DEPARTMENT OF MATHEMATICS

Department Chair: Christopher Hill, Ph.D.

Faculty

M. Cox, Ph.D.
C. Hill, Ph.D.
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C. Uhl, Ph.D.

The remarkable effectiveness of mathematics to reveal and quantify patterns in every human discipline makes a degree in mathematics enormously valuable and versatile. The department offers a major that prepares students for a myriad of careers, ranging from business to industry to government to secondary education, as well as for graduate school. Non-majors may obtain a minor in mathematics. Visit the department at https://www.sbu.edu/math (https://www.sbu.edu/math/).

- Mathematics, BS (https://catalog.sbu.edu/undergraduate/arts-sciences/mathematics/mathematics-bs/)
- Mathematics Adolescence Education, BS (https://catalog.sbu.edu/undergraduate/arts-sciences/mathematics/mathematics-aded-bs/)
- Mathematics, Minor (https://catalog.sbu.edu/undergraduate/arts-sciences/mathematics/mathematics-minor/)

Mathematics (MATH)

MATH-107 INTRODUCTION TO STATISTICS (3 Credits)
This course is a non-calculus-based study of statistics, including descriptive methods, basic probability theory, some design and data-collection issues, and procedures for statistical inference. Topics on statistical inference include confidence intervals and hypothesis testing for means and proportions along with chi-squared tests. Emphasis is on set-up and interpretation rather than on computation, with a significant reliance on computer software and/or statistical calculators for the "number crunching" portion of the analysis. Students may not receive credit for both MATH 107 and MATH 117. MATH 107 includes all content in MATH 117 except ANOVA, and consequently moves at a slower pace than MATH 117.

MATH-108 PRECALCULUS (3 Credits)
This course provides a detailed study of topics needed for success in calculus: algebra, trigonometry, analytic geometry, and functions. Intended for students who need to take at least one semester of calculus for their major. Offered fall.
Restrictions: RG.MA151

MATH-111 MATHEMATICS OF ELEMENTARY EDUCATION I (3 Credits)
This course, in conjunction with Math 112, is intended to give pre-service elementary school teachers a deep understanding of the mathematical systems that they will be expected to teach. The content of Math 111 includes the arithmetic systems of the whole numbers, the integers, and the rationales (at least in fraction form). For each system, students are expected to understand not only how to perform the four arithmetic operations, but also to understand what those operations accomplish in real life, why the operations work the way they do, and how to model or represent those operations in concrete or semi-concrete ways. The study of the integers will include some basic number theory concepts. Underlying all topics in Math 111 are the notions of estimation and mental arithmetic, problem solving, mathematical communication, and viewing mathematics as a logical and sensible system rather than a set of memorized procedures. Intended for elementary education majors. Offered fall.
Restrictions: RGALLED

MATH-112 MATHEMATICS FOR ELEMENTARY EDUCATION II (3 Credits)
This course is a continuation of Math 111, with the same philosophy and emphasis on achieving a deep understanding of elementary school mathematics. The content for Math 112 includes the real number system (as comprised of terminating, repeating, and non-repeating decimals), percents and proportions, probability, descriptive statistics, measurement (in English, metric, and non-standard units), and an overview of basic terminology and concepts from geometry. Intended for elementary education majors. Offered spring.
Prerequisite(s): Take MATH-111
Restrictions: RGALLED

MATH-117 INTRODUCTION TO STATISTICS FOR NATURAL SCIENCE MAJORS (3 Credits)
This non-calculus-based study of statistics includes descriptive methods, basic probability theory, some design and data-collection issues, and procedures for statistical inference. Topics on statistical inference include confidence intervals and hypothesis testing for means and proportions, Chi-squared tests, and one-way and two-way ANOVA. Emphasis is on set-up and interpretation rather than on computation, with a significant reliance on computer software and/or statistical calculators for the "number crunching" portion of the analysis. Students mays not receive credit for both MATH 107 and MATH 117. MATH 117 includes all content in MATH 107, but moves at a faster pace to allow for the inclusion of the ANOVA topics.

MATH-122 CALCULUS FOR MANAGEMENT AND SOCIAL SCIENCES (3 Credits)
This course is an introduction to differential and integral calculus with applications to management and social sciences. This course emphasizes the modeling of problems and the interpretations of results rather than theory. Students who have successfully completed MATH 151 may not take this course for credit. Although there is no prerequisite, students are encouraged to take QMX 210 before attempting MATH 122.

MATH-135 QUANTITATIVE REASONING (3 Credits)
This course enables students to apply quantitative reasoning skills to their daily lives. The topics include numerical reasoning, logical reasoning, and statistical reasoning, all applied to a variety of problems facing citizens of the 21st Century.

MATH-145 INTRODUCTION TO MATHEMATICAL CONCEPTS (3 Credits)
The purpose of Math 145 is to develop in students an appreciation of and a sense of accomplishment in mathematics by exploring topics that they have likely not seen in high school and illustrating them with contemporary real-world applications. The course is intended for students majoring in liberal arts disciplines. The topics of the course may vary from semester to semester, but the topics covered most often are graph theory, social choice, coding, and symmetry.
Restrictions: MATH151T

MATH-151 CALCULUS I (4 Credits)
The study of calculus of functions of one variable. The course covers rates of change, limits, the derivative, the definite integral, the Fundamental Theorem of Calculus, area and average value, and exponential growth and decay. All topics are treated with an emphasis on graphical interpretation. Prerequisite: an understanding of algebra and trigonometry at the level of MATH 108.

MATH-152 CALCULUS II (4 Credits)
A continuation of MATH 151 that includes methods of integration, numerical integration, applications of the definite integral, Taylor polynomials and approximations, and infinite sequences and series.
Prerequisite(s): Take MATH-151

MATH-199 READINGS IN MATHEMATICS (1-3 Credits)
This course offers the interested student an opportunity to work under the supervision of a faculty member in exploring an area of mathematics beyond the scope of existing courses. The topic and content for the semester (and the plan for grading) must be approved by the department chair before the course is included in offerings. The course is not open to mathematics majors.

MATH-207 DISCRETE MATHEMATICS I (3 Credits)
An introduction to topics in discrete mathematics, including logic, set theory, functions and sequences, methods of proof, algorithms, number theory, counting, and discrete probability.

MATH-208 DISCRETE MATHEMATICS II (3 Credits)
A continuation of MATH 207 that includes advanced counting techniques, relations, graphs and trees, Boolean algebra, languages and grammars, and finite state machines. Students who have successfully completed MATH 345 may not take this course for credit.
Prerequisite(s): Take MATH-207

MATH-211 GEOMETRY FOR ELEMENTARY EDUCATION (3 Credits)
An intuitive approach to geometry whose topics include angles, polygons, circles, parallelism, area, perimeter, similarity, congruence, volume, and surface area. Transformations are studied and applied to tessellations and symmetry. The course contains some proofs, but most results are developed by way of informal arguments and inductive reasoning. A dynamic geometry software package is used. Intended for elementary education majors. Offered spring.
Prerequisite(s): Take MATH-112 previously or concurrently

MATH-241 LINEAR ALGEBRA (3 Credits)
An introduction to linear algebra and its applications. Topics include systems of linear equations, vectors, matrices, linear geometry, vector spaces, dimension, and linear transformations. Offered spring.
Prerequisite(s): Take MATH-207
Corequisite(s): TAKE MATH-152 eith previously or concurrently

MATH-251 CALCULUS III (4 Credits)
The study of calculus of functions of several variables. Topics include vectors and graphs in three dimensions, partial derivatives and their applications, multiple integrals and their applications, and line surface integrals. Offered fall.
Prerequisite(s): Take MATH-152

MATH-252 ORDINARY DIFFERENTIAL EQUATIONS (3 Credits)
An introduction to ordinary differential equations. Topics include modeling, analytic solutions, qualitative study of solutions, and numerical approximation of solutions. Offered spring.
Prerequisite(s): Take MATH-152

MATH-281 PROBLEM-SOLVING SEMINAR (1 Credit)
Techniques of mathematical problem-solving are studied and applied to a wide range of problems. Students present their solutions for class discussion. This course prepares students to take the Putnam exam, if they wish to do so. Offered fall.
Prerequisite(s): Take MATH-152 MATH-207

MATH-312 GEOMETRY (3 Credits)
This course views mathematics as comprised of axiomatic systems, and illustrates this view with a study of Euclidean and non-Euclidean geometries. The course includes Euclidean constructions, along with transformational and coordinate/analytical approaches as alternatives to synthetic geometry. A dynamic geometry computer software package is used as appropriate. Offered in fall of even numbered years.
Prerequisite(s): Take MATH-207 MATH-241

MATH-322 MATHEMATICAL PROBABILITY (3 Credits)
This course is a calculus-based study of probability that includes basic probability theorems, the notions of discrete and continuous random variables, mathematical expectation, moment-generating functions, change of variable, multivariate distributions, product moments, and the Central Limit Theorem in preparation for inferential statistics. Offered spring of odd years.
Prerequisite(s): Take MATH-152 MATH-207

MATH-323 MATHEMATICAL STATISTICS (3 Credits)
This course is a calculus-based study of statistics. The course includes a brief overview of some issues in experimental design and data collection, followed by a careful study of techniques for and interpretation of inferences regarding means, variances, proportions, regression, and correlation. Computers and/or calculators are used in these analyses. Some time is devoted to non-parametric procedures. Offered fall of odd years.
Prerequisite(s): Take MATH-322

MATH-341 ABSTRACT ALGEBRA I (3 Credits)
This proof-intensive, theoretic course examines the properties of generalized algebraic structures, focusing primarily on groups, rings, integral domains, and fields. Illustrative examples include the real number system and several of its sub-systems, permutation groups, groups of functions under composition, modular arithmetic, the complex numbers, and matrices. Offered fall of even years.
Prerequisite(s): Take MATH-207 MATH-241

MATH-351 INTRODUCTION TO REAL ANALYSIS I (3 Credits)
This proof-intensive, theoretic course covers the basic principles and theory of mathematical analysis of functions of a single real variable, including the topology of the real number system, sequences, limits, continuity, differentiation, integration, infinite series of real numbers, and infinite series of functions. Offered fall of odd years.
Prerequisite(s): Take MATH-207 MATH-152

MATH-409 SPECIAL TOPICS (3 Credits)

MATH-409B SP TOP:PROBLEM SOLVING SEMINAR (3 Credits)

MATH-413 NUMBER THEORY (3 Credits)
Number theory is the study of the properties of numbers, particularly the positive integers. The subject is deep and beautiful with connections to many other areas of mathematics as well as to computer science, physics, and cryptography. Topics presented vary by instructor, but often include divisibility, congruences, the distribution of primes, Diophantine equations, and selected applications.
Prerequisite(s): Take MATH-207

MATH-453 COMPLEX VARIABLES (3 Credits)
A study of the complex number system, functions of a complex variable, and calculus concepts applied to such functions.
Prerequisite(s): Take MATH-251

MATH-455 TOPOLOGY (0 Credits)

MATH-487 SPECIAL TOPICS APPLIED MATH. (3 Credits)

MATH-487B SP TOPl DATA SCIENCE II (3 Credits)

MATH-487D SP TOP. DATA SCIENCE WITH PYTHON (3 Credits)

MATH-492 SENIOR COMPREHENSIVE PROJECT (1 Credit)
The project consists of selecting a topic relating to, but beyond the usual scope of, a 300- or 400- level mathematics course, writing a paper on the topic, and then presenting the paper to the mathematics faculty and other mathematics students. The paper and the talk are prepared under the guidance of a mathematics faculty member, typically the one who taught the course to which the topic relates.
Restrictions: RG.86+