

# Department of Mathematics

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*Dr. Gregory Harrell, Head*  
*Room 2072, Nevins Hall*

The Department of Mathematics offers the Bachelor of Science (B.S.) degree with a major in Applied Mathematics and the Bachelor of Arts (B. A.) degree with a major in Mathematics. Students pursuing the B.A. degree in mathematics may elect to follow the secondary education track, which leads to grade 6-12 teaching certification in mathematics in the state of Georgia. The department also offers a minor in mathematics.

The programs in the department are designed to give the student the knowledge, skills, and values that build upon the foundation provided by the University Core Curriculum and that are required for professional careers in the mathematical sciences. Both of the majors in mathematics stress critical thinking skills and the development of advanced problem solving skills. Through a series of sequenced courses, the department prepares the student for more advanced study, either at the graduate level or through company training programs. Students who wish to pursue graduate studies in mathematics generally pursue the B.A. in Mathematics, while students who wish to work in industry generally pursue the B.S. in Applied Mathematics. Students who want to teach high school mathematics pursue the secondary education track of the B.A. in Mathematics degree. The minor in mathematics is recommended for science, technology, and engineering majors as well as for students who want to develop the quantitative reasoning and problem solving skills that many employers desire. The requirements of all the programs have been designed in keeping with national norms of excellence.

Students may gain work experience related to their major through the VSU Cooperative Education Program. Such experience may prove valuable in terms of career exploration, acquisition of new skills, and career development.

- Bachelor of Arts with a Major in Mathematics (<http://catalog.valdosta.edu/archive/2016-2017/undergraduate/academic-programs/arts-sciences/mathematics/ba-mathematics>)
- Bachelor of Science with a Major in Applied Mathematics (<http://catalog.valdosta.edu/archive/2016-2017/undergraduate/academic-programs/arts-sciences/mathematics/bs-applied-mathematics>)
- Bachelor of Science with a Major in Computer Information Systems (<http://catalog.valdosta.edu/archive/2016-2017/undergraduate/academic-programs/arts-sciences/computer-science/bs-computer-information-systems>)
- Bachelor of Science with a Major in Computer Science (<http://catalog.valdosta.edu/archive/2016-2017/undergraduate/academic-programs/arts-sciences/computer-science/bs-computer-science>)
- Minor in Mathematics (<http://catalog.valdosta.edu/archive/2016-2017/undergraduate/academic-programs/arts-sciences/mathematics/minor-mathematics>)

**MATH 0989. Foundations for College Algebra. 3 Hours.**

Fundamental algebra skills needed prior to taking MATH 1101 and MATH 1111.

**MATH 0999. Support for College Algebra. 3 Hours.**

Corequisite support for students requiring remediation in mathematics while enrolled in MATH 1101 or MATH 1111.

**MATH 1101. Introduction to Mathematical Modeling. 3 Hours.**

A study of algebraic topics from a modeling perspective. Introduction to different types of models including linear, quadratic, polynomial, exponential, and logarithmic. Emphasis on gathering, presentation, and interpretation of data by using real-world examples as models.

**MATH 1111. College Algebra. 3 Hours.**

Algebraic topics including polynomials, rational expressions, equations, inequalities, graphing, exponents and radicals, relations and functions through exponential and logarithmic functions.

**MATH 1112. Trigonometry. 3 Hours.**

Prerequisite: MATH 1111, 1261, 1113 or 2261 with a grade of "C" or higher, or by mathematics placement policy. Circular, trigonometric, and inverse functions, mathematical induction, the binomial theorem, and complex numbers.

**MATH 1113. Precalculus. 3 Hours.**

Prerequisite: MATH 1112 or MATH 2261 with a grade of "C" or higher, or by mathematics placement policy. Study of polynomial, rational, and transcendental functions and applications, conic sections, polar coordinates, parametric equations, and mathematical induction.

**MATH 1113H. Honors Precalculus. 3 Hours.**

Prerequisite: MATH 1112 or MATH 2261 with a grade of "C" or higher, or by mathematics placement policy. Study of polynomial, rational, and transcendental functions and applications, conic sections, polar coordinates, parametric equations, and mathematical induction. Focus on concepts and real-world applications.

**MATH 1261. Survey of Calculus I. 3 Hours.**

Prerequisite: MATH 1101, 1111, 1112, 1113, 1113H, or MATH 2261 with a grade of "C" or higher, or by mathematics placement policy. Topics include limits, continuity, differentiation of functions of one variable, and applications.

**MATH 1262. Survey of Calculus II. 3 Hours.**

Prerequisite: MATH 1261 with a grade of "C" or higher. A continuation of Survey of Calculus I. Topics include techniques and applications of integration of functions of one and several variables, and techniques and applications of differentiation of functions of several variables.

**MATH 1401. Introduction to Statistics. 3 Hours.**

The course is a course in basic statistics. Topics include descriptive statistics, probability, distributions, hypothesis testing, inferences, correlation, and regression. Prerequisites: Math 1101 Mathematical Modeling, 1111 College Algebra, or 1113 Precalculus or approved equivalent. For more information on this institution's eCore courses, please see <http://www.valdosta.edu/ecore/>.

**MATH 1501. Calculus I. 4 Hours.**

Topics to include functions, limits, continuity, the derivative, antidifferentiation, the definite integral, and applications. Prerequisites: Math 1113 - Precalculus or its equivalent. For more information on this institution's eCore courses, please see <http://www.valdosta.edu/ecore/>.

**MATH 2008. Foundations of Numbers and Operations. 3 Hours.**

Prerequisite: MATH 1101, MATH 1111, or MATH 1113 with a grade of "C" or higher. An introductory mathematics course for early childhood education majors. This course will emphasize the understanding and use of the major concepts of number and operations. As a general theme, strategies of problem solving will be used and discussed in the context of various topics.

**MATH 2150. Introduction to Linear Algebra. 3 Hours.**

Prerequisite: MATH 2261 with a grade of "C" or higher. Systems of linear equations, matrices, determinants, and their properties; vectors and inner products; vector spaces; linear transformations; eigenvalues and eigenvectors. Special emphasis is placed on applications.

**MATH 2261. Analytic Geometry and Calculus I. 4 Hours.**

Prerequisite: MATH 1112 or MATH 1113 with a grade of "C" or higher, or by university placement policy. Introduction to limits, derivatives, integration, fundamental theorem of calculus, and applications.

**MATH 2262. Analytic Geometry and Calculus II. 4 Hours.**

Prerequisite: MATH 2261 with a grade of "C" or higher. Integrals; exponential, logarithmic, and inverse functions; applications of calculus; parametric equations; polar coordinates; sequences and series.

**MATH 2263. Analytic Geometry and Calculus III. 4 Hours.**

Prerequisite: MATH 2262 with a grade of "C" or higher. Three-dimensional analytic geometry; functions of several variables; partial derivatives; multiple integrals, line and surface integrals.

**MATH 2620. Statistical Methods. 3 Hours.**

Prerequisite: MATH 1101, 1111, 1112, 1113, 1113H, 1261, or MATH 2261. An introductory course in statistics. Topics include descriptive statistics; basic notions of probability, random variables, probability distributions, simple random sampling, and sampling distributions; confidence intervals and hypothesis tests; and regression. The application of statistical methodology and the use of computer software are emphasized.

**MATH 3000. Tutoring in Mathematics. 2 Hours.**

Prerequisite: consent of Tutoring Center Director. Philosophy and fundamentals of one-to-one tutoring in mathematics that takes place in the Tutoring Center. Review of basic mathematical concepts in algebra and calculus. Introduction to current technology for enhancement of mathematics instruction. Designed for the Tutoring Center tutors in mathematics, it is graded on an S/U basis. Students must complete this course prior to tutoring in the center or must register for this course during their first semester of tutoring.

**MATH 3010. History of Mathematics. 3 Hours.**

Prerequisite: MATH 2262 with a grade of "C" or higher. A study of the development of mathematics from primitive times to the twentieth century; including numeral systems, arithmetical methods, origins of algebra, geometry, trigonometry, analytic geometry, calculus; and selected topics from modern mathematics.

**MATH 3040. Set Theory. 3 Hours.**

Prerequisite: MATH 2262 with a grade of "C" or higher. Propositional and predicate logic; mathematical induction. Logic and structure of sets as related to mathematical proof. Relations and cardinality.

**MATH 3161. Mathematics for Early Childhood Teachers I. 3 Hours.**

Prerequisite: EDUC 2999 or SPEC 2999 and a grade of "C" or higher in MATH 2008. An in-depth study of the concepts and processes underlying the P-5 school mathematics curriculum, with special emphasis on numeration, number systems, estimation, algebraic thinking, and computational algorithms. Problem solving and historical context serve as unifying strands.

**MATH 3162. Mathematics for Early Childhood Teachers II. 3 Hours.**

Prerequisite: C or better in MATH 3161. An in-depth study of concepts and processes underlying the P-5 school mathematics curriculum with special emphasis on measurement, geometry, and the fundamentals of probability and statistics. Problem solving and historical context serve as unifying strands.

**MATH 3180. Mathematics for Middle School Teachers. 3 Hours.**

Prerequisite: Grade of "C" or higher in either MATH 1101, MATH 1111, MATH 1112, MATH 1113, MATH 1261, or MATH 2261. Concepts and processes that provide the foundation for the middle-grades mathematics curriculum (5-8). Includes an in-depth study of the real number system with emphasis on the rational number system and axiomatic differences among number systems. Other topics include relations and functions, geometry (including coordinate geometry and graphing), measurement, and elementary probability and statistics.

**MATH 3190. Algebra and Geometry for Teachers. 3 Hours.**

Prerequisite: Grade of "C" or higher in MATH 3180 or MATH 2261. An in-depth study of concepts and processes underlying the middle and secondary school mathematics curriculum with special emphasis placed upon the integrated development of algebra, geometry, and analytical geometry. Problem solving and historical context serve as unifying strands.

**MATH 3340. Ordinary Differential Equations. 3 Hours.**

Prerequisite: MATH 2262 with a grade of "C" or higher. Differential equations of first and second order, linear equations of higher order, and applications.

**MATH 3510. Foundations of Geometry. 3 Hours.**

Prerequisite: MATH 3040 with a grade of "C" or higher. A study of the Euclidean and non-Euclidean plane geometry from both synthetic and metric approaches. Topics include concepts related to incidence, betweenness, plane separation and convexity, congruence, and parallelism, with some attention given to geometric transformations.

**MATH 3600. Probability and Statistics. 3 Hours.**

Prerequisite: Either MATH 2262 or MATH 1262, with a "C" or higher. Descriptive statistics, probability distributions for discrete and continuous random variables, statistical inference, one way analysis of variance, and regression analysis.

**MATH 4081. Modern Algebra I. 3 Hours.**

Prerequisite: MATH 3040 with a grade of "C" or higher. Topics from groups, rings, and fields. Subgroups, cyclic groups, permutation groups, normal subgroups, homomorphisms, Cayley's and Lagrange's Theorems, factor groups, abelian groups, direct products. Introduction to rings and fields.

**MATH 4082. Modern Algebra II. 3 Hours.**

Prerequisite: MATH 4081 with a grade of "C" or higher. Continuation of MATH 4081 with emphasis on rings and fields. Rings, integral domains, and fields. Vector spaces, extension fields, finite fields.

**MATH 4085. Applied Modern Algebra. 3 Hours.**

Prerequisite: MATH 4081 with a grade of "C" or higher. Lattices, Boolean algebras, semi-groups, binary group codes, binary relations, and graphs. Special emphasis is placed on applications.

**MATH 4110. Number Theory. 3 Hours.**

Prerequisite: MATH 3040 with a grade of "C" or higher. Elementary properties of integers including divisibility, unique factorization, progressions and prime numbers. Linear congruences and residue classes, complete and reduced residue systems, Chinese Remainder Theorem, quadratic residues, law of quadratic reciprocity, Theorems of Fermat and Wilson, Fibonacci and perfect numbers, sums of squares, elementary theory of continued fractions.

**MATH 4150. Linear Algebra. 3 Hours.**

Prerequisites: MATH 2150 and MATH 3040 with a grade of "C" or higher. Introduction to the theory of vector spaces, with emphasis on finite-dimensional vector spaces, linear systems, matrices, linear transformations, eigenvalues, and related subjects.

**MATH 4161. Mathematical Reasoning. 3 Hours.**

Prerequisites: MATH 3162 or MATH 3180 with a grade of "C" or better. An in-depth study of concepts and processes underlying the P-8 school mathematics curriculum, with special emphasis on informal and formal mathematical reasoning. Problem solving and historical context serve as unifying strands. The analysis and remediation of student errors manifested in the application of conceptual and procedural mathematical knowledge will also be addressed.

**MATH 4260. Mathematical Analysis. 3 Hours.**

Prerequisites: MATH 3040 with a grade of "C" or higher. A study of the principles of mathematical analysis; point set topology in Euclidean and metric spaces, numerical sequences and series, continuity, differentiation, integration, sequences and series of functions.

**MATH 4300. Functions of a Complex Variable. 3 Hours.**

Prerequisite: MATH 2263 with a grade of "C" or higher. Introductory study of the algebraic and geometric properties of the complex number system and functions of a complex variable. Limits, continuity, and differentiation of complex functions. Analytic functions and the Cauchy-Riemann conditions. Integration of complex functions; Cauchy-Goursat theorem; Cauchy integral formula; the theorems of Morera and Liouville. Taylor and Laurent series expansions. Residues and poles with applications to integration. Conformal mappings.

**MATH 4540. Topology. 3 Hours.**

Prerequisite: MATH 3040 with a grade of "C" or higher. The study of point set topology in metric and topological spaces. Open and closed sets, compactness, connectedness, topological mappings, separation, product and function spaces.

**MATH 4621. Mathematical Statistics I. 3 Hours.**

Prerequisites: MATH 2263 and MATH 3600 with a grade of "C" or higher in both. Distributions of random variables, conditional probability and stochastic independence, multivariate and some special distributions, and distributions of functions of random variables.

**MATH 4622. Mathematical Statistics II. 3 Hours.**

Prerequisite: MATH 4621 with a grade of "C" or higher. Introduction to statistical inference, sufficient statistic, estimation theory, theory of statistical tests, and inferences about normal models.

**MATH 4651. Numerical Analysis I. 3 Hours.**

Prerequisites: MATH 2262 and CS 1301 with a grade of "C" or higher in both. Development and implementation of efficient numerical methods; locating roots of nonlinear equations; solving systems of linear equations; numerical differentiation and integration; interpolation; approximation of functions.

**MATH 4652. Numerical Analysis II. 3 Hours.**

Prerequisites: MATH 4651 and MATH 3340 with a grade of "C" or higher in both. Continuation of MATH 4651. Determination of eigenvalues and eigenvectors of matrices; method of least squares, and curve fitting; numerical solutions of ordinary and partial differential equations.

**MATH 4901. Operations Research I. 3 Hours.**

Prerequisite: MATH 2150 or MATH 4150 with a grade of "C" or higher. Mathematical aspects and applications of Operations Research. Topics are selected from linear programming (mainly), integer programming, and dynamic programming.

**MATH 4902. Operations Research II. 3 Hours.**

Prerequisite: MATH 3600 or MATH 4621 with a grade of "C" or higher. (Note that MATH 4901 is not a prerequisite). An introduction to stochastic operations research. Topics are selected from stochastic modeling and optimization, probability models, queueing theory and Monte Carlo simulation.

**MATH 4910. Mathematical Models. 3 Hours.**

Prerequisite: MATH 2263 and 3600 each with a "C" or higher, or permission of instructor. An introduction to basic principles and applications of classical mathematical models, optimization models and probabilistic models.

**MATH 4980. Senior Seminar. 3 Hours.**

Prerequisite: A 4000-level course in algebra, analysis, or topology. A capstone experience in pure mathematics. Topics in an area of algebra, analysis, or topology will be covered and presented in a written and/or oral form.

**MATH 4990. Special Topics in Mathematics. 1-3 Hours.**

Prerequisites: Consent of instructor and Head of the Department of Mathematics and Computer Science. Topics and credits to be assigned. May be taken more than once if topics are different.

**MATH 4990H. Honors Special Topics in Mathematics. 1-3 Hours.**

Prerequisites: Consent of instructor and Head of the Department of Mathematics and Computer Science. Topics and credits to be assigned. Student presentations will be required. May be taken more than once if topics are different.