GRADUATE COURSES

The following courses are available to those preparing for degree language examinations or for improvement in reading ability:

FREN505 **(5)**
(merges FREN501, parts of FREN502)
Reading French
For students without a working knowledge in French; an introduction to the grammar and syntax of French for the purpose of translating written French into English. May count toward a general elective only.

GRMN505 **(5)**
(merges GRMN501, parts of GRMN502)
Reading German
For students without a working knowledge in German; an introduction to the grammar and syntax of German for the purpose of translating written German into English. May count toward a general elective only.

INLS575 **(1-3)**
Topics in _____
A study of selected topics in language, literature, or civilization. Topics and credits to be announced. Repeatable with different topics.

INLS590 **(1-3)**
Directed Study/Reading/Research/Project
Studies in the area of French/Spanish language, literature, or civilization, as determined in consultation with the instructor.

MATHEMATICS

Haughey Hall, Room 121
(616) 471-3423
math-info@andrews.edu
http://www.andrews.edu/MATH/

Faculty
_____, *Chair*
Kenneth L. Franz
Ronald D. Johnson
Donald H. Rhoads
Lynelle M. Weldon

Lecturers
Aurora P. Burdick
Keith G. Calkins

Academic Programs	Credits
BS: Mathematics Education	30
BS: Mathematics	39
Applied Mathematics	
Preparation for Secondary School Mathematics Teaching	
Preparation for Graduate Study in Mathematics	
Minor in Mathematics	20

Students planning to major in math will be more competitive in their eventual job search if they major in more than one area. Good combinations are (1) math-physics, (2) math- engineering, (3) math-computer science, or (4) math-accounting.

Undergraduate Programs

BS: Mathematics—39

MATH141, 142, 240,281, 286, CPTR125, STAT340
And at least 15 credits in additional courses chosen in consultation with a departmental advisor from MATH355, 405, 408, 425, 431, 432, 441, 442, 475, 487, 495.

Minor in Mathematics—20

MATH141, 142, 281
And at least 9 credits in additional courses chosen in consultation with a departmental advisor from MATH240,286, 355, 405, 408, 425, 431, 432, 441, 442, 475, 487, 495. STAT340

BS: Mathematics Education—30

MATH141, 142, 240, 281, 286, CPTR125, STAT340
And at least 6 credits in additional courses chosen in consultation with a departmental advisor from MATH355, 405, 408, 425, 431, 432, 441, 442, 475, 487, 495.
This major is available only to those who are obtaining elementary or secondary teacher certification.

SPECIAL REQUIREMENTS AND PLACEMENT TEST
Sequential Course Numbering. All courses with more than one course number must be taken sequentially.

Non-overlapping Credit Requirement. Because there is substantial overlap in material covered in the following groups of courses, no student is granted credit (other than general elective credit) in more than one course from each group:
1. MATH141, 182 (Calculus)
2. MATH215, 281 (Linear Algebra)

Mathematics Departmental Placement Examination (MPE). Any student wishing to enroll in any mathematics or statistics course must have achieved appropriate scores on the MPE of this department, or have prerequisite course(s) accepted for credit. The minimum score on the MPE is indicated as the prerequisite for each course.

Graduate Programs

The Mathematics Department collaborates in the Master of Science: Interdisciplinary Studies (Mathematics and Physical Sciences). See the Interdisciplinary Studies section, p. 96.

Courses

(Credits)

See inside front cover for symbol code.

MATH105 **(2)**
Mathematical Skills—Arithmetic
Designed to remedy the deficiencies, diagnosed by the Mathematics Placement Examination, in arithmetic skills, unit conversions, and problem solving. Does not apply toward any General Education requirement. *Fall, Spring*

MATH106 **(3)**
Mathematical Skills—Algebra
Remediation in algebraic skills. At the end of this course, the Mathematics Placement Examination is retaken. Outcome determines eligibility for entrance into certain first-level mathematics courses. Does not apply toward any General Education requirements. Prerequisite: MPE 1.0. *Fall, Spring*

MATH141 **(4)**
(merges MATH171, half of MATH172)
Calculus I
Real functions and relations, differentiation and applications. Prerequisite: MPE 4.0. *Fall*

MATH142 **(4)**
(merges MATH173, part of MATH172)
Calculus II
Continuation of Calculus I; Integration of function; Series. Prerequisite: MATH141. *Spring*

MATH165 **(1.5 or 3)**
College Algebra
A study of linear equations and inequalities; algebraic, logarithmic, exponential, and trigonometric functions; polynomials and complex numbers. Includes applications in business and science. Prerequisite: MPE of 2.0. *Fall, Spring*

MATH165 **V (4)**
College Algebra
Distance education —see content above.

MATH168 **(4)**
(merges MATH162, part of MATH165)
Algebra with Trigonometry
A study of linear equations and inequalities; algebraic, logarithmic, and exponential functions; polynomials and complex numbers. Includes trigonometric functions and identities. Primarily for Technology students. Prerequisite: MPE 2.0, and one year of high-school geometry. *Fall*

MATH182 **(3)**
Calculus with Applications
Introduction to calculus of functions of one variable, including finding maxima and minima; partial derivatives; applications to problems in business and the social sciences. Prerequisite: MATH165. *Spring*

MATH215 **(3)**
Applied Linear Algebra
Vectors, matrices, determinants, and eigen values, with emphasis on applications. Credit may not be earned in this course and in MATH281. Prerequisites: MATH182, or 141. *Spring*

MATH240 **(4)**
(was part of MATH283)
Calculus III
Curves and surfaces, directional derivatives, multiple integrals, line and surface integrals, integral theorems. Prerequisites: MATH142. *Fall*

MATH281 **(3)**
Linear Algebra
Vector spaces, linear mappings, solution of sets of linear equations, bilinear and quadratic mappings. Prerequisite: MATH141 or consent of instructor. *Spring*

MATH286 **(3)**
(was part of MATH282)
Differential Equations
Elementary differential equations, First order equations, higher order linear equations, systems. Prerequisites: MATH142.. *Spring*

MATH355 **(3)**
Discrete Mathematics
Selected topics in discrete mathematics, such as logic, set theory, relations, functions, algebraic structures and graph theory. Prerequisite: MATH141 or 182. *Fall*

MATH405 **Alt ? (3)**
(merges parts of MATH401, 402)
Applied Mathematics
Function transforms applied to differential equations. Trigonometric series. Prerequisite: MATH240. *Fall*

MATH408 **Alt ? (3)**
Complex Analysis
Elementary complex analysis, contour integrals, complex series Prerequisite: MATH240. *Spring*

MATH425 **Alt ? (3)**
(was MATH427)
Numerical Methods and Modeling
Construction of mathematical models. Implementing such models on a computer. Prerequisites: MATH141 or 281, or 215; and a knowledge of computer programming. *Spring*

MATH431, 432 **Alt ? (3,3)**
Advanced Calculus
Introduction to topology; theorems on continuity, differentiation, integration, and convergence; introduction to differentiable manifolds. Prerequisite: MATH240. *Fall/Spring sequence*

MATH441, 442 **Alt ? (3,3)**
Algebra
Study of groups, rings, fields, modules, vector spaces, and algebras. Prerequisites: MATH240. *Fall/Spring sequence*

MATH475 **Alt ? (3)**
(merges parts of MATH471, 472)
Geometry
Intuitive background and outline of axiomatic development of Euclidean, non-Euclidean, affine, and projective spaces. Relation of these topics to secondary teaching. Prerequisite: MATH142. *Fall*

MATH487 **Alt (1-3)**
Special Topics in Mathematics
Consult the instructor in regard to the topic to be covered. Prerequisite: Consent of teacher. *Fall*

MATH495 **(1-3)**
Independent Study
Independent study of selected topics in mathematics to enable advanced students to pursue topics not offered in other scheduled courses. The student will study under the supervision of a mathematics teacher whose prior approval is required. Ordinarily a minimum of four hours of study per week is expected for each credit. Grades are assigned on the basis of a teacher-selected procedure such as oral or written exams or reports.

STATISTICS

STAT285 **(3)**
Elementary Statistics
A study of basic descriptive and inferential statistics, including elementary probability and probability distributions, statistical inference involving binomial, normal, and t distributions, and hypothesis testing. Prerequisite: MPE 2.0 *Fall, Spring*

STAT285 **V (3)**
Elementary Statistics
Distance education—see content above.

STAT340 **(3)**
(was STAT251)
Probability Theory with Statistical Applications
Basic concepts of probability theory and statistics for students having preparation in calculus and algebra and who desire a deeper understanding of the principles underlying statistical methods. Definitions of probability, random variables, probability distributions, estimators, and statistical decision theory. Prerequisite: MATH141 or 182. *Fall*

HONORS

MATH271-50 **(1)**
Honors in Mathematics
The study of mathematical problems where the solution depends more on insight and creativity than on routine computation. Repeatable to 2 credits. Prerequisite: MATH142 and consent of instructor.

GRADUATE

MATH530 **(2-3)**
Topics in Teaching Mathematics
A. Algebra
B. Geometry
C. Analysis
D. Applications
Consult with department chair regarding availability in any given year. Repeatable to 6 credits.

MATH540 **Alt (2-3)**
Topics in Mathematics
Consult with the instructor in regard to the topic to be covered. Prerequisite: Consent of the instructor. Repeatable to 6 credits.