

# MATH-EMATICS

Haughey Hall, Room 121  
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 http://www.andrews.edu/MATH/

**Faculty**

Theodore R. Hatcher, *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	45
BS: Mathematics Applied Mathematics Preparation for Secondary School Mathematics Teaching Preparation for Graduate Study in Mathematics	60
Minor in Mathematics	30

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 Education—45**

MATH171,172,173, 281, 282, 283, COSC125, STAT251, and at least 13 credits in additional courses chosen in consultation with a departmental adviser from MATH271, 355, 401, 402, 421, 427, 431, 432, 441, 442, 471, 472, 487, 495, COSC436, STAT286, 455.

This major is available only to those students seeking elementary or secondary certification.

**BS: Mathematics—60**

MATH171,172,173, 281, 282, 283, COSC125, STAT251, and at least 28 credits in additional courses chosen in consultation with a departmental adviser from MATH271, 355, 401, 402, 421, 427, 431, 432, 441, 442, 471, 472, 487, 495, COSC436, STAT286, 455.

**Minor in Mathematics—30**

MATH171,172,173, 281 and at least 14 credits in additional courses chosen in consultation with a departmental adviser from MATH271, 282, 283, 355, 401, 402, 421, 427, 431, 441, 471, 472, 487, 495, COSC125, 436, STAT251, 286, 455.

**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. MATH163, 171, 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. 85.

## Courses

(Credits)

See inside back cover for symbol code.

**MATH105**

*Mathematical Skills—Arithmetic*

Emphasis on arithmetic skills, unit conversions, and problem solving. Does not apply toward any General Education requirement.

(3)

**MATH106**

*Mathematical Skills—Algebra*

Emphasis on 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. MPE 1.0.

(4)

**MATH162, 163**

*Technical Mathematics*

Trigonometric and inverse-trigonometric functions with applications; vectors; complex numbers; emphasis on graphical methods. Introduces techniques of elementary calculus. Prerequisite: MATH165 or MPE 3.0.

(4,4)

**MATH165**

*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.

(4)

**MATH165**

*College Algebra*

Distance education —see content above.

V (6 qtr; 4 sem)

**MATH171, 172, 173**

(4,4,4)

*Freshman Calculus*

Real functions and relations, coordinate geometry, differentiation and integration. Applications of these topics. Prerequisite: MPE 4.0.

**MATH182**

(4)

*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 or MPE 3.5.

**MATH215**

(4)

*Applied Linear Algebra*

Vectors, matrices, determinants, and eigenvalues, with emphasis on applications. Prerequisites: MATH163, 171, or 182; COSC125.

**MATH216**

Alt (4)

*Applied Differential Equations*

Differential equations as mathematical models; methods of solving first-order equations and linear equations with constant coefficients. Credit may not be earned in this course and MATH282. Prerequisite: MATH163 or 171.

**MATH235**

Alt (4)

*Introduction to Discrete Structures*

Includes symbolic logic, relations, functions, and Boolean algebra. Applications of these topics to information science. Does not apply to a mathematics major or minor. Prerequisite: MATH163, 171, or 182.

**MATH281**

(4)

*Linear Algebra*

Vector spaces, linear mappings, solution of sets of linear equations, bilinear and quadratic mappings. Prerequisite: MATH171.

**MATH282, 283**

(4,4)

*Sophomore Calculus*

Differential equations, convergence, approximation, curves and surfaces, directional derivatives, multiple integrals, line and surface integrals.

Applications of these topics. Prerequisites: MATH173, 281.

**MATH355**

Alt (4)

*Foundations of Discrete Mathematics*

Such topics as logic, set theory, relations, functions, algebraic structures, and graph theory. Prerequisite: MATH163 or 171.

**MATH401, 402**

Alt g (4,4)

*Applied Mathematics*

Vector calculus, integral theorems, differential equations, and function transforms. Prerequisite: MATH283.

**MATH421**

Alt g (4)

*Intermediate Analysis*

Careful development of calculus from an axiomatic basis. Prerequisite: MATH283.

**MATH427**

Alt g (4)

*Mathematical Modeling*

Construction of mathematical models in the natural sciences, economics, psychology, and other disciplines. Prerequisites: MATH281; a course in calculus.

**MATH431, 432**

Alt g (4,4)

**Advanced Calculus**

Introduction to topology; theorems on continuity, differentiation, integration, and convergence; introduction to differentiable manifolds. Prerequisite: MATH421.

**MATH441, 442** Alt G (4,4)

**Algebra**

Study of groups, rings, fields, modules, vector spaces, and algebras. Prerequisites: MATH281, 355.

**MATH471, 472** Alt G (8)

**Geometry**

Intuitive background and outline of axiomatic development of Euclidean, non-Euclidean, affine, and projective spaces. Relation of these topics to secondary teaching. Prerequisite: MATH173.

**MATH487** Alt (variable)

**Special Topics in Mathematics**

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

**MATH495** (1-4)

**Independent Study**

Enables students to pursue topics in mathematics not offered in other scheduled courses. Ordinarily a minimum of 4 hours of study per week is expected for each credit. Grades are assigned on the basis of a procedure such as oral or written exams or reports selected by a faculty supervisor.

**STATISTICS**

**STAT251** (4)

**Probability Theory with Statistical Applications**

Concepts of probability for students desiring a deeper understanding of the principles underlying statistical methods. Definitions of probability random variables, probability distributions, estimators, and statistical decision theory. Prerequisite: MATH163, 171, or 182.

**STAT285** (4)

**Elementary Statistics**

A study of basic descriptive and inferential statistics, including elementary probability and probability distributions, statistical inference involving the binomial, normal, and t distributions, and hypothesis testing. Prerequisite: MPE 2.0. Does not apply to a mathematics major or minor.

**STAT285** V (6 qtr; 4 sem)

**Elementary Statistics**

Distance education—see content above.

**STAT286** (4)

**Statistical Methods**

An introduction to multiple regression, analysis of variance, and non-parametric methods. Prerequisite: STAT251 or 285.

**STAT455** (4)

**Analysis of Variance**

Tests of hypotheses concerning 2 or more populations, contingency table analysis, one-way and two-way analysis of variance, and experimental designs. Prerequisite: STAT286.

**HONORS IN MATHEMATICS**

**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 3 credits. Prerequisite: MATH173 and consent of instructor.

**GRADUATE LEVEL MATHEMATICS**

**MATH530** (2-4)

**Topics in Teaching Mathematics**

- A. Algebra
- B. Geometry
- C. Analysis
- D. Applications

Consult with department chair regarding availability in any given year. Repeatable to 8 credits.

**MATH540** Alt (2-4)

**Topics in Mathematics**

Consult with the instructor in regard to the topic to be covered. Prerequisite: Consent of the instructor. Repeatable to 8 credits.

**MUSIC**

Hamel Hall, Room 210  
(616) 471-3600; FAX (616) 471-6339  
music@andrews.edu

**Faculty**

- Peter J. Cooper, *Chair*
- Lilianne Doukhan
- Carlos A. Flores
- Julia S. Lindsay
- Kenneth D. Logan
- Alan F. Mitchell
- Carla L. Trynchuk
- Stephen P. Zork

Academic Programs	Credits
BA: Music	60
BA/BS in Elementary Music Education	58
Bachelor of Music (B.Mus.)	75
Music Education	52-54
Music Performance	60
Minor in Music	33
Minor in Elementary Music Education	40
MA: Music	48
Master of Music (M.Mus.)	48
Music Education	
Performance	

The Music Department is committed to providing a vibrant environment to nurture artistic and creative growth in all students of music. It strives to encourage and guide students through classroom interaction and practical experiences as they mature into music professionals, and to mentor students in responsible use of their talents for service to Christ and humanity.

Bachelor of Music curricula provide a comprehensive exposure to and experience with the performance, history, and theory of music. Students receive hands-on supervised teaching experience in studio or classroom teaching. Bachelor of Arts/Science curricula are for students wishing to pursue concerted study in music within a liberal arts context.

Non-music majors may take courses in music or participate in music lessons or ensembles for for credit or non-credit. See General Education section and course descriptions below for further clarification.

The Andrews University Music Department has been a member of the National Association of Schools of Music since 1964. Music majors may choose to join the student chapter of Music Educators National Conference as well as the Music Department Society of Student Musicians. Selected students are chosen yearly for induction into Pi Kappa Lambda, the national music honor society.

**ENROLLMENT**

Status as a music major is provisional until the student demonstrates academic and performance skills on an acceptable level. All first-year students must take the Freshman Theory Placement Exam *prior* to being considered for acceptance as a music major. After the student performs in his/her first jury, the performance instructor makes a recommendation to the music faculty concerning the student's application for admission as a music major. See the *Music Department Student Handbook* for further information.