DEPARTMENT OF MATHEMATICS AND STATISTICS

501 Lincoln Building
(330) 941-3302

If you are attempting to register for a mathematics course and receive a registration error, please complete the Math Department Override Request Form (https://forms.office.com/Pages/ResponsePage.aspx?id=F4pyOaeXSU-MmyecGkA4wbQmJLwz7tBdy9fB1-JUNVIIMVJKwTVBU1ZHMy1aMkc0OcwOTRGRi4u). Please contact the Department of Mathematics and Statistics at (330) 941-3302 with any questions. Please visit the "Placements and Pathways" tab for more information about mathematics placement.

Students may select mathematics as their major for the following degree programs:

- Bachelor of Science (BS)
- Bachelor of Science in Education (BSED)

In addition to satisfying general University requirements, all students majoring in mathematics must complete the following core courses:

<table>
<thead>
<tr>
<th>COURSE</th>
<th>TITLE</th>
<th>S.H.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 1571</td>
<td>Calculus 1</td>
<td>4</td>
</tr>
<tr>
<td>MATH 1572</td>
<td>Calculus 2</td>
<td>4</td>
</tr>
<tr>
<td>MATH 2673</td>
<td>Calculus 3</td>
<td>4</td>
</tr>
<tr>
<td>MATH 3715</td>
<td>Discrete Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>MATH 3720</td>
<td>Linear Algebra and Matrix Theory</td>
<td>3</td>
</tr>
<tr>
<td>MATH 3721</td>
<td>Abstract Algebra 1</td>
<td>4</td>
</tr>
<tr>
<td>MATH 3751</td>
<td>Real Analysis 1</td>
<td>4</td>
</tr>
<tr>
<td>STAT 3743</td>
<td>Probability and Statistics</td>
<td>4</td>
</tr>
<tr>
<td>CSIS 2610</td>
<td>Programming and Problem-Solving</td>
<td>4</td>
</tr>
<tr>
<td>Intermediate-level (2600) proficiency in a foreign language</td>
<td>2</td>
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<tr>
<td>Select one of the following:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 4896</td>
<td>Senior Undergraduate Research Project</td>
<td>2</td>
</tr>
<tr>
<td>MATH 4897H</td>
<td>Thesis</td>
<td></td>
</tr>
<tr>
<td>STEM 4890</td>
<td>STEM Internship</td>
<td></td>
</tr>
</tbody>
</table>

In addition, students must complete 12 additional semester hours in mathematics or statistics at the 3700-level or above, with at least two courses chosen from the 4800-level. The total number of hours of mathematics is 40 semester hours.

In selecting appropriate courses, the student should consult a department advisor, since certain courses are recommended according to whether the student plans for graduate study in mathematics or statistics, secondary school teaching, or a career in business, industry, or government. The following courses are recommended based upon the student’s interest and career goals:

Traditional Mathematics

In addition to the core, students seeking classical training in mathematics are recommended to take MATH 4822, MATH 4880, MATH 5852 and one additional 4800-level course in mathematics. The minor course of study may be any discipline. Suggested minors include biology, chemistry, computer science, economics, geology, physics, psychology, one engineering specialty (from chemical, civil, electrical, industrial, mechanical), or statistics. Students will study the nature of mathematics in fields such as algebra, real analysis, complex analysis, and topology. Connections to, and generalizations of, earlier formulations of mathematical concepts will constantly occur. Generally, new results in mathematics are developed and proven by those with a Ph.D. in mathematics. Students planning to pursue a Ph.D. will be well prepared for graduate school with these courses.

Applied Mathematics

Applied mathematics courses emphasize areas of mathematics used in government and industry. Students learn mathematical models for the study of physical and computational processes. Mathematical techniques are also used to study uncertainty, scheduling, and decision theory. Many graduates find employment in consulting firms and large corporations where computing and mathematical problem solving skills are valued. Students are also prepared to pursue a master’s degree in applied mathematics.

In addition to the core, students interested in applied mathematics are recommended to take MATH 3705, 3745, 4855, 5825, 5835, 5845, or 5860 and complete a recognized minor in any discipline. Suggested minors include statistics, computer science, engineering, physics, geology, chemistry, biology, logistics, or economics.

Statistics

Statistical techniques are utilized in many fields of research such as medicine, biology, business, and sociology. Statisticians learn proper methodology for collecting, summarizing, and interpreting data subject to sampling variability. The increase in affordable computing and the ease of statistical software have placed statistical expertise in demand. Generally, students interested in statistics pursue further study at the graduate level, but positions are available for students upon completion of a bachelor’s degree.

In addition to the core, students interested in statistics are recommended to fulfill their upper-level course requirements with statistics courses and complete a minor in statistics.

Actuarial Mathematics

Students interested in using mathematics and statistics to quantify risk and develop models to better predict and study risk should consider actuarial mathematics. Actuaries work for insurance companies, investment and consulting firms, as well as the government and seek ways to manage risk and avoid potential exposure to excessive risk. Actuaries assess pension plans, mortality rates, and accident rates. Students will study the mathematical and statistical foundations of actuarial models as they prepare for the examination sequence to become a licensed actuary.

In addition to the core, students interested in actuarial mathematics are recommended to take STAT 5800, STAT 4804, STAT 4844, STAT 4888, and STAT 5802 and complete a minor in actuarial science.

Accelerated 4+1 Program

Undergraduate students can apply for admission into the accelerated program for the MS in Mathematics after completing 78 undergraduate semester hours with a GPA of 3.3 or higher. After being admitted to the accelerated MS program, students can take a maximum of nine semester hours of graduate coursework that can count toward both a bachelor’s and master’s degree from the Department of Mathematics and Statistics. The courses chosen to count for both undergraduate and graduate coursework must be approved by the Graduate Executive Committee within the Department upon admission into the program. An additional six hours of graduate coursework can be completed as an undergraduate and used exclusively for graduate credit. This allows the student to graduate with a master’s degree with one year of additional full-time study beyond the bachelor’s degree.

Chair
Thomas P. Wakefield, Ph.D., Professor, Chair
Professor
Alexis Byers, Ph.D., Assistant Professor
Guang-Hwa (Andy) Chang, Ph.D., Professor
Neil Flowers, Ph.D., Assistant Professor
Richard G. Goldthwait, Ph.D., Assistant Professor
Jozsi Z. Jalics, Ph.D., Professor
G. Jay Kems, Ph.D., Professor
Lucy Xiaojing Kems, Ph.D., Associate Professor
Thomas L. Madsen, Ph.D., Associate Professor
Nguyet Thi Nguyen, Ph.D., Associate Professor
Anita C. O'Mellan, Ph.D., Professor
Alicia Prieto Langarica, Ph.D., Professor
Stephen Rodabaugh, Ph.D., Professor
Thomas Smotzer, Ph.D., Professor
Jamal K. Tartir, Ph.D., Professor
Padraic ("Paddy") W. Taylor, Ph.D., Associate Professor
Eric J. Wingler, Ph.D., Professor
Lecturer
Lori A. Carlson, M.S., Senior Lecturer
Emily Dolsak, M.S., Lecturer
Hayden Julius, Ph.D., Lecturer
Sepideh Khavari, M.S., Lecturer
Alayne Leone, M.S., Lecturer

**Majors**

- BS in Mathematics (http://catalog.ysu.edu/undergraduate/colleges-programs/college-science-technology-engineering-mathematics/department-mathematics-statistics-bs-mathematics-traditional-mathematics-track/)

**Minors**

- Biomathematics Minor (http://catalog.ysu.edu/undergraduate/colleges-programs/college-science-technology-engineering-mathematics/department-mathematics-statistics/biomathematics-minor/)

**Mathematics**

MATH 1500    Mathematics Preparation for Algebra Placement    2 s.h.
This course is for students in the algebra pathway (mainly pre-STEM and pre-business) who wish to improve their mathematics placement and skills in desired areas of mathematics. Topics covered are uniquely determined by the student's initial placement assessment. Does not count toward the degree. May be repeated. Grading is ABC/NC.

MATH 1510    College Algebra    4 s.h.
This course is primarily intended to prepare STEM students (along with MATH 1511) for MATH 1570 or 1571 and business students for MATH 1552. Topics include real numbers, equations and inequalities, linear, quadratic, polynomial, exponential, and logarithmic functions, graphing techniques, systems of equations, and applications. The course fulfills the general education requirements for mathematics.
Prereq.: YSU Math Placement Level 35 or higher.
Gen Ed: Mathematics.

MATH 1510C    College Algebra with Co-requisite Support    6 s.h.
This course is primarily intended to prepare STEM students (along with MATH 1511C) for MATH 1570 or 1571 and business students for MATH 1552. Topics include algebraic structure and graphs of trigonometric functions and inverse trigonometric functions, angle measurements, similar triangles, trigonometric identities, vectors, complex numbers, polar coordinates and solving trigonometric equations with applications.
Prereq.: YSU Math Placement Level 20.
Gen Ed: Mathematics.

MATH 1511    Trigonometry    3 s.h.
This course, along with MATH 1510 is primarily intended to prepare STEM students for MATH 1570 or MATH 1571. Topics include algebraic structure and graphs of trigonometric functions and inverse trigonometric functions, angle measurements, similar triangles, trigonometric identities, vectors, complex numbers, polar coordinates and solving trigonometric equations with applications.
Prereq.: YSU Math Placement Test Level 20 and a grade of C or better in MATH 1510C.
Gen Ed: Mathematics.

MATH 1511C    Trigonometry with Co-requisite Support    4 s.h.
This course, along with MATH 1510C is primarily intended to prepare STEM students for MATH 1570 or MATH 1571. Topics include algebraic structure and graphs of trigonometric functions and inverse trigonometric functions, angle measurements, similar triangles, trigonometric identities, vectors, complex numbers, polar coordinates and solving trigonometric equations with applications.
Prereq.: YSU Math Placement Test Level 20 and a grade of C or better in MATH 1510C.
Gen Ed: Mathematics.

MATH 1513    Algebra and Transcendental Function    5 s.h.
Function concepts including trigonometric, exponential, and logarithmic functions. Application problems and graphing. Supplemental topics.
Prereq.: Math Placement Level 45 or higher.
Gen Ed: Mathematics.

MATH 1552    Applied Mathematics for Management    4 s.h.
Apply functions and linear systems to business including use of technology; mathematics of finance and an introduction to limits, derivatives and integrals with business applications. Credit will not be given to students who have completed MATH 1570, 1571, 1571H, or 1585H.
Prereq.: One of Math 1510, Math 1510C, or Math 1513 with grade of "C" or better or at least Level 45 on the YSU Mathematics Placement Test.
Gen Ed: Mathematics.

MATH 1564    Foundations of Middle School Mathematics    4 s.h.
Conceptual foundations of topics from number theory, operations, functions, algebra, and data analysis. Emphasis on multiple approaches and representations, problem solving, and communication of mathematical reasoning. Includes inquiry-based experiences with manipulatives and computing technology.
Prereq.: Level 35 on the Mathematics Placement Test.
MATH 1570  Applied Calculus 1  4 s.h.
The elements of differential and integral calculus, with emphasis on applications. Analytical geometry, differentiation and integration techniques and series representations. Introduction to differential equations, transform calculus, and Fourier analysis. This is a basic methods course particularly adapted for those who require applied topics in mathematics. Not applicable toward the Mathematics major. Credit will not be given for both MATH 1552 and MATH 1570.
Prereq.: At least Level 70 on the YSU Mathematics Placement Test or "C" or better in either MATH 1510 and MATH 1511, MATH 1510C and MATH 1511C, or MATH 1513.
Gen Ed: Mathematics.

MATH 1571  Calculus 1  4 s.h.
This course is an introduction to calculus. The main concepts to be studied are limits, continuity, rates of change, derivatives, integrals and applications.
Prereq.: At least Level 70 on the YSU Mathematics Placement Test or C or better in either MATH 1510 and MATH 1511, MATH 1510C and MATH 1511C, or MATH 1513.
Gen Ed: Mathematics.

MATH 1580H  Honors Biomathematics 1  2 s.h.
Counting techniques, probability, matrices and linear systems. Emphasis on the role of mathematical models in explaining and predicting phenomena in life sciences.
Prereq.: Admission to NEOMED-YSU program.

MATH 1581H  Honors Biomathematics 2  4 s.h.
Limits, derivatives, integrals; emphasizes theory, proofs, nonlinear epsilonics, medical/health applications. Rigorously develops logarithmic/exponential functions. Major projects applying differential equations to medicine. Credit can be given for both MATH 1571 and MATH 1581H if taken in that order; MATH 1581H can be prerequisite for MATH 1572.
Prereq.: Admission to YSU-BaccMed program.
Gen Ed: Mathematics.

MATH 1585H  Honors Accelerated Calculus 1  5 s.h.
A sequence of honors courses in analytical geometry and calculus which cover essentially the same material as MATH 1571, 1572, 2673, in two semesters instead of three. A detailed study of limits, derivatives, and integrals of functions of one and several variables with applications.
Prereq.: ACT math subscore of 32, AP Calculus score of 4 or higher, or at least one unit of high school calculus with a score of 28 or higher on placement exam or instructor permission.
Gen Ed: Mathematics.

MATH 1586H  Honors Calculus Laboratory 1  1 s.h.
Introduction to mathematical modeling of topics covered in calculus. Emphasizes the use of technology such as computer algebra systems, technical document processing, and graphics software for solving problems and reporting solutions.
Prereq.: MATH 1571 or concurrent with 1585H.

MATH 2623  Quantitative Reasoning  3 s.h.
Mathematics models emphasizing basic ideas in mathematics and statistics, stressing concept formation rather than manipulative skills.
Prereq.: YSU Mathematics Placement Level 15 or higher.
Gen Ed: Mathematics.

MATH 2623C  Quantitative Reasoning with Co-Requisite Support  5 s.h.
Mathematics models emphasizing basic ideas in mathematics and statistics, stressing concept formation rather than manipulative skills. This course includes corequisite support for students requiring remediation in mathematics while studying quantitative reasoning. Emphasis for the support will be placed on prerequisite skills needed for MATH 2623 as well as just in time review through the use of appropriate technology.
Prereq.: YSU Mathematics Placement Level 10.
Gen Ed: Mathematics.

MATH 2661  Mathematics for Elementary Teachers 1  4 s.h.
A conceptual development of mathematics topics underlying today's Pre-K-grade 5 curriculum (Number, Operations, and Algebraic Thinking). Emphasis on multiple approaches, problem solving, and communication of mathematics. Incorporates manipulatives, technology, and classroom activities developmentally appropriate for early and elementary children.
Prereq.: At least Level 15 on the Mathematics Placement Test.

MATH 2661C  Mathematics for Elementary Teachers 1 with Co-Requisite Support  6 s.h.
A conceptual development of mathematics topics underlying today's Pre-K-grade 5 curriculum (Number, Operations, and Algebraic Thinking). Emphasis on multiple approaches, problem solving, and communication of mathematics. Incorporates manipulatives, technology, and classroom activities developmentally appropriate for early and elementary children.
Prereq.: C or better in either MATH 2661 or MATH 2661C.

MATH 2662  Mathematics for Elementary Teachers 2  4 s.h.
A conceptual development of mathematics topics underlying today's Pre-K-grade 5 curriculum (Number, Operations, and Algebraic Thinking). Emphasis on multiple approaches, problem solving, and communication of mathematics. Incorporates manipulatives, technology, and classroom activities developmentally appropriate for early and elementary children.
Prereq.: Level 35 on the Mathematics Placement Test.
Gen Ed: Mathematics.

MATH 2665  Foundations of Middle School Mathematics 2  4 s.h.
Emphasis on multiple approaches and representations, problem solving, and communication of mathematical reasoning. Includes inquiry-based experiences with manipulatives and computing technology.
Prereq.: Level 35 on the Mathematics Placement Test.
Gen Ed: Mathematics.

MATH 2670  Applied Calculus 2  5 s.h.
The elements of differential and integral calculus, with emphasis on applications. Analytical geometry, differentiation and integration techniques and series representations. Introduction to differential equations, transform calculus, and Fourier analysis. This is a basic methods course particularly adapted for those who require applied topics in mathematics. Not applicable toward the Mathematics major.
Prereq.: MATH 1570 grade of "C" or better.
Gen Ed: Mathematics.

MATH 2673  Calculus 3  4 s.h.
A sequence of integrated courses in analytic geometry and calculus. A detailed study of limits, derivatives, and integrals of functions of one and several variables with applications.
Prereq.: MATH 1572 with a "C" or better.

MATH 2686H  Honors Accelerated Calculus 2  5 s.h.
A sequence of honors courses in analytical geometry and calculus which cover essentially the same material as MATH 1571, 1572, 2673, in two semesters instead of three. A detailed study of limits, derivatives, and integrals of functions of one and several variables and their applications. This sequence will be offered at most once during each academic year.
Prereq.: "C" or better in MATH 1585H.
Gen Ed: Mathematics.
MATH 2687H Honors Calculus Laboratory 2 1 s.h.
Introduction to mathematical modeling of topics covered in calculus.
Emphasizes the use of technology such as computer algebra systems,
technical document processing, and graphics software for solving problems
and reporting solutions.
Prereq.: MATH 1572 or concurrent with MATH 1572H or 1586H.

MATH 3702 Problem Solving Techniques for Secondary Mathematics 3 s.h.
Approaches to and practice with problem solving with examples from a broad
spectrum of mathematics. Emphasizes problems at the level of the Ohio
Assessment for Educators (OAE) examination for integrated mathematics and
problems suitable for high school contests. Not applicable to the mathematics
major or minor.
Prereq.: Limited to TELS majors with MATH 1572, 1572H or MATH 1585H or
consent of instructor.

MATH 3705 Differential Equations 3 s.h.
Methods and theory of solving differential equations with applications.
Introduction to partial differential equations and boundary value problems,
including Laplace’s equation.
Prereq.: C or better in one of MATH 2673, MATH 2673H, or MATH 2686H.

MATH 3715 Discrete Mathematics 3 s.h.
A course in discrete mathematical structures to prepare students for
advanced courses. Topics include set theory, functions and relations, logic
and quantifiers, truth tables and Boolean expressions, induction and other
techniques of proof, and graphs. Credit will not be given for both CSCI 3710 and
MATH 3715.
Prereq.: MATH 1572 or MATH 1585H.

MATH 3715H Honors Discrete Mathematics 3 s.h.
A course in discrete mathematical structures to prepare students for
advanced courses. Topics include set theory, functions and relations, logic
and quantifiers, truth tables and Boolean expressions, induction and other
techniques of proof, and graphs. Credit will not be given for both CSCI 3710 and
MATH 3715.
Prereq.: MATH 1572 or MATH 1585H.

MATH 3718 Linear Algebra and Discrete Mathematics for Engineers 3 s.h.
This introduction to linear algebra and discrete mathematics covers the
following topics: systems of linear equations, logic and proof, matrix algebra,
determinants, vector spaces, eigenvalues and eigenvectors, set theory, and
counting. The course does not count toward the mathematics major. Credit will
not be given for MATH 3718 and both MATH 3715 and MATH 3720.
Prereq.: C or better in MATH 1572.

MATH 3720 Linear Algebra and Matrix Theory 3 s.h.
Matrices; matrix operations; linear transformations; applications.
Prereq.: MATH 1572 or MATH 1585H.

MATH 3721 Abstract Algebra 1 4 s.h.
Introduction to abstract algebra investigating fundamental concepts in group
and ring theory. Topics include groups, subgroups, cyclic groups, permutation
groups, cosets, direct products, homomorphisms, factor groups, rings, integral
domains and polynomial rings.
Prereq.: MATH 3715 and MATH 3720.

MATH 3745 Topics in Mathematical Modeling 3 s.h.
This course exposes students to methods of mathematical modeling through
applications. Tools used to develop, refine, test, and present mathematical
models will be discussed. Topics covered and projects undertaken may
vary with each course offering and are designed to expose students to the
types of problems modeled by applied mathematicians working in business,
government, industry, or research. Course may be repeated depending on
projects or topics presented.
Prereq.: MATH 2673 or MATH 2686H or permission of the instructor.

MATH 3750 History of Mathematics 3 s.h.
A survey of the historical development of mathematics.
Prereq.: MATH 3715.

MATH 3751 Real Analysis 1 4 s.h.
Introduction to the properties of the real number system and metrics and
metric properties, with critical analysis of limits, continuity, differentiability,
integration, and other fundamental concepts underlying the calculus.
Prereq.: MATH 3715 and one of MATH 2673 or MATH 2686H.

MATH 3767 Algebra/Geometry for Middle School Teachers 1 4 s.h.
MATH 3767, MATH 3768 is an integrated, conceptual, and function-centered
approach to the foundations of algebra, geometry, and trigonometry for
preservice middle childhood mathematics specialists. Emphasis on multiple
approaches and representations, problem solving, and communication of
mathematical reasoning. Includes inquiry-based experiences. MATH 3767
focuses on conceptual foundations of algebra and parts of coordinate
geometry. Not applicable to the mathematics major.
Prereq.: Level 35 on the Mathematics Placement Test.

MATH 3768 Algebra/Geometry for Middle School Teachers 2 4 s.h.
MATH 3767 and MATH 3768 is an integrated, conceptual, and function-
centered approach to the foundations of algebra, geometry, and trigonometry
for preservice middle childhood mathematics specialists. Emphasis on multiple
approaches and representations, problem solving, and communication of
mathematical reasoning. Includes inquiry-based experiences. MATH 3768 focuses on synthetic, analytic and transformational
geometry. Not applicable to the mathematics major.
Prereq.: MATH 2665 and level 35 on the Mathematics Placement Test.

MATH 3795 Topics in Mathematics 1-4 s.h.
The study of a mathematical topic or the development of a special area of
mathematics. May be repeated once.
Prereq.: C or better in a general education mathematics course and
permission of the instructor.

MATH 3795E Topics in Mathematics: Teaching Math in Secondary
Schools 1-4 s.h.
The study of a mathematical topic or the development of a special area of
mathematics. May be repeated once.
Prereq.: C or better in a general education mathematics course and
permission of the instructor.

MATH 4822 Abstract Algebra 2 3 s.h.
A continuation of Abstract Algebra 1 with special emphasis on fields. Additional
topics in pure or applied algebra.
Prereq.: MATH 3721 or equivalent.

MATH 4823 Abstract Algebra 3 3 s.h.
This course introduces advanced topics in field theory. Topics may include
principal ideal domains, irreducibility, quotient rings, algebraic extensions,
finiteness, splitting fields, and the Galois group.
Prereq.: MATH 4822.

MATH 4830 Foundations of Geometry 3 s.h.
The development of Euclidean and non-Euclidean geometries from postulate
systems.
Prereq.: MATH 3715.

MATH 4832 Euclidean Transformations 3 s.h.
General properties of functions and transformations; isometries and
transformations of the Euclidean plane; the complex plane, its geometry and
subfields; transformational, analytical, and vector approaches to Euclidean
group theory; connections to other branches of mathematics and applications.
Prereq.: MATH 3720 and MATH 4830.

MATH 4855 Ordinary Differential Equations 3 s.h.
A second course in differential equations with emphasis on nonlinear
problems and qualitative methods or on boundary value problems. Topics are
chosen from: proofs of fundamental theorems, phase plane analysis, limit
cycles and the Poincare-Bendixon theorem, biological models, stability via
Liapunov functions, asymptotic methods, and boundary value problems.
Prereq.: MATH 3705 and MATH 3720.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 4875</td>
<td>Complex Variables</td>
<td>3 s.h.</td>
<td>MATH 3721.</td>
</tr>
<tr>
<td>MATH 4880</td>
<td>Introduction to Topology</td>
<td>3 s.h.</td>
<td>MATH 3721 and MATH 3751.</td>
</tr>
<tr>
<td>MATH 4882</td>
<td>Mathematical Biology Research</td>
<td>1-3 s.h.</td>
<td>MATH 2673 or MATH 2686H and MATH 3720 and MATH 3715.</td>
</tr>
<tr>
<td>MATH 4884</td>
<td>Mathematical Logic</td>
<td>3 s.h.</td>
<td>MATH 3721 or PHIL 3719.</td>
</tr>
<tr>
<td>MATH 4996</td>
<td>Senior Undergraduate Research Project</td>
<td>2 s.h.</td>
<td>Individual study of a topic in mathematics culminating in a written report and an oral presentation at a national or regional meeting or a local seminar. May be repeated once.</td>
</tr>
<tr>
<td>MATH 5821</td>
<td>Topics in Abstract Algebra</td>
<td>4 s.h.</td>
<td>MATH 3721 or MATH 3751 and permission of the department chairperson.</td>
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<tr>
<td>Gen Ed:</td>
<td>Capstone.</td>
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<tr>
<td>MATH 4897H</td>
<td>Thesis</td>
<td>2 s.h.</td>
<td>Individualized study of a topic in mathematics culminating in a written report and an oral presentation at a national or regional meeting or a local seminar.</td>
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<tr>
<td>STAT 2601</td>
<td>Introductory Statistics</td>
<td>3 s.h.</td>
<td>Designed for students from different disciplines who desire an introduction to statistical reasoning. Topics include collecting and summarizing data, concepts of randomness and sampling, statistical inference and reasoning, correlation and regression. Credit will not be given for both STAT 2601 and STAT 2625.</td>
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<tr>
<td>Gen Ed:</td>
<td>Mathematics.</td>
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</tbody>
</table>
STAT 2625  Statistical Literacy and Critical Reasoning  4 s.h.
An introduction to statistics and its applications. Topics include descriptive
statistics, experimental design, probability sampling distribution, statistical
inference, correlation and regression. Emphasis on applications, critical
reasoning, and data analysis using statistical software. Credit will not be given
for both STAT 2601 and STAT 2625.
Prereq.: At least Mathematics Placement Level 15.
Gen Ed: Mathematics.

STAT 2625C  Statistical Literacy and Critical Reasoning with Co-Requisite
Support  6 s.h.
An introduction to statistics and its applications. Topics include descriptive
statistics, experimental design, probability, sampling distribution, statistical
inference, correlation and regression. Emphases are on applications, critical
reasoning, and data analysis using statistical software. Includes co-requisite
support for basic algebra skills required to be successful in the course.
Prereq.: YSU Mathematics Placement Level 10.
Gen Ed: Mathematics.

STAT 3717  Statistical Methods  4 s.h.
Probability and statistics designed for students majoring in the natural
sciences. Topics include descriptive statistics, probability, estimation, testing
hypotheses, analysis of variance, regression and nonparametric statistics. Use
of personal computers with computer software will be required. Credit will not
be given for both STAT 3717 and STAT 3743.
Prereq.: One of MATH 1552, MATH 1570, MATH 1571, Math 1571H,
MATH 1581H, MATH 1585H or equivalent.

STAT 3743  Probability and Statistics  4 s.h.
A calculus-based probability and statistics course. Topics include descriptive
statistics, probability models and related concepts and applications, statistical
estimation, and hypothesis testing. Credit will not be given for both STAT 3717
and STAT 3743.
Prereq.: MATH 1572 or MATH 1585H.

STAT 3781H  Honors Biostatistics  3 s.h.
Descriptive statistics, testing hypotheses, analysis of count data, correlation,
regression, nonparametric statistics, and analysis of variance with
applications relating to biological and health sciences.
Prereq.: MATH 1580H and MATH 1581H, or equivalent.

STAT 4804  Long-Term Actuarial Mathematics 1  3 s.h.
An introduction to long-term actuarial mathematics through an analysis
of survival models and their applications as well as the determination and
interpretation of probabilities and statistics related to the present value
random variable.
Prereq.: STAT 3743 or consent of department chairperson.

STAT 4805  Long-Term Actuarial Mathematics 2  3 s.h.
A continuation of the study of long-term actuarial mathematics through the
application of premium-calculation methodologies and reserving.
Prereq.: STAT 4804.

STAT 4817  Applied Statistics  3 s.h.
Application of regression, survey sampling, analysis of variance, design and
analysis of experiments, and related topics.
Prereq.: STAT 3717 or STAT 3743 or equivalent.

STAT 4843  Theory of Probability  3 s.h.
The mathematical foundation of probability theory including the study of
discrete and continuous distributions. Other topics selected from limit
theorems, generating functions, stochastic processes, and applications.
Prereq.: STAT 3743 and one of MATH 2673 or MATH 2686H or consent of
department chairperson.

STAT 4844  Theory of Statistics  3 s.h.
The mathematical theory of statistical inferences including likelihood principle,
sufficient statistics, theory of statistical estimation, hypothesis testing and
related topics.
Prereq.: STAT 4843.

STAT 4845  Stochastic Process Models  3 s.h.
Introduction to the mathematical foundations of the theory and application of
stochastic processes. Topics include Markov processes, Poisson processes,
queueing theory, and simulation. Other topics selected from limit theorems,
Brownian Motion, and stationary processes.
Prereq.: STAT 4843.

STAT 4848  Applied Regression Time Series  3 s.h.
Statistical methods for regression and time series analysis. Topics include
applied linear regression with model fitting and diagnostics, data analysis,
and forecasting with time series models.
Prereq.: STAT 3717 or STAT 3743.

STAT 4849  Design of Experiments  3 s.h.
The objective of this course is to learn how to plan, design and conduct
experiments efficiently, and apply statistical techniques on resulting data to
obtain conclusions. Topics include introduction of experiments, complete
randomized designs, blocking designs, factorial designs, nested designs, and
random effects models.
Prereq.: STAT 4817 or STAT 6940 or equivalent.

STAT 4888  Actuarial Models in Financial Economics  3 s.h.
An introduction to actuarial models in financial economics. Topics include the
Black-Scholes framework for pricing derivatives, the binomial pricing model,
and interest rate models.
Prereq.: STAT 4843.

STAT 4896  Statistical Project  2 s.h.
Individualized study of a topic in statistics culminating in a written report and
an oral presentation. May be repeated once.
Prereq.: STAT 4817 and permission of chairperson.
Gen Ed: Capstone.

STAT 5800  Mathematical Foundations of Actuarial Science  3 s.h.
A survey of probability theory and an introduction to risk management.
Emphasis of the course will be on problem solving with applications in
actuarial science.
Prereq.: STAT 4843 or consent of instructor.

STAT 5801  Data Management  3 s.h.
This course covers the basic concepts of database systems and emphasizes
the real-world database applications relevant to the management of data in
an organization environment. The topics include (not limited to) database
environment, database development, relational database management
systems, SQL/NoSQL data management language, data normalization, data
warehousing, and internet database environment. Credit will not be given for
both DATX 5801 and CSIS 3722. Cross-Listed: h.
Prereq.: Junior standing or higher and GPA of 2.5 or higher. h.

STAT 5802  Theory of Interest  3 s.h.
Mathematical theory and techniques in analysis of interest. Topics include
measurement of interest, force of interest, annuities, amortization, pricing of
investment products, and applications to actuarial sciences.
Prereq.: MATH 1572 and any 3700 level MATH, STAT, ECON, or FIN course.

STAT 5806  Seminar in Actuarial Science  2-3 s.h.
Approaches to and practice with problem solving in actuarial science. Topics
may include financial mathematics, financial economics, or actuarial modeling.
May be repeated once. Not applicable to the mathematics major.
Prereq.: STAT 4843 or consent of the instructor.

STAT 5811  SAS Programming for Data Analytics  3 s.h.
An introduction to SAS programming for data analytics. Topics include using
SAS for data processing, manipulation, visualization, reporting and statistical
analysis. The objective is for students to develop statistical computing skills
for problem solving and decision making. Also listed as ECON 5861.
Prereq.: STAT 3717 or STAT 3743 or STAT 2601 or ECON 3790 or equivalent.

STAT 5814  Statistical Data Mining  3 s.h.
A systematic introduction to data mining with emphasis on various data
mining problems and their solutions. Topics include data mining processes
and issues, exploratory data analysis, supervised and unsupervised learning,
classification, and prediction methods.
Prereq.: STAT 3717 or STAT 3743, or consent of department chairperson.
STAT 5819  Bayesian Statistics  3 s.h.
An introduction to the Bayesian approach to statistical inference for data analysis in a variety of applications. Data analysis using statistical software will be emphasized. Topics include: comparison of Bayesian and frequentist methods, Bayesian model specification, prior specification, basics of decision theory, Markov chain Monte Carlo, Bayes factor, empirical Bayes, Bayesian linear regression and generalized linear models, hierarchical models.
Prereq.: STAT 3717 or STAT 3743 or STAT 4817 or STAT 6940 or equivalent.

STAT 5840  Statistical Computing  3 s.h.
Computational methods used in statistics. Topics include generation and testing of random numbers, computer intensive methods, and simulation studies.
Prereq.: STAT 3717 or STAT 3743.

STAT 5846  Categorical Data Analysis  3 s.h.
Discrete distributions, contingency table analysis, odds ratios, relative risk, logistic regression, hierarchical models.
Prereq.: STAT 4817 or STAT 4844.

STAT 5847  Nonparametric Statistics  3 s.h.
Nonparametric statistical inference including tests of hypotheses for one sample, two or more related independent samples, dependence, goodness-of-fit, trend, and related topics.
Prereq.: STAT 3717 or STAT 3743 or equivalent.

STAT 5849  Multivariate Statistical Analysis  3 s.h.
The statistical analysis of multivariate observations. Topics include multivariate probability distribution theory, regression, analysis of variance, and techniques in data analysis.
Prereq.: MATH 3720 and STAT 4844 or equivalent.

STAT 5857  Statistical Consulting  3 s.h.
The objective of this course is to cultivate the skills necessary to competently engage in statistical consulting. Topics include problem solving, study design, power and sample size, data management, selection and application of statistical methods, ethical practice, and effective visual and literal communication of results.
Prereq.: STAT 4817 or equivalent.

STAT 5895  Special Topics in Statistics  2-3 s.h.
The study of a standard statistical topic in depth or the development of a special area of statistics. May be repeated twice.
Prereq.: STAT 3717 or STAT 3743.

Placement and Pathways
The following documents are provided to clarify mathematics placement and when a placement exam is required.

Math Placement Guidelines

Flow Chart