Department/Program:

Mathematics

Students intending to work in scientific professions are encouraged to pursue a Bachelor of Science degree. The Bachelor of Arts degree is for those who want a core of mathematics courses with a broader background in the humanities or the arts.

Majors preparing for graduate study should take as many courses as possible in the department. Seniors in the department will take an assessment exam and participate in an exit interview.

Courses

MATH 002 Mathematics for Elementary Teachers (3 hours)

A course designed to deepen prospective elementary school teachers' understanding of mathematics. Using reasoning and logic to understand the connections between various mathematical ideas will be emphasized.

(Normally offered each fall semester.)

MATH 007 Statistics (3 hours)

A study of topics essential to an understanding of statistics and their applications. Topics include probability, discrete and normal probability distributions, sample variability, the central limit theorem, and linear regression.

(Normally offered each spring semester.)

MATH 008 Mathematics for Liberal Arts (3 hours)

An investigation of the application of mathematical reasoning and problem solving. Topics to be covered may include networks, linear programming, data sampling and analysis, voting systems, game theory, measurement analysis, and coding.

Prerequisite(s): Appropriate placement score.

(Normally offered each semester.)

MATH 010 College Algebra (3 hours)

A study of linear and quadratic equations and inequalities and their graphs; systems of equations and inequalities, algebraic exponential and logarithmic functions and their graphs. Other topics may be selected from sets, complex numbers, sequences and series, and probability.

Prerequisite(s): Appropriate placement score.

(Normally offered each semester.)

MATH 050 Pre-Calculus (4 hours)

A study of elementary functions, their graphs, and applications, including polynomial, rational, algebraic, exponential, logarithmic, trigonometric, and metric functions. Scientific calculators are required and graphing calculators are recommended.

Prerequisite(s): Appropriate placement score or grade of "C" or better in MATH-010.

(Normally offered each semester.)

MATH 060 Calculus for Management, Biological, and Social Sciences (4 hours)

A calculus course for non-mathematics majors. Topics include limits, continuity, differentiation, and integration with emphasis on relevant applications.

Prerequisite(s): Appropriate placement score or grade of "C" or better in MATH-010.

(Normally offered each fall semester.)

MATH 065 Calculus for Biologists (4 hours)

A calculus course that emphasizes biological applications. Topics include Malthusian growth, limits, continuity, differentiation, optimization, differential equations, and integration. Assignments are given that involve spreadsheets and computer algebra systems.

Prerequisite(s): Appropriate placement score or grade of "C" or better in MATH-010.

(Normally offered each spring semester.)

MATH 090 Selected Topics (1-5 hours)

A course designed to treat subject matter not covered in other standard courses. The title, content, and credit hours will be determined by mutual interests of faculty and students.

MATH 105 Calculus I (5 hours)

An introduction to calculus of a single variable. Topics include limits, continuity, differentiation, and beginning integration with applications. Assignments are given that help build proficiency in the use of a computer algebra system.

Prerequisite(s): Appropriate placement score or grade of "C" or better in MATH-050.

(Normally offered each semester.)

MATH 106 Calculus II (5 hours)

A continuation of Mathematics 105. Topics studied include integration techniques and applications, differential equations, numerical approximations, sequences and series, and vectors. Assignments are given that help build proficiency in the use of a computer algebra system.

Prerequisite(s): Permission of department or grade of "C" or better in MATH-105.

(Normally offered each semester.)

MATH 111 Introduction to Higher Mathematics (3 hours)

A study of mathematical induction and other methods of proof, recursion, formal logic, and set theory.

Prerequisite(s): Grade of "C" or better in MATH-105.

(Normally offered each spring semester.)

MATH 135 Mathematical Problem Solving (1 hours)

A seminar of problem-solving skills and their application to nontrivial problems. Students will have the opportunity to represent NWU in the Putnam Exam. May be repeated.

Prerequisite: Grade of "C" or better in MATH-106 or permission of the instructor.

MATH 190 Selected Topics (1-3 hours)

A course designed to treat subject matter not covered in other standard courses or to provide study of subject matter introduced in other courses. The title, content, and credit hours will be determined by mutual interests of faculty and students.

MATH 200 Formal Languages and Automata (3 hours)

See CMPSC-200.

MATH 204 Calculus III (4 hours)

An introduction to multivariable calculus. Topics include vector-valued functions, functions of several variables, partial differentiation, multiple integrals, and analysis. Assignments are given that help build proficiency in the use of a computer algebra system.

Prerequisite(s): Permission of department chair or grade of "C" or better in MATH-106.

(Normally offered each fall semester.)

MATH 206 Mathematical Statistics I (3 hours)

Elementary mathematical theory and applications of basic probability to statistics. Topics studied include random variables, both discrete and continuous, and their probability distributions with applications of a practical nature to numerous fields. Also studied are multivariate probability distributions.

Prerequisite(s): Grade of "C" or better in MATH-106.

(Normally offered fall of even-numbered years.)

MATH 207 Mathematical Statistics II (3 hours)

A continuation of MATH-206, with further applications of probability theory to statistical problems of estimation and hypothesis testing, including least squares estimation and correlation. Also studied is analysis of variance with numerous applications of this technique.

Prerequisite(s): Grade of "C" or better in MATH-206.

MATH 209 Number Theory (3 hours)

A study of fundamental concepts in number theory, including divisibility and factorization of integers, linear and quadratic congruences, the quadratic reciprocity theorem, Diophantine equations, number-theoretic functions, and continued fractions. Additional topics may include Euler's theorem and cryptography, perfect numbers and Mersenne primes, Pythagorean triples, and Fermat's Last Theorem.

Prerequisite(s): Grade of "C" or better in MATH-106.

MATH 210 Linear Algebra (3 hours)

A study of vector spaces, determinants, linear transformations, matrices, and matrix equations, and their applications in the natural and social sciences.

Prerequisite(s): Grade of "C" or better in MATH-106.

(Normally offered each spring semester.)

MATH 212 Numerical Analysis (3 hours)

An introduction to the numerical approximation of solutions of various types of problems. Topics include rootfinding, interpolation and numerical differentiation, and integration. Additional topics may be drawn from numerical solutions of ordinary differential equations and linear systems.

Prerequisite(s): Grade of "C" or better in MATH-106.

MATH 221 Geometry (3 hours)

Selected topics from Euclidean and non-Euclidean geometry, geometry as a mathematical structure, and geometry as a study of invariants of set transformations.

Prerequisite(s): Grade of "C" or better in MATH-111.

(Normally offered fall of even-numbered years.)

MATH 224 Differential Equations (4 hours)

A study of ordinary differential equations. Topics include first and higher order, and linear and nonlinear differential equations with applications. Additional topics may be chosen from systems of differential equations, transform techniques, and numerical methods. Use will be made of a computer algebra system.

Prerequisite(s): Grade of "C" or better in MATH-106.

(Normally offered each spring semester.)

MATH 227 Mathematical Modeling (3 hours)

A course that explores applications of mathematics to real-world problems. One or more topics may be chosen from the non-inclusive list: dynamical systems, linear programming, queueing theory, game theory, numerical analysis, wavelets, coding theory, and partial differential equations. Computer-based exercises will be a component of the course.

MATH 230 Abstract Algebra I (3 hours)

A study of various algebraic systems arising in modern mathematics, such as groups and rings.

Prerequisite(s): Grades of "C" or better in MATH-111 and any 200-level mathematics course.

(Normally offered fall of even-numbered years.)

MATH 231 Abstract Algebra II (3 hours)

A continuation of MATH-230. More study of groups, rings, and fields. Additional topics may be drawn from modules and finite fields.

Prerequisite(s): Grade of "C" or better in MATH-230.

MATH 235 Mathematical Problem Solving (1 hour)

A seminar on problem solving skills and their application to nontrivial problems. Students will be required to take the Putnam Exam. May be repeated.

Prerequisite(s): Grade of "C" or better in MATH-111 or permission of the instructor.

(Normally offered each fall semester.)

MATH 240 Real Analysis (3 hours)

A formal approach to limits, continuity, differentiation, and integration with emphasis on the proofs of theorems. Additional topics may include topology, uniform continuity, and uniform convergence.

Prerequisite(s): Grade of "C" or better in MATH-111 and MATH-204.

(Normally offered spring of even-numbered years.)

MATH 290 Selected Topics (1-3 hours)

Further study of a topic selected by the department, the selection based partially upon student demand. The title, content, and credit hours will be determined by current mutual interests of faculty and students. Possible topics include complex analysis, measure theory, topology, logic and set theory, advanced modeling, algebraic number theory, group theory and ring theory.

MATH 295 Independent Study (1 hours)

Individual study of a specific mathematical topic under the supervision of a faculty member. Independent Study may not duplicate courses described in the catalog.

Prerequisite(s): Permission of the instructor and the department chair.

MATH 297 Internship (1 hours)

The student secures a firm to sponsor on-the-job training satisfactory to the sponsor, the faculty coordinator, and the student. The student submits a written report and the sponsor supplies a statement regarding the satisfactory completion of the internship. May be repeated up to a maximum of 4 credit hours.

Pass/Fail only.

Prerequisite(s): 17 hours of mathematics courses and permission of the instructor.

MATH 299 Mathematics Seminar (3 hours)

A study of special interest topics in mathematics. The student will study independently under the supervision of a faculty member and present their work in oral and written form. As a culmination of the course, the student will write an in-depth paper of a research or expository nature.

Prerequisite(s): Major in mathematics, senior standing, grade of "C" or better in either MATH-230 or MATH-240, and permission of the instructor.

(Normally offered each spring semester.)