

MTH—MATHEMATICS

COLLEGE OF ARTS AND SCIENCES

MTH U010 Algebra Review 4 SH

Designed for arts and sciences, criminal justice, and other majors who need to build their algebraic skills in order to succeed in the next math or math-related courses required by their major. Most students are directed to this course as a result of placement tests. Concepts include solving first- and second-degree equations, understanding slopes and graphs of lines, solving simultaneous equations in several variables, solving rational equations, and graphing inequalities. Requires the analysis and solution of word problems. (Does not count toward graduation credit.)

MTH U100 Mathematics at Northeastern 1 SH

Designed for freshman math majors to introduce them to one another, their major, their college, and the University. Students are introduced to our advising system, register for next semester's courses, and learn more about co-op. Also helps students develop the academic and interpersonal skills necessary to succeed as a university student. *Prereq.* Math major.

MTH U110 College Algebra 4 SH

Covers laws of exponents, roots, graphing of equations and inequalities, special curves (that is, conic sections), functions and operations on functions, complex numbers, matrices, and vectors. If time permits, also explores elementary discrete probability and least squares curve fitting. *Prereq.* Primarily for BSET majors.

MTH U115 Mathematical Thinking 4 SH

Focuses on the development of mathematical thinking and its use in a variety of contexts to translate real-world problems into mathematical form and, through analysis, to obtain new information and reach conclusions about the original problems. Mathematical topics include counting principles and topics in probability theory such as Markov chains, linear regression, and the binomial distribution. *Coreq.* MTH U116.

MTH U116 Recitation for MTH U115 0 SH

Provides small-group discussion format to cover material in MTH U115. *Coreq.* MTH U115.

MTH U117 Interactive Mathematics 4 SH

Develops problem-solving skills while simultaneously teaching mathematics concepts. Each unit centers on a particular applied problem, which serves to introduce the relevant mathematical topics. These may include but are not limited to polling theory, rate of change, the concepts behind derivatives, probability, binomial distributions, and statistics. The course is not taught in the traditional lecture format and is particularly suited to students who work well in collaborative groups and who enjoy writing about the concepts they are learning. Assessment is based on portfolios, written projects, solutions to "problems of the week," and exams.

MTH U121 Precalculus 4 SH

Focuses on linear, polynomial, exponential, logarithmic, and trigonometric functions. Emphasis is placed on understanding, manipulating, and graphing these basic functions, their inverses and compositions, and using them to model real-world situations (that is, exponential growth and decay, periodic phenomena). Equations involving these functions are solved using appropriate techniques. Special consideration is given to choosing reasonable functions to fit numerical data. *Prereq.* Basic understanding of algebraic manipulation assumed, including exponents and polynomials.

MTH U130 College Math for Business and Economics 4 SH

Introduces students to some of the important mathematical concepts and tools (such as modeling revenue, cost and profit with functions) used to solve problems in business and economics. Assumes familiarity with the basic properties of linear, polynomial, exponential, and logarithmic functions. Topics include the method of least squares, regression curves, solving equations involving functions, compound interest, amortization, and other consumer finance models. (Graphing calculator required, see instructor for make and model.) *Prereq.* Basic knowledge of algebra, log, and exponential functions.

MTH U131 Calculus for Business and Economics 4 SH

Provides an overview of differential calculus including derivatives of power, exponential, logarithmic, logistic functions, and functions built from these. Derivatives are used to model rates of change, to estimate change, to optimize functions, and in marginal analysis. The integral calculus is applied to accumulation functions and future value. Emphasis is on realistic business and economics problems, the development of mathematical models from raw business data, and the translation of mathematical results into verbal expression appropriate for the business setting. Also features a semester-long marketing project in which students gather raw data, model it, and use calculus to make business decisions; each student is responsible for a ten-minute presentation. (Graphing calculator required, see instructor for make and model.) *Prereq.* MTH U130.

- MTH U141 Calculus 1** 4 SH
Serves as both the first half of a two-semester calculus sequence and as a self-contained one-semester course in differential and integral calculus. Basic concepts and techniques of differentiation and integration are introduced and applied to polynomial, exponential, log, and trigonometric functions. The derivative as rate of change and integral as accumulator are emphasized. Applications include optimization, growth and decay, area, volume, and motion. *Prereq. MTH U121 or equivalent.*
- MTH U142 Calculus 2** 4 SH
Continues MTH U141. Introduces additional techniques of integration and numerical approximations of integrals and the use of integral tables; further applications of integrals. Also introduces differential equations and slope fields, and elementary solutions. Introduces functions of several variables, partial derivatives, and multiple integrals. *Prereq. MTH U141.*
- MTH U151 Calculus and Differential Equations for Biology 1** 4 SH
Begins with the fundamentals of differential calculus and proceeds to the specific type of differential equation problems encountered in biological research. Presents methods for the solutions of these equations and how the exact solutions are obtained from actual laboratory data. Topics include differential calculus: basics, the derivative, the rules of differentiation, curve plotting, exponentials and logarithms, and trigonometric functions; using technology to understand derivatives; biological kinetics: zero- and first-order processes, processes tending toward equilibrium, bi- and tri-exponential processes, and biological half-life; differential equations: particular and general solutions to homogeneous and nonhomogeneous linear equations with constant coefficients, systems of two linear differential equations; compartmental problems: nonzero initial concentration, two-compartment series dilution, diffusion between compartments, population dynamics; and introduction to integration. *Prereq. MTH U121 or equivalent.*
- MTH U152 Calculus and Differential Equations for Biology 2** 4 SH
Continues MTH U151. Begins with the integral calculus and proceeds quickly to more advanced topics in differential equations. Introduces linear algebra and uses matrix methods to analyze functions of several variables and to solve larger systems of differential equations. Advanced topics in reaction kinetics are covered. The integral and differential calculus of functions of several variables is followed by the study of numerical methods in integration and solutions of differential equations. Provides a short introduction to probability. Covers Taylor polynomials and infinite series. Special topics include reaction kinetics: Michaelis-Menten processes, tracer experiments, and inflow and outflow through membranes. *Prereq. MTH U151.*
- MTH U165 Introduction to Mathematical Reasoning** 4 SH
Covers the basics of mathematical reasoning and problem solving to prepare incoming math majors for more challenging mathematical courses at Northeastern. Focuses on learning to write logically sound mathematical arguments and to analyze such arguments appearing in mathematical books and courses. Includes fundamental mathematical concepts such as sets, relations, and functions.
- MTH U170 Math Discovery and Computers** 4 SH
Provides students with marketable scientific computing skills, and uses those skills to explore open-ended mathematical problems. Through guided processes of computing, reflecting, discussing, and writing, offers students the opportunity to expand their capacities to think productively about problems that are new to them. Such capacities are useful in all future courses and forms of employment.
- MTH U180 Statistical Thinking** 4 SH
Introduces statistical thinking to students without using any sophisticated mathematics. Uses extensive class discussion and homework problems to cover statistical reasoning and to evaluate critically the usage of statistics by others. Readings from a wide variety of sources are assigned. Topics include descriptive statistics, sampling theory, and fundamentals of statistical inference (confidence intervals and hypothesis testing).
- MTH U201 History of Mathematics** 4 SH
Traces the development of mathematics from its earliest beginning to the present. Emphasis is on the contributions of various cultures including the Babylonians, Egyptians, Mayans, Greeks, Indians, and Arabs. Computations and constructions are worked out using the techniques and notations of these peoples. The role of mathematics in the development of science is traced throughout, including the contributions of Descartes, Kepler, Fermat, and Newton. More modern developments are discussed as time permits. *Prereq. Interest in mathematics, facility in arithmetic and elementary algebra.*
- MTH U203 Foundations of Mathematics** 4 SH
Investigates the modern revolutions in mathematics initiated by Cantor, Gödel, Turing, and Robinson in the fields of set theory, provability, computability, and analysis respectively, as well as provides background on the controversy over the philosophy and underlying logic of mathematics. *Prereq. Interest in mathematics, logic, and philosophy.*

- MTH U215 Game Theory** 4 SH
Uses the unifying theme of game theory to explore mathematical techniques for gaining an understanding of real-world problems. Includes matrix algebra, linear programming, probability, trees, von Neumann's minimax theorem, and Nash's theorem on equilibrium points. Considers zero-sum and non-zero-sum games, multiperson games, and the prisoner's dilemma. Explores the applications of game theory, including conflict analysis, and various issues in psychology, sociology, political science, economics, and business. *Prereq. Math SAT of at least 600 or permission of instructor.*
- MTH U220 Mathematics of Art** 4 SH
Presents mathematical connections and foundations for art. Topics vary and may include aspects of linear perspective and vanishing points, symmetry and patterns, tilings and polygons, Platonic solids and polyhedra, golden ratio, non-Euclidean geometry, hyperbolic geometry, fractals, and other topics. Includes connections and examples in different cultures.
- MTH U230 Discrete Mathematics** 4 SH
Provides the discrete portion of the mathematical background needed by students in electrical and computer engineering. Topics include Boolean algebra and set theory, logic, and logic gates; growth of functions, and algorithms and their complexity; proofs and mathematical induction; and graphs, trees, and their algorithms. As time permits, additional topics may include methods of enumeration and finite-state machines.
- MTH U240 Intensive Calculus for Engineers** 6 SH
Contains the material from the first semester of MTH U241, preceded by material emphasizing the strengthening of precalculus skills. Topics include properties of exponential, logarithmic, and trigonometric functions; differential calculus; and introductory integral calculus.
- MTH U241 Calculus 1 for Science and Engineering** 4 SH
Covers definition, calculation, and major uses of the derivative, as well as an introduction to integration. Topics include limits; the derivative as a limit; rules for differentiation; and formulas for the derivatives of algebraic, trigonometric, and exponential/logarithmic functions. Also discusses applications of derivatives to motion, density, optimization, linear approximations, and related rates. Topics on integration include the definition of the integral as a limit of sums, antidifferentiation, the fundamental theorem of calculus, and integration by substitution.
- MTH U242 Calculus 2 for Science and Engineering** 4 SH
Covers further techniques and applications of integration, infinite series, and introduction to vectors. Topics include integration by parts; numerical integration; improper integrals; separable differential equations; and areas, volumes, and work as integrals. Also discusses convergence of sequences and series of numbers, power series representations and approximations, 3D coordinates, parameterizations, vectors and dot products, tangent and normal vectors, velocity, and acceleration in space. *Prereq. MTH U241.*
- MTH U243 Calculus 2 for Engineering Technology** 4 SH
Builds upon the differential and integral calculus topics in MTH U241 to develop additional tools such as partial derivatives and multiple integrals needed by students of engineering technology. This course is not equivalent to MTH U242. *Prereq. MTH U241.*
- MTH U280 Statistics and Software** 4 SH
Provides an introduction to basic statistical techniques and the reasoning behind each statistical procedures. Covers appropriate statistical data analysis methods for applications in health and social sciences. Also examines a statistical package such as SPSS or SAS to implement the data analysis on computer. Topics include descriptive statistics, elementary probability theory, parameter estimation, confidence intervals, hypothesis testing, nonparametric inference, and analysis of variance and regression with a minimum of mathematical derivations. *Prereq. Nonmath majors.*
- MTH U300 Co-op Reflections Seminar 1** 1 SH
Intended for math majors who have completed their first co-op assignment. Examines the mathematical problems encountered on the job, and relates them to courses already taken and to the student's future program. Faculty members and other guests contribute to the discussion. Grades are determined by the student's participation. *Prereq. Math major, after first co-op.*
- MTH U314 Mathematical Encounters** 4 SH
Covers interesting and significant developments in pure and applied mathematics, from ancient times to the present. Fundamental mathematical ideas have a power and utility that are undeniable and a beauty and clarity that can be inspirational. Selected topics may include: prime and irrational numbers, different infinities and different geometries, map coloring, and famous unsolved and recently solved problems. Provides students with an opportunity for hands-on experience actually doing some of the mathematics discussed and to research topics in the library and on the Web. *Prereq. MTH U115.*

- MTH U341 Calculus 3 for Science and Engineering** 4 SH
 Extends the techniques of calculus to functions of several variables; introduces vector fields and vector calculus in two and three dimensions. Topics include lines and planes, 3D graphing, partial derivatives, the gradient, tangent planes and local linearization, optimization, multiple integrals, line and surface integrals, the divergence theorem, and theorems of Green and Stokes with applications to science and engineering and several computer lab projects. *Coreq. MTH U342. Prereq. MTH U242.*
- MTH U342 Recitation for MTH U341** 0 SH
 Provides small-group discussion format to cover material in MTH U341. *Coreq. MTH U341.*
- MTH U343 Differential Equations and Linear Algebra for Engineering** 4 SH
 Studies ordinary differential equations, their applications, and techniques for solving them including numerical methods (through computer labs using MS Excel and MATLAB), Laplace transforms, and linear algebra. Topics include linear and nonlinear first- and second-order equations and applications include electrical and mechanical systems, forced oscillation, and resonance. Topics from linear algebra, such as matrices, row-reduction, vector spaces, and eigenvalues/eigenvectors, are developed and applied to systems of differential equations. *Coreq. MTH U344. Prereq. MTH U242.*
- MTH U344 Recitation for MTH U343** 0 SH
 Provides small-group discussion format to cover material in MTH U343. *Coreq. MTH U343.*
- MTH U345 Ordinary Differential Equations** 4 SH
 Studies ordinary differential equations from both the quantitative and qualitative points of view: first-order equations and systems, second-order equations, analytic solution techniques, numerical methods and visualization (through computer labs), and applications to mechanical and electrical oscillations. Emphasizes the dynamical systems approach including instances of chaos. *Prereq. MTH U242.*
- MTH U371 Linear Algebra** 4 SH
 Uses the Gauss-Jordan elimination algorithm to analyze and find bases for subspaces such as the image and kernel of a linear transformation. Covers the geometry of linear transformations: orthogonality, the Gram-Schmidt process, rotation matrices, and least squares fit. Examines diagonalization and similarity, and the spectral theorem and the singular value decomposition. Is primarily for math and science majors; applications are drawn from many technical fields. Computation is aided by the use of software such as Maple or MATLAB, and graphing calculators. *Prereq. MTH U242.*
- MTH U385 Introduction to Multisample Statistics** 4 SH
 Provides an introduction to statistical techniques, including multisample statistics and regression. Offers an opportunity to learn to choose appropriate statistical data analysis methods for applications in various scientific fields and to learn to use a statistical package to implement the data analysis. Topics include descriptive statistics, elementary probability theory, parameter estimation, confidence intervals, hypothesis testing, analysis of variance, and regression. May also include optimal design. *Prereq. MTH U115 or MTH U141; not open to students who have completed MTH U280.*
- MTH U400 Co-op Reflections Seminar 2** 1 SH
 Intended for math majors who have completed their second co-op assignment. Its goal is to examine the mathematical problems encountered on the job, and relate them to courses already taken and to the student's future program. Faculty members and other guests contribute to the discussion. Grades are determined by the student's participation in the course. *Prereq. Math major, after second co-op.*
- MTH U430 Number Theory** 4 SH
 Introduces number theory. Topics include linear diophantine equations, congruences, design of magic squares, Fermat's little theorem, Euler's formula, Euler's phi function, computing powers and roots in modular arithmetic, the RSA encryption system, primitive roots and indices, and the law of quadratic reciprocity. As time permits, may cover diophantine approximation and Pell's equation, elliptic curves, points on elliptic curves, and Fermat's last theorem.
- MTH U433 Combinatorial Mathematics** 4 SH
 Introduces techniques of mathematical proofs including mathematical induction. Explores various techniques for counting such as permutation and combinations, inclusion-exclusion principle, recurrence relations, generating functions, Polya enumeration, and the mathematical formulations necessary for these techniques including elementary group theory and equivalence relations. *Prereq. Two semesters of calculus.*
- MTH U441 Chaotic Dynamical Systems** 4 SH
 Presents an experimental study using simple mathematical models of chaotic behavior in dynamical systems. (Such systems are frequently found in science and industry.) Goals include the development of skills of experiment and inquiry, integration of visual and analytical modes of thought, and appreciation of issues of problem formulation and representation. *Prereq. Two semesters of calculus.*

- MTH U481 Probability and Statistics** 4 SH
Focuses on probability theory. Topics include sample space; conditional probability and independence; discrete and continuous probability distributions for one and for several random variables; expectation; variance; special distributions including binomial, Poisson, and normal distributions; law of large numbers; and central limit theorem. Also introduces basic statistical theory including estimation of parameters, confidence intervals, and hypothesis testing. *Prereq.* MTH U341.
- MTH U525 Applied Analysis** 4 SH
Demonstrates the applications of mathematics to interesting physical and biological problems. Methods are chosen from ordinary and partial differential equations, calculus of variations, Laplace transform, perturbation theory, special functions, dimensional analysis, asymptotic analysis, and other techniques of applied mathematics. *Prereq.* MTH U341, MTH U545, and MTH U371.
- MTH U530 Numerical Analysis** 4 SH
Considers various problems including roots of nonlinear equations; simultaneous linear equations: direct and iterative methods of solution; eigenvalue problems; interpolation; and curve fitting. Emphasizes understanding issues rather than proving theorems or coming up with numerical recipes. *Prereq.* Three semesters of calculus.
- MTH U532 Numerical Solutions of Differential Equations** 4 SH
Covers numerical problems in interpolation, differentiation, integration, Fourier transforms, and the solving of differential equations. Emphasizes practical methods and techniques. The heart of the course is a study of modern methods for finding numerical solutions of ordinary differential equations, both initial value problems and boundary value problems. Homework and projects are based on MATLAB. *Prereq.* Three semesters of calculus.
- MTH U535 Mathematical Topics in Computer Vision** 4 SH
Studies topics in computer vision and the mathematical approaches to them. These include but are not limited to detection of object boundaries in images, nonlinear diffusion, optimization, and curve evolution. Students are required to be able to program algorithms that the course develops. *Prereq.* MTH U341 and programming experience with Matlab or an equivalent computer algebra system; familiarity with matrices and their properties is helpful.
- MTH U541 Advanced Calculus** 4 SH
Offers a deeper and more generalized look at the ideas and objects of study of calculus. Topics include the generalized calculus of n -space, the inverse and implicit function theorems, differential forms and general Stokes-type theorems, geometry of curves and surfaces, and special functions. *Prereq.* MTH U341 and MTH U371.
- MTH U545 Fourier Series and PDEs** 4 SH
Provides a first course in Fourier series, Sturm-Liouville boundary value problems, and their application to solving the fundamental partial differential equations of mathematical physics: the heat equation, the wave equation, and Laplace's equation. Green's functions are also introduced as a means of obtaining closed-form solutions. *Prereq.* MTH U345.
- MTH U550 Real Analysis** 4 SH
Provides the theoretical underpinnings of calculus and the advanced study of functions. Emphasis is on precise definitions and rigorous proof. Topics include the real numbers and completeness, continuity and differentiability, the Riemann integral, the fundamental theorem of calculus, inverse function and implicit function theorems, and limits and convergence. Required of all mathematics majors. *Prereq.* MTH U165, MTH U341, and MTH U371.
- MTH U555 Complex Variables** 4 SH
Provides an introduction to the analysis of functions of a complex variable. Starting with the algebra and geometry of complex numbers, basic derivative and contour integral properties are developed for elementary algebraic and transcendental functions as well as for other analytic functions and functions with isolated singularities. Power and Laurent series representations are given. Classical integral theorems, residue theory, and conformal mapping properties are studied. Applications of harmonic functions are presented as time permits. *Prereq.* MTH U341.
- MTH U560 Geometry** 4 SH
Studies classical geometry and symmetry groups of geometric figures, with an emphasis on Euclidean geometry. Teaches how to formulate mathematical propositions precisely and how to construct and understand mathematical proofs. Provides a line between classical and modern geometry with the aim of preparing students for further study in group theory and differential geometry. *Prereq.* MTH U343 or MTH U371.
- MTH U565 Topology** 4 SH
Introduces the student to fundamental notions of topology. Introduces basic set theory, then covers the foundations of general topology (axioms for a topological space, continuous functions, homeomorphisms, metric spaces, the subspace, product and quotient topologies, connectedness, compactness, and the Hausdorff condition). Also introduces algebraic and geometric topology (homotopy, covering spaces, fundamental groups, graphs, surfaces, and manifolds) and applications. Other topics are covered if time permits. *Prereq.* MTH U341 and MTH U371.

- MTH U571 Advanced Linear Algebra** 4 SH
Provides a more detailed study of linear transformations and matrices: LU factorization, QR factorization, Spectral theorem and singular value decomposition, Jordan form, positive definite matrices, quadratic forms, partitioned matrices, and norms and numerical issues. Topics and emphasis change from year to year. *Prereq.* MTH U371.
- MTH U575 Group Theory** 4 SH
Presents basic concepts and techniques of the group theory: symmetry groups, axiomatic definition of groups, important classes of groups (abelian groups, cyclic groups, additive and multiplicative groups of residues, and permutation groups), Cayley table, subgroups, group homomorphism, cosets, the Lagrange theorem, normal subgroups, quotient groups, and direct products. Studies structural properties of groups. Possible applications include geometry, number theory, crystallography, physics, and combinatorics. *Prereq.* MTH U165, MTH U341, and MTH U371.
- MTH U576 Rings and Fields** 4 SH
Introduces commutative rings, ideals, integral domains, fields, and the theory of extension fields. Topics include Gaussian integers, Galois groups, and the fundamental theorem of Galois theory. Applications include the impossibility of angle-trisection and the general insolubility of fifth- and higher-degree polynomials. Other topics are covered as time permits. *Prereq.* MTH U371.
- MTH U581 Statistics and Stochastic Processes** 4 SH
Continues topics introduced in MTH U481. The first part of the course covers classical procedures of statistics including the t-test, linear regression, and the chi-square test. The second part provides an introduction to stochastic processes with emphasis on Markov chains, random walks, and Brownian motion, with applications to modeling and finance. *Prereq.* MTH U481.
- MTH U585 Introduction to Actuarial Math** 4 SH
Introduces basic aspects of life contingencies. The theory is illustrated by worked examples and reinforced through numerous exercises. Prepares students to take the relevant actuarial exam. *Prereq.* MTH U481 is recommended.
- MTH U606 Mathematical and Computational Methods for Physics** 4 SH
Covers advanced mathematical methods topics that are commonly used in the physical sciences, such as complex calculus, Fourier transforms, special functions, and the principles of variational calculus. Applies these methods to computational simulation and modeling exercises. Introduces basic computational techniques and numerical analysis, such as Newton's method, Monte Carlo integration, gradient descent, and least squares regression. Uses a simple programming language, such as MATLAB, for the exercises. *Same as PHY U606. Prereq.* PHY U303, MTH U341, and MTH U343 or MTH U345.
- MTH U681 Probability and Risks** 4 SH
Reviews main probability and statistics concepts from the point of view of decision risks in actuarial and biomedical contexts, including applications of normal approximation for evaluating statistical risks. Also examines new topics, such as distribution of extreme values and nonparametric statistics with examples. May be especially useful for students preparing for the first actuarial exam on probability and statistics. *Prereq.* MTH U481.
- MTH U682 Theory of Interest and Basics of Life Insurance** 4 SH
Reviews basic financial instruments in the presence of interest rates, including the measurement of interest and problems in interest (equations of value, basic and more general annuities, yield rates, amortization schedules, bonds and other securities). Examines numerous practical applications. Also introduces problems of life insurance with examples. May be especially useful for students preparing for the second actuarial exam on theory of interest. *Prereq.* MTH U481.
- MTH U725 Applied Mathematics Capstone** 4 SH
Offers students of mathematics the experience of utilizing their skills to study problems that arise in industry and other real-world settings. Provides students the opportunity to build on exciting industrial experiences they may have had through co-op or other employment. Fulfills the Arts and Sciences experiential education requirement, and is intended for juniors and seniors with some experience or interest in applications of mathematics. *Prereq.* Two years calculus and junior or senior standing.
- MTH U921 Directed Study** 1 SH
MTH U922 Directed Study 2 SH
MTH U923 Directed Study 3 SH
MTH U924 Directed Study 4 SH
Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. *Prereq.* Permission of instructor.

MTH U951 Experiential Education Directed Study 4 SH

Draws upon the student's approved experiential activity and integrates it with study in the academic major. Restricted to those junior and senior mathematics majors who are using it to fulfill their experiential education requirement; for these students it may count as a mathematics elective, subject to approval by instructor and adviser. *Prereq. Math major with junior or senior standing.*

MTH U970 Junior/Senior Honors Project 1 4 SH

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. Culminating experience in the University Honors Program. Combined with Junior/Senior Project 2 or college-defined equivalent for 8-credit honors project. *Prereq. Honors program participation.*

MTH U971 Junior/Senior Honors Project 2 4 SH

Focuses on second semester of in-depth project in which a student conducts research or produces a product related to the student's major field. Culminating experience in the University Honors Program. *Prereq. MTH U970 and honors program participation.*