. Some specific objectives include developing in each student: (1) the ability to think rigorously; (2) an understanding of the fundamental principles and techniques of mathematics; (3) an appreciation of mathematics as the primary language of science and an important part of our cultural heritage; (4) the ability to learn independently and to utilize technology effectively for learning and problem solving; (5) the ability to communicate mathematics well in both oral and written form.

### Major requirements for the B.A. degree in Mathematics

#### Required semester hours

36 sh

#### Prerequisites and supporting courses

CSIS 1210

#### Required core courses

MATH 1510, 1520, 3050, 3060, 3100, 3110, 3150, 4010, 4020

#### Electives

4 additional hours in Mathematics, numbered 2000 or higher

#### Notes and restrictions

A comprehensive examination is required for graduation.

An oral presentation of a paper outside the classroom (the paper and venue to be previously approved by the department) is required for graduation.

For students in secondary education: The B.A. in Math requires 36 sh in MATH, namely MATH 1510, 1520, 3010, 3050, 3060, 3100, 3110, 3150, 3210, 4010, and 4020 as well as CSIS 1210 (4 sh) as a supporting course.

#### Honors

For Departmental Honors in Mathematics, 4 sh of MATH 4000 are required in addition to the 36 sh for a B.A. Application for admission should be made the second semester of the third year. For general Departmental Honors requirements and MATH 4000 course description, see appropriate sections of this catalog.

### Major requirements for the B.S. degree in Mathematics

#### Required semester hours

40 sh

#### Prerequisites and supporting courses

CSIS 1210

#### Required core courses

MATH 1510, 1520, 3050, 3060, 3100, 3110, 3150, 3620, 4010, 4020

#### Electives

4 additional hours in Mathematics, numbered 2000 or higher

#### Notes and restrictions

A comprehensive examination is required for graduation. An oral presentation of a paper outside the classroom (the paper and venue to be previously approved by the department) is required for graduation.

#### Honors

4 sh of MATH 4000 are required in addition to the 40 sh for a B.S. Application for admission should be made the second semester of the third year. For general departmental honors requirements and a MATH 4000 course description, see appropriate sections of this catalog.

### Minor requirements in Mathematics

#### Required semester hours

20 sh

#### Required core courses

20 sh in the Mathematics department in courses numbered 1510 or higher, including MATH 1510 and 1520

GE Designates a course that fulfills all or part of a General Education (G.E.) requirement; see the General Education Program section of the catalog for more information.

#### 1005 Practical Mathematics for College Students (4 sh)

Topics in basic mathematics including solving equations, graphing, substitution to evaluate expressions, order of operations, word problems, translations of units, proportions, real-world modeling problems, fractions, exponential notation and use of calculator. Registration based on score on the mathematics placement test. Developmental courses do not count toward the 120sh graduation requirement but do count towards full-time enrollment status.

#### 1010 Intermediate Algebra (4 sh)

Topics in beginning and intermediate algebra such as: equations and inequalities, systems, polynomials, factoring, graphing, roots and radicals, rational functions, and quadratic equations. Designed to prepare students for math classes numbered 1020 or higher and especially for MATH 1150. Developmental courses do not count toward the 120sh graduation requirement but do count towards full-time enrollment status. Prerequisite: MATH 1000, MATH 1005 or by math placement.

#### 1020 Modern Mathematics for Elementary Teachers (4 sh)

Content and trends in the mathematics usually taught at the elementary school level. Emphasis is on philosophy and concepts of mathematics. Includes computer applications.

#### 1030 Concepts and Structures (4 sh) GE

Acquaints students with some of the diversity of mathematics and mathematical thinking through a survey of topics such as symbolic logic, topology, graph theory, modular arithmetic and coding theory, probability, and the history of mathematics; or by exploring one area in depth. Oral and written work required. Prerequisite: MATH 1005 or MATH 1010 or designated score on the NPU math placement examination.

#### 1150 First-Year Mathematics (4 sh) GE

Analysis of polynomial, rational, algebraic, trigonometric, exponential, and logarithmic functions. Prerequisite: MATH 1010 or by math placement.

#### 1410 Discrete Mathematics I: Number Theory And Logic (4 sh) GE

Introduction to mathematical logic and writing proofs, providing a solid foundation for further work in mathematics. Topics include

propositional logic, first-order logic, proof techniques, elementary number theory, sets, Boolean algebra, and relations. Students should have completed four years of high school math. Prerequisite: MATH 1010.

**1420 Discrete Mathematics II: Counting And Probability (4 sh) GE**

Continuation of Math 1410. Topics selected from counting, combinations and permutations, discrete probability, recurrence relations, graphs and trees. Prerequisite: MATH 1410.

**1490 Introductory Statistics (4 sh) GE**

Introduction to applied statistical analysis. Descriptive, correlational, and inferential statistics; concepts of population, sample, sampling distribution; elements of probability; parameters of discrete distributions; hypothesis testing: analysis of proportions, means, and variance; linear regression. Cross-listed with STAT 1490. Prerequisite: MATH 1005 or MATH 1010 with a minimum grade of C or by math placement.

**1510 Calculus I (4 sh) GE**

Beginning calculus, limits and continuity, derivatives, mean value theorem, applications of derivatives, antiderivatives, Riemann Sums, introduction to the definite integrals. Uses computers. Lab included. Student should have completed four years of high school math. Prerequisite: MATH 1150.

**1520 Calculus II (4 sh) GE**

Continuation of MATH 1510. Fundamental theorem of calculus, evaluation of definite integrals, applications of definite integrals, introduction to differential equations, infinite sequences and series. Uses computers. Lab included. Prerequisite: MATH 1510.

**2030 Differential Equations (4 sh) GE**

Study of ordinary differential equations, especially first and second order, with applications to geometry and the physical life sciences. Uses computers. Prerequisite: MATH 1520.

**3010 Introduction to Geometry (2 sh) GE**

A study of Euclidean and non-Euclidean geometries by synthetic, analytic, and transformation methods. Prerequisite: MATH 1520.

**3050 Vector Calculus (4 sh) GE**

A detailed study of functions of several variables including differentiation, line and surface integrals, and Green and Stokes' theorems. Uses computers. Prerequisite: MATH 1520.

**3060 Real Analysis (4 sh) GE**

Introduction to the fundamentals of real analysis including real numbers, limits, derivatives, and the Riemann integral. Prerequisite: MATH 1520.

**3100 Linear Algebra (4 sh) GE**

A study of matrices, vector spaces, linear transformations, orthogonality, eigenvalues, and eigenvectors. Uses computers. Lab included. Prerequisite: MATH 1520.

**3110 Modern Abstract Algebra (4 sh) GE**

Study of groups, rings, ideals, integral domains, fields and their applications. Prerequisite: MATH 1520.

**3150 Statistical Theory (4 sh) GE**

Probability, probability distributions, random variables, numerical and descriptive statistics, and statistical inference. Prerequisite: STAT 1490 MATH 1520.

**3210 History of Mathematics (2 sh) GE**

Study of primary sources in mathematics. Focuses on the changing nature of mathematics. Prerequisite: MATH 1520.

**3310 Complex Analysis (4 sh) GE**

Complex numbers, elementary complex functions, the Cauchy theory, infinite series, the calculus of residues, and introduction to conformal representation. Prerequisite: MATH 3060.

**3620 Numerical Methods (4 sh) GE**

An introduction to numerical methods with computer implementation. Solution of linear, non-linear, and differential equations; interpolation and approximation; numerical integration and differentiation; and error analysis. Prerequisite: MATH 1520.

**3910 Topics in Mathematics (2 or 4 sh)**

In-depth treatment of selected topics. Possible topics include point set topology, philosophy of mathematics, and Dynamical Systems. Prerequisite will depend on the topic.

**4000 Department Honors in Mathematics (4 sh)**

Honors independent study in Mathematics.

**4010 Fourth-Year Seminar (2 sh)**

Capstone course for mathematics major. Students learn to read, analyze, and learn mathematics not contained in standard undergraduate textbooks. Written and oral presentations required. Student must be of fourth-year standing and a mathematics major.

**4020 North Park Distinctives in Mathematics (2 or 4 sh)**

In consultation with the mathematics faculty, students will select one of the three North Park Distinctives to relate to mathematics. Students will choose a service learning project modeling mathematics in an urban setting, an international experience studying or applying mathematics in a foreign country, or a historical/theological study relating mathematics to their faith. Written and oral presentations required. Student must be of fourth-year standing and a mathematics major.

**4910 Independent Study in Mathematics (1-4 sh)**

Independent Study in Mathematics.

**4970 Internship in Mathematics (1-4 sh)**

Please refer to the Internship section for requirements and guidelines.