## CHAIRED BY JOAN BURKE, ED.D.

The department offers a B.A. in mathematics and a minor in mathematics.

**Requirements for Mathematics Major**

DEGREE: Bachelor of Arts

Liberal Arts Core (see page 36) .....54 credits
Major
Mathematics .....43 credits
Open Electives .....23 credits
Total .....120 credits

STUDENTS WHO MAJOR IN MATHEMATICS MUST COMPLETE:

MA 214 Linear Algebra
MA 220 Calculus I (satisfies core requirement)
MA 221 Calculus II
MA 309 Foundations of Mathematics
MA 324 Calculus III
MA 325 Calculus IV
MA 420 Abstract Algebra
MA 450 Coordinating Seminar
MT 180 Multimedia I
MT 280 Multimedia II

and at least four additional mathematics courses at the 200 level or above, two of the four electives must be chosen from: MA 207, MA 307, MA 340, and MA 411.

## STATEMENT OF OUTCOMES ASSESSMENT

Students are required to successfully complete the course MA 450 Coordinating Seminar. This course reviews the mathematics concepts that students learned in their major required courses and introduces new topics that are not covered in the major courses. In addition, this course is designed to assess the students' understanding of important concepts and mathematical techniques in these courses, their ability to see the connectivity among the different areas of mathematics, and their ability to communicate mathematics in a clear and coherent manner. Students are given a set of essay questions to be researched in this course. These questions are broad in nature and deal with the underlying concepts that tie together the different areas in the major. An oral presentation of one of the questions is required. Results of the outcomes assessment are used by faculty to determine if content of the courses or the curriculum needs to be revised.

**Requirements for a Mathematics Major**

**With a Double Major in Education or with Certification in Education K–12:**

Students who major in mathematics and education or who major in mathematics with certification in education must complete MA 207 and MA 307 to meet the requirements for a mathematics major and must meet all the requirements of the Division of Education concerning admission, continuance, and completion of the program. Students who major in mathematics and elementary education must complete MT 180 Multimedia I and MT 280 Multimedia II.

**Requirements for Elementary School**
**With Subject Matter Specialization Endorsement (Middle School):**
Candidates for the Mathematics Middle School Endorsement will be required to take a placement test to determine the courses needed to complete the Mathematics Middle School Endorsement.

**Required:**
MA 140 Discrete Mathematics
MA 207 Applications of Statistics I
MA 220 Calculus I

**Electives:**
MA 130 Foundations of Analysis I *
MA 131 Foundations of Analysis II *
MA 208 Applications of Statistics II
MA 214 Linear Algebra
MA 221 Calculus II
MA 307 Modern Geometry
MA 309 Foundations of Mathematics

** Selection of a MA 130 and MA 131 depends on placement test results.*

**Requirements for a Mathematics Minor**
A total of at least 20 credits is required for a mathematics minor. No more than two courses from the student's major concentration requirements may be included in the minor. Students must attain a grade of C or better in all courses applied to the minor.

**Required courses:**
MA 214 Linear Algebra
MA 220 Calculus I
MA 221 Calculus II
MA 309 Foundations of Mathematics
and at least **two** additional mathematics courses at the 300 level or above.

**Core Requirement**
The choice of course to meet the core requirement in mathematics depends on: a) results of a college-administered mathematics placement test; b) secondary school preparation; and c) potential major. Students are assigned to a developmental course, a 100 level course or a 200 level course.

# COURSE DESCRIPTIONS

**MA 085 Basic Mathematical Techniques**
Refreshes basic computational skills. Required of all freshmen and new students whose test scores indicate weakness in computational skills. Does not satisfy the core requirement. 3 non-degree credits. *Students may not withdraw from this course.

**MA 090 Basic Algebraic Skills**
Refreshes basic algebraic skills. Required of all freshmen and new students whose test scores indicate weakness in the skills of elementary algebra. Does not satisfy the core requirement. 3 non-degree credits. **Prerequisite: MA 085 or placement test.** *Students may not withdraw from this course.

**MA 112 Concepts of Mathematics (3)**
Treats topics used in various disciplines. Topics are chosen from among the algebra of functions, logic, statistics, probability, consumer mathematics, and special topics. Not open to students majoring in mathematics, biology, chemistry and medical technology. **Prerequisite: MA 090 or placement test.**

**MA 120 Applied Mathematics for Business and the Social Sciences (3)**
Applies the concepts of functions and graphing to real world problems in business and the social sciences. Examines methods of solving systems of equations and inequalities, matrices, and linear programming. **Prerequisite: Placement test.**

**MA 130 Foundations of Analysis I (3)**
Studies the real number system, algebraic expressions, exponents, radicals, solutions of equations and inequalities, rational and polynomial functions; emphasizes the use of algebraic techniques in the solution of problems from a variety of disciplines. **Prerequisite: MA 090 or placement test.**

**MA 131 Foundations of Analysis II (3)**
Concentrates on the trigonometric and inverse trigonometric functions, their graphs, properties and relations; also included are polar coordinates, and the conic sections. Recommended as preparation in trigonometry for the study of calculus. **Prerequisite: MA 130.**

**MA 140 Discrete Mathematical Structures (3)**
Studies a variety of finite mathematical structures and their applications with emphasis on topics which are important to computer science. Topics include: algorithms, logic and sets, graph theory, combinatorics, finite probability spaces and recurrence relations. **Prerequisite: MA 090 or placement test.**

**MA 207 Applications of Statistics I (3)**
Introduces the fundamentals of statistics as employed in a variety of disciplines. Includes sampling, descriptive statistics, probability, discrete and continuous probability distributions, hypothesis testing, correlation and regression. **Prerequisite: Core requirement in mathematics.**

**MA 208 Applications of Statistics II (3)**
Extends the study of statistical procedures to include regression analysis, estimates and sample sizes, tests comparing two parameters, ANOVA, and non-parametric methods. **Prerequisite: MA 207.**

**MA 214 Linear Algebra (3)**
Studies the properties and techniques of matrices, determinants, vector spaces, bases, linear dependence, linear transformation and orthogonality. **Prerequisite: MA 130.**

**MA 220 Calculus I (4)**
Develops the basic theorems of calculus; develops the concepts of limit and continuity; studies techniques for finding the limit and the derivative of algebraic and trigonometric functions; applies the techniques of calculus to curve sketching, the study of motion and other fields of application; introduction to integral calculus. **Prerequisite: MA 131 or placement test.**

**MA 221 Calculus II (4)**
Continues the development of the basic theorems of calculus; applications of the integral; differentiation and integration of exponential, logarithmic, trigonometric and inverse trigonometric functions; and some techniques of integration. **Prerequisite: MA 220 or placement test.**

**MA 307 Modern Geometry (3)**
Considers the axiomatic approach to geometry; compares the various analyses of Euclid's fifth Postulate and resulting ono-Euclidean geometries; studies several finite geometries. (Cycled) **Prerequisite: MA 309 or Departmental approval.**

**MA 309 Foundations of Mathematics (3)**
Introduction to concepts and tools used in abstract mathematics. Emphasis on writing of proofs. Elementary logic and set theory, formal axiom systems, transfinite numbers, the real number system, and the foundations of mathematics. (Cycled) **Prerequisite: MA 220.**

**MA 324 Calculus III (4)**
Extends the study of the techniques of integration; studies series, parametric equations, conic sections and vectors in a plane; includes applications. (Cycled) **Prerequisite: MA 221.**

**MA 325 Calculus IV (3)**
Completes the study of series and vectors and extends the concepts and techniques of the calculus of one variable to several variables. (Cycled) **Prerequisite: MA 324.**

**MA 331 Number Theory (3)**
Introduces the theory of numbers, including prime numbers, perfect numbers, the divisibility properties of the integers, congruences and Euler function. (Cycled) **Prerequisite: MA 220.**

**MA 340 Differential Equations (3)**
Presents methods for solving first- and second-order ordinary differential equations; systems of ordinary differential equations; applications are included. (Cycled) **Prerequisite: MA 324.**

**MA 409 Numerical Analysis I (3)**
Presents the fundamentals of numerical computation to solve problems requiring computerized numerical analysis. Topics include numerical methods for solving single variable equations and linear and non-linear systems of equations, interpolation and approximation. (Cycled) **Prerequisite: MA 220.**

**MA 411 Introduction to Real Analysis (3)**
A rigorous treatment of the basic concepts of real analysis, including limits, continuity, the derivative and the Riemann integral. Also considered will be the elementary topology of the real line and plane, sequences, series, and uniform convergence. (Cycled) **Prerequisite: MA 324.**

**MA 420 Abstract Algebra (3)**
Explores algebraic structures—groups, rings, fields and integral domains; also, Peano's postulates and elementary number theory. (Cycled) **Prerequisite: MA 309.**

**MA 450 Coordinating Seminar (1)**
This course will review the mathematics concepts that students learned in their major required courses, show the interconnectivity between the various mathematics disciplines, and introduce new topics that are not covered in the major courses. Also, students will be guided in their research questions for their outcomes assessment. Limited to second semester juniors and seniors. Pass/Fail.

**MA 479 Cooperative Education (3)**
Provides for the integration of classroom study with a specific, planned period of supervised learning through paid work experience related to the student's career goals. **Prerequisite: Departmental approval.**

**MA 499 Independent Study (3)**
Offers opportunity for in-depth study of a topic of particular interest to a student; arranged by student with agreement of faculty advisor and consent of the department chair. Limited to junior and senior majors in mathematics.

**MT 180 Multimedia I (3)**
Introduces underlying concepts and applications to multimedia. Topics include: presentation software, audio and video technology, on-line communications and ethical issues related to video imagery in marketing and persuasion techniques. Additional technologies include: experiences in using scanners, digital cameras, camcorders, and press programs to CD/DVD. **Prerequisite: Departmental approval.**

**MT 280 Multimedia II (3)**
This course provides a comprehensive hands-on introduction to the fundamental concepts of multimedia development. Topics include hypermedia development, scripting language, development of an interactive learning tools, exploration of research issues related to the impact of authoring software and hypermedia technology on the learning process, integration and synchronization of multimedia, including text, graphics, animation, digital video, and sound. **Prerequisite: MT 180 or departmental approval.**