

MATHEMATICS

The mathematics courses offered below are designed to help the student attain: 1) an understanding and appreciation of the fundamental methods of deductive reasoning; 2) adequate preparation for work in graduate and professional school; 3) facility in the use of mathematics as a tool; 4) thorough familiarity with modern mathematical concepts.

MAJOR IN MATHEMATICS (36 credits)**REQUIRED:**

MTH 122 Discrete Math, is required of all Mathematics majors who minor in Secondary Education

MTH 236 Calculus IV, together with prerequisites Calculus I, II & III or the equivalent of any or all of these (e.g., high school, AP)

MTH 244 Linear Algebra

MTH 441 Historical Perspectives in Mathematics (this Jr/Sr capstone course requires a project to be evaluated and accepted by the Math faculty)

Choose one course (3 credits) from:

MTH 333 Geometry

MTH 431 Modern Algebra I

MTH 437 Theory of Numbers

MTH 445 Real Analysis

Choose one course (3 credits) from:

MTH 336 Differential Equations (prerequisite: MTH 126)

MTH 341 Probability (prerequisite: MTH 125)

MTH 342 Statistics

MTH 439 Numerical Analysis (prerequisite: MTH 126)

Choose the remaining credits from courses in Mathematics numbered 111 or higher.

MINOR IN MATHEMATICS (18 credits)**REQUIRED:**

MTH 236 Calculus IV, together with the prerequisites Calculus I, II and III or the equivalent of any or all of these (e.g., high school, AP)

15 credits from Mathematics courses numbered 111 or higher.

MINOR IN MATHEMATICS FOR ELEMENTARY EDUCATION (18 credits)**REQUIRED:**

MTH 111 Math as a Human Pursuit MTH 125 Calculus I

MTH 122 Discrete Math MTH 126 Calculus II

Choose remaining 6 credits from mathematics courses numbered above MTH 111.

Only Elementary Education Majors may elect this minor.

COURSE DESCRIPTIONS

017. Basic Algebraic Skills

3 credits

The course treats the following topics: operations on real numbers, linear equations and inequalities, exponents and polynomials, rational expression, roots and radicals, and quadratic equations. Included is a review of basic computational and problem solving skills. Students may not receive credit for both this course and EDC 201.

093. Pre-Calculus

3 credits

This course is intended for those who wish to study the Calculus, but need some preliminary mathematical work. It begins with some fundamentals of algebra, including sets, functions, and graphs. It treats polynomial and rational functions, and includes the usual transcendental functions. It considers trigonometric identities and certain elements of analytic geometry, including conic sections. Some study of combinatorics is pursued.

111. Mathematics As A Human Pursuit

3 credits

It is widely accepted that mathematics is necessary for modern technology; mathematics also makes a basic contribution to other aspects of human life. This course is designed to integrate the student's knowledge and study of mathematics with other experiences and disciplines. It pursues a problem solving approach to some consumer issues, the arts, elements of probability, voting, some number theory, and geometry. At least one segment of the course will treat contemporary concerns found in the news media that are based on statistical concerns.

122. Discrete Mathematics

3 credits

This is an introduction to logical and algebraic structures and combinatorial mathematics. Topics include methods of proof, recursion, Boolean algebra, recurrence relations, graph theory, finite automata, and theory of computation with examples of applications to the field of computer science. Required of all Mathematics majors who minor in Secondary Education.

125. Calculus I

3 credits

Including a review of pre-calculus, this course is an introduction to the calculus through concepts involving limits of functions, continuity at a point, and the derivative. Differentiation of products, quotients, and composite functions are treated. Implicit differentiation, the Extreme Value Theorem and the Mean Value Theorem are also considered. Graph sketching noting asymptotic behavior, extrema, concavity, and related concepts complete the content. The course will include a laboratory session with the computer algebra system Maple and will incorporate the use of a scientific graphics calculator as a regular part of the study. Each student is expected to have either the suggested calculator or one approved by the instructor.

126. Calculus II**3 credits**

Continuing the introduction to the calculus, the theory and techniques of integration are introduced with analytic geometry, then Riemann sums, and then the Fundamental Theorem of Calculus. Applications of the definite integral include area of regions, volumes, arc length and surface area. The laboratory section will continue the use of the Computer Algebra System and the graphics calculator will again be used on a regular basis. **Prerequisite: MTH 125 or department approval.**

235. Calculus III**3 credits**

This course continues the calculus sequence. A main thrust is its opening in-depth study of infinite sequences and series, including power series, Taylor series and Taylor polynomials. Conic sections, parametric equations and polar coordinates—together with whatever review is required—are studied as they relate to calculus concepts. Vector theory and the geometry of space are also treated. **Prerequisite: MTH 126 or department approval.**

236. Calculus IV**3 credits**

This concluding portion of the calculus sequence begins with a brief review of vectors followed by a pursuit of vector-valued functions. Functions of several variables, with their attendant partial derivatives, extrema, and multiple integration with applications are studied. The directional derivative, tangent planes and normal lines follow from the vector considerations. **Prerequisite: MTH 235 or department approval.**

244. Linear Algebra**3 credits**

This course studies linear transformations and linear algebras, including the study of solutions to systems of linear equations. It treats the theory of matrices leading to the theory of vector spaces over a field. It studies the operations on matrices, including determinants, and uses these concepts in a variety of applications. **Prerequisite: MTH 125 or consent of the instructor.**

333. Geometry**3 credits**

This course is a critical examination of the foundations of plane geometry, using an axiomatic approach. It includes the study of both Euclidean and non-Euclidean geometries. Proofs are emphasized.

336. Differential Equations**3 credits**

This course studies differential equations from a practical viewpoint. It combines the formal exercises of integrating the various standard types of differential equations with the setting-up of equations for problems from the natural sciences.

Prerequisite: MTH 126 or equivalent.

341. Probability**3 credits**

This course is an introduction to probabilistic models and the theory of probability. It includes the study of conditional probability, random variables of one, two and higher dimensions, as well as some characterizations of discrete and continuous random variables. **Prerequisite: MTH 125 or consent of the instructor.**

342. Statistics**3 credits**

This course presents an introduction to inferential statistics beginning with a brief overview of descriptive statistics and probability, including discrete and continuous distributions, and the central limit theorem. The main emphasis is on estimation, hypothesis testing, and selected tests for small samples. It culminates in analyses of variance and bivariate data with correlation and linear regression.

Prerequisite: MTH 125 or consent of the instructor.

355. Independent Study**1-3 credits****390. Internship****3-9 credits****431. Modern Algebra****3 credits**

This course is that portion of Abstract Algebra that studies elementary group theory. It considers the properties of groups, subgroups, and functions; this leads to groups of permutations and groups isomorphic to them. Homomorphisms of groups along with the induced quotient groups culminate in the Fundamental Homomorphism Theorem; this rounds out the course.

432. Modern Algebra II**3 credits**

This course is that portion of Abstract Algebra that studies elementary ring theory including ideals and quotient rings. It follows with a study of field theory and closes with a look at rings of polynomials and extension fields. **Prerequisite: MTH 431 or consent of instructor.**

437. Theory of Numbers**3 credits**

This course treats the elementary properties of integers. It studies divisibility of integers, Euclid's Algorithm, solutions to Diophantine Equations, prime numbers, congruencies and quadratic residues.

439. Numerical Analysis (CMP 439)**3 credits**

This course develops algorithms involving iteration to approximate solutions to various kinds of problems. It studies finite differences, interpolating polynomials for numerical differentiation and integration, as well as the solution of equations and differential equations. The hand calculator and personal computer are the normal tools for this course. **Prerequisite: MTH 126 or consent of the instructor.**

441. Historical Perspectives in Mathematics**3 credits**

This course, the capstone, is a seminar on historical topics from the great theorems and thinkers of mathematics. Students make oral and written presentations from their independent, though not necessarily original, research. Portfolios are to be kept by each student. **Prerequisite: Junior or Senior Math major or consent of the instructor.**

445. Real Analysis**3 credits**

This course is a modern, topological approach to real analysis. It deals with the concepts of bounded sets; convergence of sequences and sub-sequences of real numbers; continuous functions on metric spaces; open and closed sets; connectedness, completeness, and compactness; Riemann integrals and derivatives; law of the mean; fundamental theorems of calculus; and improper integrals. **Prerequisite: MTH 235 or consent of the instructor.**

446. Topics In Mathematics**3 credits**

Students with demonstrated skills and background may select, with a designated professor, topics to be studied during a semester. Topics might be chosen from such subjects as vector analysis, complex variables, cryptology, fractals, chaos theory, or even actuarial studies, including the SPSS statistical computer package. **Prerequisite: consent of the instructor.**



Math professors assist a student