Mathematics plays a central role in modern society. It has long been an important tool in science and engineering, and is used increasingly in varied and sophisticated ways in the social sciences, the humanities and business. With expanding applications, many areas of mathematics from pure to applied have grown tremendously. This major offers a variety of courses that address these diverse applications of mathematics.

Mathematicians value clarity and originality of argument and the capacity to resolve challenging questions that originate either in applications of math, or within mathematics itself. Above all, mathematicians esteem the ability to formulate and apply insights that open new vistas. The curriculum in the mathematics major provides a solid foundation in several core branches of mathematics, including calculus, linear algebra, and algebra, and supports the development of analytical, problem-solving, communication and research skills. Students majoring in mathematics learn about its diverse applications and acquire an understanding of both the foundations and the frontiers of the discipline.

Degrees Offered

- Mathematics, BPhil (https://catalogs.northwestern.edu/sps/undergraduate/mathematics/mathematics-bphil/)
- Mathematics, BSGS (https://catalogs.northwestern.edu/sps/undergraduate/mathematics/mathematics-bsgs/)

Mathematics Courses

MATH 100-CN Quantitative Reasoning (1 Unit)
NPEP course.

MATH 101-CN Algebra (1 Unit)
Overview of core mathematical concepts that permeate business, science and everyday life. Primary focus is on mathematical tools needed in a variety of degree programs. Topics include: functions and graphs, linear, polynomial and rational equations, inequalities and their applications, modeling, variation, and systems of equations. This course does not count for credit if taken after any higher mathematics course. May not be audited.

MATH 101-DL Algebra (1 Unit)
Overview of core mathematical concepts that permeate business, science and everyday life. Primary focus is on mathematical tools needed in a variety of degree programs. Topics include: functions and graphs, linear, polynomial and rational equations, inequalities and their applications, modeling, variation, and systems of equations. This course does not count for credit if taken after any higher mathematics course. May not be audited.

MATH 100-CN Introduction to Mathematics (1 Unit)
NPEP course.

MATH 113-CN Precalculus Mathematics (1 Unit)
Properties and graphs of the basic functions: polynomial, rational, exponential, logarithmic, and trigonometric. Complex numbers, theory of equations, and selected topics are also included. May not be audited.

MATH 202-CN Finite Mathematics (1 Unit)
Foundation of mathematical knowledge targeting data analysis. Topics chosen from set theory, combinatorics (the art of counting), finite probability, elementary linear algebra and its applications to linear optimization problems.

MATH 211-CN Short Course in Calculus (1 Unit)

Elements of differential and integral calculus.

MATH 220-A Single-Variable Differential Calculus (1 Unit)

MATH 220-B Single-Variable Integral Calculus (1 Unit)

Prerequisite: MATH 220-A.

MATH 226-CN Sequences and Series (1 Unit)

Prerequisite: MATH 220-B.

MATH 230-A Multivariable Differential Calculus (1 Unit)
Vectors, vector functions, partial derivatives, and optimization.

Prerequisite: MATH 220-B.

MATH 230-B Multivariable Integral Calculus (1 Unit)

Prerequisite: MATH 230-A.

MATH 240-CN Elementary Differential Equations (1 Unit)

Prerequisite: MATH 220-B, MATH 240-CN, or equivalents.

MATH 250-CN Elementary Differential Equations (1 Unit)

Prerequisite: MATH 230-A, MATH 240-CN, or equivalents.

MATH 300-CN Foundations of Higher Mathematics (1 Unit)
Introduction to fundamental mathematical structures, including sets, functions, equivalence relations, and cardinal numbers. Elementary logic and proof techniques.

Prerequisite: MATH 240-CN.

MATH 306-CN Combinatorics & Discrete Mathematics (1 Unit)
Discrete mathematics, inductive reasoning, counting problems, binomial coefficients and Pascal's triangle, Fibonacci numbers, combinatorial probability, divisibility and primes, partitions, and generating functions.

Prerequisite: MATH 240-CN.

MATH 310-A Probability and Stochastic Processes (1 Unit)

Prerequisite: MATH 230-B.

MATH 310-B Probability and Stochastic Processes (1 Unit)
Discrete-time Markov chains, recurrence and transience.

Prerequisite: MATH 240-CN and MATH 310-A.

MATH 310-C Probability and Stochastic Processes (1 Unit)

Prerequisite: MATH 310-B.

MATH 320-A Introduction to Real Analysis (1 Unit)
Analysis on the real line: axiomatic development of the real number system, sequences and series of real numbers, continuity, and differentiability.

**Prerequisite:** MATH 300-CN.

**MATH 320-B Real Analysis II (1 Unit)**
Analysis on the real line: the Riemann integral and sequences and series of functions.

**Prerequisite:** MATH 320-A.

**MATH 320-C Introduction to Real Analysis (1 Unit)**
Analysis on Euclidean spaces: the topology of Euclidean spaces, limits, continuity, and differentiability, including the inverse and implicit function theorems.

**Prerequisite:** MATH 320-B.

**MATH 325-CN Complex Analysis (1 Unit)**

**Prerequisite:** MATH 230-B.

**MATH 330-A Abstract Algebra (1 Unit)**
Group theory.

**Prerequisite:** MATH 300-CN.

**MATH 334-CN Linear Algebra II: Second Course (1 Unit)**

**Prerequisite:** MATH 300-CN.

**MATH 336-A Introduction to the Theory of Numbers (1 Unit)**

**Prerequisite:** MATH 230-A.

**MATH 340-CN Geometry (1 Unit)**

**Prerequisite:** MATH 300-CN.

**MATH 366-A Mathematical Models in Finance (1 Unit)**

**Prerequisite:** MATH 240-CN.

**MATH 399-CN Independent Study (1 Unit)**