

SPAN447 **9** (3)**Spanish for Translation**

An introduction to the basic principles of translation from English to Spanish and from Spanish to English. An approach to techniques used in writing translation. Strong emphasis on written translations. Conducted entirely in Spanish.

SPAN448 **9** (3)**Spanish and Latin American Literature and Film**

Comparison of artistic and linguistic differences between selected pieces of Spanish and Latin American literature and their film adaptation. Emphasis on language, characters, and cultural aspects of society. Conducted entirely in Spanish.

SPAN449 **9** (3)**Spanish for Interpreters**

A study of the basic principles of oral interpretation from English to Spanish and from Spanish to English. An approach to techniques used in oral interpretation. Strong emphasis on oral communication. Conducted entirely in Spanish.

SPAN466 **9** (3)**Contemporary Spanish-American Literature**

A study of selected major Spanish-American writers of our time. Emphasis on research. Conducted entirely in Spanish.

SPAN470 **9** (3)**Spanish for International Trade**

Spoken and written Spanish common to the Spanish-speaking world of business and industry, with emphasis upon business practices, and the writing and translating of business letters and professional reports. Cross-cultural references provide opportunities for comparative and contrastive analysis of American and Spanish cultural patterns in business settings. Conducted entirely in Spanish.

GRADUATE COURSES

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

FREN505 (5)**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)**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
(269) 471-3423
dhr@andrews.edu
<http://www.math.andrews.edu>

Faculty

Donald H. Rhoads, *Chair*
Shandelle M. Henson
Ronald D. Johnson
Joon Hyuk Kang
Lynelle M. Weldon

Lecturers

Keith G. Calkins
Shirleen Luttrell

Emeriti

Kenneth L. Franz
Theodore R. Hatcher
Kenneth E. Thomas
Edward J. Specht

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

Mathematics is foundational to physics, engineering, and computer science, and is increasingly important in many fields of study such as finance, accounting, economics, biology, medicine, and environmental science. Students majoring in these and other fields will find that acquiring an additional major in mathematics or mathematical studies greatly enhances the marketability of their degree.

Undergraduate Programs**BS: Mathematics—39**

MATH141, 142, 215, 240, 286, 315; STAT340 and at least 15 credits in additional courses chosen in consultation with a Mathematics Department advisor from MATH271, 355, 389, 405, 408, 425, 431, 432, 441, 442, 475, 487, 495.

Cognate Course: CPTR125

Major in Mathematical Studies—30

MATH141, 142, 215, 240 and at least 15 credits in additional courses chosen in consultation with a Mathematics Department advisor from STAT340, CPTR125, MATH271, 286, 315, 355,

389, 405, 408, 425, 431, 432, 441, 442, 475, 487, 495. This major is available only as a second major, to those taking a major in another field.

Minor in Mathematics—20

MATH141, 142, 215 and at least 9 credits in additional courses chosen in consultation with a departmental advisor from MATH240, 286, 315, 355, 389, 405, 408, 425, 431, 432, 441, 442, 475, 487, 495; STAT340.

BS: Mathematics Education—30

MATH141, 142, 215, 240, 355, 475; STAT285, 340 and one additional course chosen in consultation with a Mathematics Department advisor from MATH286, 405, 425. This major is available only to those who are obtaining elementary or secondary teacher certification. Cognate Course: CPTR125.

Minor in Mathematics Education-20

(pending Michigan Department of Education approval)
MATH145, 167, 182, 215, 355, 475, STAT285. This minor is available only to those obtaining elementary teacher certification. The regular minor listed above will also suffice for elementary certification.

SPECIAL REQUIREMENTS AND PLACEMENT TEST

Sequential Course Numbering. All courses with more than one course number must be taken sequentially.

Non-overlapping Credit Restrictions. 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 I, Calculus with Applications)
2. MATH145, 166, 168 (Reasoning with Functions, Precalculus Algebra, Precalculus)

Minimum grade for prerequisites, except for MATH141, is C-.

Mathematics Placement Examination (MPE). See pp. 31-32 for information on the MPE and the General Education Mathematics requirement.

Graduate Programs

The Mathematics Department collaborates in the Master of Science: Interdisciplinary Studies (Mathematics and Physical Sciences). See the Interdisciplinary Studies section, p. 130.

Mathematics Endorsement Program for Middle School Educators. The Mathematics Department collaborates with the School of Education and the Berrien County Intermediate School District to administer the Alternative Certification Experimental Program (Math Endorsement Program) for Middle School Educators. Courses for this Program are listed under “Mathematics Education.” Inquiries about this program should be directed to Larry Burton (269) 471-3465, burton@andrews.edu; Lynelle Weldon (269) 471-3866, weldon@andrews.edu; or Judy Wheeler (269) 471-7725 ext. 302, jwheele@remc11.k12.mi.us.

Courses

(Credits)

See inside front cover for symbol code.

MATH107 (3)

Arithmetic and Algebra Review

Review of arithmetic and algebra skills, for students not achieving an MPE score \geq P2. Class attendance is required, but most work is done on the computer using ALEKS software. The class meets two hours per week. Students meeting attendance and participation requirements and not completing the course in the first semester may receive a grade of R which will require re-registration and completion the following semester. Credit is given only in the semester in which the course is passed. This a mastery learning course, requiring passage of three proficiency tests, one in arithmetic and two in algebra. *Fall, Spring*

MATH141 (4)

Calculus I

Real functions and relations, differentiation and applications. Introduction to integration. Fulfills the General Education Mathematics reasoning requirement. Prerequisite: MPE=P5 or MATH167 or MATH168 with grade no lower than C. *Fall, Spring*

MATH142 (4)

Calculus II

Continuation of Calculus I; integration of functions with applications; convergence of series. Prerequisite: MATH141. *Fall, Spring*

MATH145 (3)

Reasoning with Functions

Logic, sets; functions, graphing, with examples including linear, quadratic and trigonometric functions; the exponential function and its applications; one additional topic selected by the instructor, such as elementary statistics, probability, rates of change and related topics, the concept of infinity and its applications, or other topic based on a great mathematical idea. Fulfills the General Education Mathematics reasoning requirement. Prerequisite: MPE \geq P2 or MATH107. *Fall, Spring*

MATH165 V (3)

College Algebra

AU/HSI course. A study of linear equations and inequalities; algebraic, logarithmic, and exponential functions; polynomials and complex numbers. Includes applications in business and science. Fulfills the General Education Mathematics reasoning requirement. Prerequisite: MPE \geq P2 or MATH107.

MATH166 (3)

Precalculus Algebra

Equations and inequalities; algebraic, logarithmic, exponential, polynomial and rational functions, complex numbers; and selected topics. Fulfills the General Education Mathematics reasoning requirement. Prerequisite: MPE \geq P2 or MATH107. *Fall, Spring*

MATH167 (2)

Precalculus Trigonometry

Trigonometric functions and identities, vectors, and selected topics. Fulfills the General Education Mathematics reasoning requirement. Prerequisite: MPE \geq P3 or MATH166 or MATH145. *Spring*

MATH168 (4)

Precalculus

Covers most of the content of MATH166 and MATH167. A study of equations and inequalities; algebraic, logarithmic, exponential,

polynomial and rational functions; trigonometric functions and identities, vectors. Fulfills the General Education Mathematics reasoning requirement. Prerequisite: MPE \geq P2 or MATH107. *Fall*

MATH168 V (4)
Precalculus

AU-HSI course—see content above. Fulfills the General Education Mathematics reasoning requirement. Prerequisite: MPE \geq P2 or MATH107.

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. Fulfills the General Education Mathematics reasoning requirement. Prerequisite: MPE \geq P4 or MATH166, 167 or 168 preferred; MATH145 is acceptable. *Spring*

MATH215 (3)
Introduction to Linear Algebra

Vectors, matrices, determinants, and eigenvalues, with emphasis on applications and computation. Prerequisite: MATH182 or 141. *Fall*

MATH240 (4)
Calculus III

Curves and surfaces, partial derivatives, multivariable calculus; multiple integrals, line and surface integrals; Stokes', Green's and divergence theorems. Prerequisite: MATH142. *Fall*

MATH286 (3)
Differential Equations

Elementary differential equations, first order equations, higher order linear equations, systems. Prerequisite: MATH142. *Spring*

MATH315 Alt (3)
Linear Algebra

Vector spaces, linear transformations, bilinear and quadratic forms. Prerequisite: MATH215. *Spring*

MATH355 (3)
Discrete Mathematics

Selected topics in discrete mathematics, including logic, set theory, relations, functions, algebraic structures and graph theory. Prerequisite: MATH141 or 182. *Fall*

MATH389 (0.5)
Mathematics Colloquium

Participation in at least 10 mathematics colloquia or approved colloquia of other departments. Grade is based on attendance and notes taken at the colloquium. Repeatable to 2 credits. S/U. *Fall, Spring*

MATH405 g Alt (3)
Applied Mathematics

Solutions of first and second order partial differential equations, and applications. Prerequisites: MATH240, 286. *Fall*

MATH408 g Alt (3)
Complex Analysis

Elementary complex analysis, contour integrals, complex series. Prerequisite: MATH240. *Spring*

MATH425 g Alt (3)

Numerical Methods and Modeling

Construction of mathematical models. Implementing such models on a computer. Prerequisites: MATH141. *Fall*

MATH431, 432 g Alt (3, 3)
Advanced Calculus

Theorems on continuity, differentiation, integration, and convergence; additional selected topics such as topology, differentiable manifolds, and real analysis. Prerequisite: MATH240. *Fall/Spring sequence*

MATH441, 442 g Alt (3, 3)
Algebra

Study of groups, rings, fields, modules, vector spaces, and algebras. Prerequisite: MATH240. *Fall/Spring sequence*

MATH475 g Alt (3)
Geometry

Axiomatic development of Euclidean, non-Euclidean, affine, and projective spaces. Relation of these topics to secondary teaching. Prerequisites: MATH142 or either MATH141 or 182 and 355. *Fall*

MATH487 Alt (1-3)
Special Topics in _____

Consult the instructor in regard to the topic to be covered. Prerequisite: Consent of teacher. Repeatable in different areas.

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 professor 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 instructor-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 \geq P2 or MATH107. *Fall, Spring*

STAT285 V (4)
Elementary Statistics

AU/HSI course—see content above. Prerequisite: MPE \geq P2 or MATH107.

STAT340 (3)
Probability Theory with Statistical Applications

Probability theory and statistics for students having preparation in calculus. Topics include probability models, combinatoric problems, random variables, discrete and continuous distributions, expectation, moment generating functions, central limit theorem. Prerequisite: MATH141 or 182. *Spring*

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.

MATHEMATICS EDUCATION

The following courses are available only to participants in the Alternative Certification Experimental Program (Math Endorsement Program) for Middle School Educators, which is jointly administered by the Andrews University School of Education and the Berrien County Intermediate School District. Applications to this Program are initially screened by the School of Education and the Department of Mathematics, and then go through the regular Andrews admissions process. These courses will be taught in rotation, during the regular school year and during the summer, according to a schedule set by the Administrative Committee for the Program.

MAED505 (2) *Understanding Numbers and Operations for Middle Grades Educators*

This course is designed to strengthen middle school teachers' rational number knowledge and number sense. This includes the in-depth study of rational numbers and operations on rational numbers, the structure of the rational and real number systems, algorithms for computation, estimation strategies, and working with very large and very small numbers. The pedagogy of the course models that of effective middle school mathematics teachers.

MAED510 (3) *Exploring Algebra and Functions for Middle Grades Educators*

This course extends the middle school teachers' understanding of algebra as a symbolic language. This course moves beyond symbol manipulation to include modeling of physical situations. Students will explore algebraic, linear, and non-linear functions within the context of the course. The pedagogy of the course models that of effective middle school mathematics teachers.

MAED515 (3) *Data Analysis for Middle Grades Educators*

This course presents an integrated approach to data analysis, statistics, and probability for middle grades math teachers. Instruction focuses on specific real-world data sets and statistical investigations. The pedagogy of the course models that of effective middle school mathematics teachers.

MAED521 (2) *Informal Geometry and Measurement for Middle Grades Educators*

This course is the first of two which lead prospective mathematics teachers through a series of explorations to develop competence in

geometric reasoning, including conjecture, proving, and disproving. Prospective teachers develop a deeper understanding of the role of proof in geometry. The pedagogy of this course models that of effective middle school mathematics teachers.

MAED522 (2) *Formal Geometry for Middle Grades Educators*

This course is the second of two which lead prospective mathematics teachers through a series of explorations to develop competence in geometric reasoning, including conjecturing, proving, and disproving. Prospective teachers refine their understanding of the role of proof in geometry. The pedagogy of the course models that of effective middle school mathematics teachers.

MAED600 (2) *Discrete Mathematics and Number Theory for Middle Grades Educators*

Students investigate concepts of number theory, discrete mathematics, and logic as they apply to middle grades mathematical education. Each topic includes a study of graphic representation of concepts and applications in technology. The pedagogy of the course models that of effective middle school mathematics teachers.

MAED610 (4) *Mathematical Modeling for Middle Grades Educators*

Investigation of concepts and practices of mathematical modeling with an emphasis on application to middle grades education. The pedagogy of the course models that of effective middle school mathematics teachers.

MAED625 (2) *Mathematical Investigations for Middle Grades Classrooms*

Participants investigate topics in mathematics, including probability, programming, fractals, and chaos theory. Emphasis is placed on participant understanding of these topics and their appropriate use as investigations with middle grades students. The pedagogy of the course models that of effective middle school mathematics teachers.