MATHEMATICS DEPARTMENT

Goals

The Niagara University Mathematics Department's goal for our students is that they learn to be flexible problem solvers and be able to read, write, and talk about mathematics clearly. Also, they should have a sense of the breadth and scope of mathematics, be familiar with the tools of mathematics and have a firm grasp of the core material. Students should be prepared to enter a graduate program in mathematics if they choose. If students do not wish to go to graduate school in mathematics, they should have the problem solving and mathematical skills to be successful in whatever they choose.

Programs

- B.A. for students interested in pursuing a double major.
- B.A. for students wishing to qualify for a provisional teaching certificate in mathematics for secondary, elementary or inclusion elementary/special education.
- B.S. for students interested in the possibility of graduate work in mathematics.
- B.S. in Actuarial Science

Bachelors

- Actuarial Science (https://catalog.niagara.edu/undergraduate/programs-az/arts-sciences/mathematics/actuarial-science-bs/)
- Mathematics Department (p. 1)
- Mathematics, B.A. (https://catalog.niagara.edu/undergraduate/programs-az/arts-sciences/mathematics/mathematics-ba/)
- Mathematics, B.A. - Education with Teacher Certification, Elementary Grades (https://catalog.niagara.edu/undergraduate/programs-az/arts-sciences/mathematics/mathematics-ba-education-teacher-certification-elementary-grades/)
- Mathematics, B.A. - Education with Teacher Certification, Grades 7-12 (https://catalog.niagara.edu/undergraduate/programs-az/arts-sciences/mathematics/mathematics-ba-education-teacher-certification-grades-7-12/)
- Mathematics, B.S. (https://catalog.niagara.edu/undergraduate/programs-az/arts-sciences/mathematics/mathematics-bs/)

Minor

- Mathematics, Minor (https://catalog.niagara.edu/undergraduate/programs-az/arts-sciences/mathematics/mathematics-minor/)
- Statistics, Minor (https://catalog.niagara.edu/undergraduate/programs-az/arts-sciences/mathematics/statistics-minor/)

Courses

Mathematics

MAT 101 — Math for the Liberal Arts (AS) (3 credits)
A survey of mathematics including sets, probability, descriptive statistics, and other contemporary math topics.

MAT 102 — Intro Statistics (MAT) (3 credits)
A study of the basic terminology and methods of elementary statistics including organization of data, measures of central tendency and dispersion, sampling theory, estimation, and testing of hypotheses. Also includes an introduction to correlation and linear regression. Students may not receive credit in both MAT 102 and MAT 201.

MAT 102Y — Intro Statistics (LA) (3 credits)
A study of the basic terminology and methods of elementary statistics including organization of data, measures of central tendency and dispersion, sampling theory, estimation, and testing of hypotheses. Also includes an introduction to correlation and linear regression. Students may not receive credit in both MAT 102 and MAT 201. MAT 102Y includes an extra hour per week of supplemental instruction.

MAT 106 — Intro College Math (AS) (3 credits)
This course is designed for students who have mastered the basic skills of arithmetic and elementary algebra, but are not adequately prepared for Business Calculus I (MAT 107) or Precalculus (MAT 109). Topics include exponents; scientific notation; graphing; polynomial arithmetic and factoring; linear, fractional, and quadratic expressions and equations; linear equalities; measurement geometry; and trigonometry. Course does not satisfy the mathematics requirement in the distribution component.

MAT 107 — Business Calculus I (MAT) (4 credits)
An introduction to calculus with primary emphasis on applications to business and economics. Topics include algebra, problem solving, functions including exponential and logarithmic, mathematics of finance, systems of linear equations, differentiation, and applications of differentiation.

MAT 109 — Precalculus (MAT) (4 credits)
A study of basic properties of algebra and trigonometry together with algebraic functions, transcendental functions, and analytic geometry. Emphasis will be on providing students with the background necessary to begin the formal calculus sequence.

MAT 111 — Calculus I (MAT) (4 credits)
Prerequisite Take MAT 109.

A study of functions, limits, continuity, differentiation, applications of differentiation, and an introduction to integration.

MAT 112 — Calculus II (MAT) (4 credits)
*Prerequisite Take MAT*111*

A study of integration, techniques of integration, applications of integration, and an introduction to infinite sequences and series.

MAT 201 — Business Statistics I (AS) (3 credits)
Prerequisite Taking CIS 232 is recommended

A completely integrated computer-based course in which Excel is used to study statistical methods as applied to business, including descriptive statistics, probability sampling, hypothesis testing, and statistical inference. Students may not receive credit in both MAT 102 and MAT 201.

MAT 202 — Statistics II (MAT) (3 credits)
A continuation of MAT 102 including estimating and testing the difference between means, proportions, and variances. An introduction to analysis of variance, regression analysis, and nonparametric statistics. Students may not receive credit in both MAT 202 and BUS 231.

MAT 221 — Calculus III (MAT) (4 credits)
*Prerequisite Take MAT*112*

A study of vectors, vector algebra, analytic geometry in three-space,partial differentiation, multiple integration,sequences, and series.

MAT 222 — Differential Equat (MAT) (3 credits)
*Prerequisite Take MAT*112*

An introduction to the solution and application of ordinary differential equations.

MAT 227 — Foundat of Math (MAT) (3 credits)
*Prerequisite Take MAT*111*

A study of the algebra of sets, relations, functions, cardinality, selected topics of number theory, prepositional logic, and number systems.

MAT 228 — Linear Algebra (MAT) (4 credits)
*Prerequisite Take MAT*112 or MAT*227*

A study of vector spaces, linear transformations, matrices, systems of linear equations, and determinants.

MAT 251 — Math for Elem Teach (MAT) (3 credits)
A look at the topics of K-5 mathematics including numbers and operation of whole through rational numbers, algebraic thinking, geometry, measurement, and data analysis with an emphasis on understanding the mathematical concepts being taught. Students must demonstrate proficiency in the basic arithmetic and geometry skills covered in the course. Course is intended for students anticipating careers in elementary education.

MAT 305 — Math of Finance (MAT) (3 credits)
*Prerequisite Take MAT*111*

A study of simple and compound interest, bank discount, annuities, amortization, depreciation, perpetuities, and bonds.

MAT 306 — Mathematics of Finance II (AS) (3 credits)
Prerequisite Take MAT 305 prior to this course

This course focuses on amortization, bond pricing,

MAT 320 — Math Modeling (MAT) (3 credits)
*Prerequisite Take MAT*112*

An introduction to mathematical problem solving. Primary focus will be using geometry, trigonometry, probability, and calculus to model various topics from business, biology, physics, social sciences, engineering, and recreational mathematics.

MAT 331 — Analysis I (MAT) (3 credits)
*Prerequisite Take MAT*112 and MAT*227*

A more rigorous approach to the basic concepts of Calculus I, II and III: limits, derivative, integral, and series.

MAT 333 — Algebra Structures I (MAT) (3 credits)
*Prerequisite Take MAT*227*

An introduction to the basic structures of modern abstract algebra: groups, rings, integral domains, and fields.

MAT 335 — Prob and Stat I (MAT) (3 credits)
Prerequisite MAT 112 required prior

An introduction to probability including probabilistic experiments and their sample spaces, random variables and their probability distributions, and functions of random variables and their properties. An introduction to the methods of inferential statistics.

MAT 336 — Probability and Statistics II (MAT) (3 credits)
Prerequisite MAT 221 and MAT 335 required prior

A continuation of the methods of inferential statistics. Topics include introductory sampling theory, estimation, confidence intervals and hypothesis testing, experimental design, and analysis of variance. Some nonparametric statistics also introduced.

MAT 351 — Math for Elem and Middle School Teachers (AS) (3 credits)
*Prerequisite Take MAT*251*

A look at the topics of grades 5-8 mathematics including, numbers and operation of rational through real numbers, algebra, geometry, measurement, and probability with an emphasis on understanding the mathematical concepts being taught. Students must demonstrate proficiency in the basic arithmetic and geometry skills covered in the course. Course is intended for students anticipating careers in elementary or middle school education.

MAT 403 — Honors Thesis I (AS) (3 credits)
Individual research of a substantive nature pursued in the students major field of study. The research will conclude in a written thesis or an original project, and an oral defense.

MAT 404 — Honors Thesis II (AS) (3 credits)
Individual research of a substantive nature pursued in the students major field of study. The research will conclude in a written thesis or an original project, and an oral defense.

MAT 442 — Complex Variable (MAT) (3 credits)
*Prerequisite Take MAT*227*

A study of complex numbers, complex sequences, complex functions, analytic functions, differentiation and integration of complex functions, and conformal mapping.

MAT 443 — Euclidean Geometry (MAT) (3 credits)
*Prerequisite Take MAT*227*

A study of the foundations of geometry including transformations, deductive and inductive reasoning, and an introduction to non- Euclidean geometries.

MAT 451 — History of Math (MAT) (3 credits)
*Prerequisite Take MAT*227*

An introduction to the history of mathematics emphasizing the evolution of basic concepts ranging from primitive number systems through the foundations of set theory. These concepts will be studied via pertinent problems and the tools available for their solution when they were originally introduced.

MAT 481 — Independent Study in Math (AS) (1 credits)
The independent study elective provides a student with an opportunity to do in-depth work in an area of particular interest. Departmental approval necessary.

MAT 482 — Independent Study in Math (AS) (2 credits)
The independent study elective provides a student with an opportunity to do in-depth work in an area of particular interest. Departmental approval necessary.

MAT 483 — Independent Study in Math (AS) (3 credits)
The independent study elective provides a student with an opportunity to do in-depth work in an area of particular interest. Departmental approval necessary.

MAT 490 — Topics Course (MAT) (3 credits)
A study of selected topic(s) in mathematics. Offered upon demand of a sufficient number of students.

MAT 493 — Math 493 (LA) (6.00 credits)
A junior or senior work-study program providing relevant employment experience. Registration will occur at the beginning of the experience. The objective of the program is to integrate classroom theory and practical work experience, thus lending relevancy to learning, and providing the student with a realistic exposure to career opportunities. Students interested in an internship or co-op should talk to their adviser.

MAT 494 — Math Co-op (LA) (6.00 credits)
A junior or senior work-study program providing relevant employment experience. Registration will occur at the beginning of the experience. The objective of the program is to integrate classroom theory and practical work experience, thus lending relevancy to learning, and providing the student with a realistic exposure to career opportunities. Students interested in an internship or co-op should talk to their adviser.

MAT 495 — Math Co-op (AS) (6.00 credits)
A junior or senior work-study program providing relevant employment experience. Registration will occur at the beginning of the experience. The objective of the program is to integrate classroom theory and practical work experience, thus lending relevancy to learning, and providing the student with a realistic exposure to career opportunities. Students interested in an internship or co-op should talk to their adviser.

MAT 496 — Math Co-op (LA) (6.00 credits)
A junior or senior work-study program providing relevant employment experience. Registration will occur at the beginning of the experience. The objective of the program is to integrate classroom theory and practical work experience, thus lending relevancy to learning and providing the student with a realistic exposure to career opportunities. Students interested in an internship or co-op should talk to their adviser.

MAT 499 — Senior Seminar (AS) (3 credits)
*Prerequisite Take MAT*227 and half of required Math Courses*

A study of selected topics in various fields of mathematics, with emphasis on search of the literature and/or original investigation.

Statistics Courses

STA 301 — Linear Models (AS) (3 credits)
*Prerequisite Must have taken CIS*233, ECO*231, PSY*221 or MAT*336;*

A completely integrated computer-based course in which software is used to study statistical relationships between several variables. The topics include multiple regression, ANOVA, design of experiments and logistic regression. A comprehensive project will evaluate students' ability to collect and analyze data.

STA 305 — Nonparametric Statistics (AS) (3 credits)
*Prerequisite Must have taken CIS*233, ECO*231, MAT*335 or PSY*221;*

This course will discuss how to analyze data when the distribution of the data is unknown. Topics include bootstrap estimation, analysis of contingency tables, and rank based tests. Computer software will be used extensively. Students will do a research project and analyze the data they have collected.

STA 499 — Statistics Internship (AS) (3 credits)
*Prerequisite Must have taken STA*301;*

In this course, students will learn how to analyze real data. Students will find another faculty member or corporation to work with and analyze their data. Students will write a proposal, analyze the data, and present their results both orally and in written form.