MATH

Graduate study in the Department of Mathematics is designed to train students in the formulation, analysis, and solution of mathematical models in a variety of application areas. It also emphasizes interdisciplinary research and teamwork. The master's program prepares students for work in industry, government agencies, academia, and further graduate studies.

Visit the Department of Mathematics website (https://www.uakron.edu/math/) to learn more about its faculty and facilities.

- Applied Mathematics, Accelerated BS/MS (https://bulletin.uakron.edu/graduate/colleges-programs/engineering/math/applied-mathematics-accelerated-bs-ms/)
- Applied Mathematics, MS (https://bulletin.uakron.edu/graduate/colleges-programs/engineering/math/applied-mathematics-ms/)

Mathematics (MATH)

MATH:501 History of Mathematics (3 Credits)
Prerequisite: Departmental permission. Origin and development of mathematical ideas. Course does not meet degree requirements in the department. (Formerly 3450:501)

MATH:510 Advanced Linear Algebra (3 Credits)
Prerequisite: Departmental permission. Study of vector spaces, linear transformation, canonical and quadratic forms, inner product spaces. (Formerly 3450:510)

MATH:511 Abstract Algebra I (3 Credits)
Prerequisite: Departmental permission. Study of groups, rings, fields, integral domains, vector spaces, field extensions. Galois theory. May not be used to meet master's degree requirements in mathematics. (Formerly 3450:511)

MATH:512 Abstract Algebra II (3 Credits)
Prerequisite: MATH 511 or departmental permission. Study of groups, rings, fields, integral domains, vector spaces, field extensions, Galois theory. (Formerly 3450:512)

MATH:513 Theory of Numbers (3 Credits)
Prerequisite: Departmental permission. Euclidean algorithm, unique factorization theorem, congruences, primitive roots, indices, quadratic residues, number-theoretic functions, Gaussian integers and continued fractions. (Formerly 3450:513)

MATH:515 Combinatorics & Graph Theory (3 Credits)
Prerequisite: Departmental permission. Introduction to basic ideas and techniques of mathematical counting; properties of structure of systems. (Formerly 3450:515)

MATH:520 Mathematical Technology and Communication (3 Credits)
Prerequisites: Departmental permission. Graphical, numerical, and algebraic computation with applications using a variety of mathematical hardware and software: symbolic manipulators, dynamic geometry software, programs, scripts and web-browsers. (Formerly 3450:520)

MATH:521 Advanced Calculus I (3 Credits)
Sequential. Prerequisite: Departmental permission. Real number system, sequences, series, set theory, continuity, differentiation, integration, partial derivatives, multiple integration, maxima and minima, convergences and uniform convergences, power series, improper integrals, transformations, line and surface integrals. May not be used to meet master's degree requirements for mathematics or applied mathematics. (Formerly 3450:521)

MATH:522 Advanced Calculus II (3 Credits)
Sequential. Prerequisite: Departmental permission. Real number system, sequences, series, set theory, continuity, differentiation, integration, partial derivatives, multiple integration, maxima and minima, convergence and uniform convergence, power series, improper integrals, transformations, line and surface integrals. (Formerly 3450:522)

MATH:525 Complex Variables (3 Credits)
Prerequisite: Departmental permission. Complex variables; elementary functions, differentiation and analytic functions; integration and Cauchy's theorem; power series and Laurent series; residue theorem; applications such as conformal mappings, inversion of integral transform. (Formerly 3450:525)

MATH:527 Applied Numerical Methods I (3 Credits)
Prerequisite: departmental permission. Numerical methods in polynomial interpolation, root finding, numerical integration, and numerical linear algebra. May not be used to meet master's degree requirements for applied mathematics. (Formerly 3450:527)

MATH:528 Applied Numerical Methods II (3 Credits)
Prerequisite: Departmental permission. Numerical methods in the solution of ordinary and partial differential equations. Numerical differentiation, Runge-Kutta methods, and iterative methods for ODEs, finite differences for PDEs. (Formerly 3450:528)

MATH:532 Introduction to Partial Differential Equations (3 Credits)
Prerequisite: Departmental permission. Studies of various aspects of the analysis of Partial Differential Equations, including the construction of solutions, their uniqueness, behavior and qualitative properties. (Formerly 3450:532)

MATH:535 Systems of Ordinary Differential Equations (3 Credits)
Prerequisites: Departmental permission. Analysis, solution of systems of equations, linear, nonlinear. Topics: stability theory, perturbation methods, asymptotic methods, applications from physical, social sciences. (Formerly 3450:535)

MATH:536 Mathematical Models (3 Credits)
Prerequisite: Departmental permission. Formulation and analysis of mathematical models in social and physical sciences. Analysis of deterministic and stochastic models. Topics may include stochastic processes, linear programming, graph theory, theory of measurement. (Formerly 3450:536)

MATH:538 Advanced Engineering Mathematics I (3 Credits)
Prerequisite: Departmental permission. Matrices, eigenvalue problems, systems of ODEs, vector analysis, complex variables. May not be used to meet master's requirements for applied mathematics. (Formerly 3450:538)

MATH:539 Advanced Engineering Mathematics II (3 Credits)
Prerequisite: Departmental permission. Special functions, fourier series and transforms, PDEs. (Formerly 3450:539)

MATH:541 Concepts in Geometry (4 Credits)
Prerequisite: Departmental permission. Axiomatic treatment of both Euclidean and non-Euclidean geometries. Other concepts included are finite geometry, transformations, constructions and inversions. (Formerly 3450:541)

MATH:545 Introduction to Topology (3 Credits)
Prerequisite: Departmental permission. Introduction to topological spaces and topologies, mapping, cardinality, homeomorphisms, connected spaces, metric spaces. (Formerly 3450:545)

MATH:589 Topics in Mathematics (1-4 Credits)
(May be repeated for a total of 12 credits) Prerequisite: Permission of instructor. Selected topics in mathematics and applied mathematics at an advanced level. (Formerly 3450:589)

MATH:591 Workshop in Mathematics (1-4 Credits)
(May be repeated) Group studies of special topics in mathematics and applied mathematics. May not be used to meet undergraduate or graduate credit requirements in mathematics. May be used for elective credit only. (Formerly 3450:591)

MATH:611 Topics in Algebra (3 Credits)
Prerequisite: MATH 512 or departmental permission. Advanced study of selected topics in some of the following areas: semigroups, groups, rings, modules and fields. (Formerly 3450:611)

MATH:621 Real Analysis (3 Credits)
Prerequisite: MATH 522 or departmental permission. In-depth study of real analysis - metric spaces, normed vector spaces, integration theory, Hilbert spaces. (Formerly 3450:621)

MATH:625 Analytic Function Theory (3 Credits)
Prerequisite: MATH 522 or departmental permission. Complex number system, holomorphic functions, continuity, differentiability, power series complex integration, residue theory, singularities, analytic continuation, asymptotic expansion. (Formerly 3450:625)

MATH:627 Advanced Numerical Analysis I (3 Credits)
Prerequisites: MATH 522 (grade C- or better) and knowledge of C++, FORTRAN, or MATLAB or departmental permission. Error propagation; theoretical analysis of numerical methods in interpolation, integration and ordinary differential equations. (Formerly 3450:627)

MATH:628 Advanced Numerical Analysis II (3 Credits)
Prerequisites: MATH 522 (grade C- or better) and knowledge of C++, FORTRAN, or MATLAB or departmental permission. Theoretical analysis of numerical methods in linear algebra. (Formerly 3450:628)

MATH:631 Calculus of Variations (3 Credits)
Prerequisite: Departmental permission. Problems with fixed and movable endpoints, problems with constraints, generalization to several variables, the maximality principle, linear time-optional problems, the connective between classical theory and the maximality principle. (Formerly 3450:631)

MATH:632 Advanced Partial Differential Equations (3 Credits)
Prerequisite: MATH 532 or departmental permission. Existence, uniqueness and stability of solutions to general classes of partial differential equations. Methods for solving these classes introduced, emphasizing both analytical and numerical techniques. (Formerly 3450:632)

MATH:633 Methods of Applied Mathematics I (3 Credits)
Prerequisite: MATH 539 or departmental permission. Methods of applied mathematics concentrating on techniques for analysis of differential and integral equations - applied complex analysis, integral transforms, partial differential equations, and integral equations. (Formerly 3450:633)

MATH:634 Methods of Applied Mathematics II (3 Credits)
Prerequisite: MATH 539 or departmental permission. Methods of applied mathematics concentrating on techniques for analysis of differential and integral equations - applied complex analysis, integral transforms, partial differential equations, and integral equations. (Formerly 3450:634)

MATH:635 Optimization (3 Credits)
Prerequisite: MATH 522 or departmental permission. Unconstrained and constrained optimization theory and methods in applied problems. (Formerly 3450:635)

MATH:636 Advanced Combinatorics & Graph Theory (3 Credits)
Prerequisite: Departmental permission. Theory and techniques of combinatorics as applied to network problems and graph theoretic problems. (Formerly 3450:636)

MATH:638 Theory & Application of Wavelets (3 Credits)
Prerequisite: Permission of instructor. Theory of wavelets and applications to signal and image analysis. Topics include time-frequency representations, filter bands, discrete and continuous wavelet transforms, wavelet packets, and applications. (Formerly 3450:638)

MATH:689 Advanced Topics in Mathematics (1-3 Credits)
(May be repeated for a total of six credits) Prerequisite: Permission of advisor. Seminar-type discussion on topics in mathematics leading to supervised research project. No more than 2 credits apply to major requirements. (Formerly 3450:689)

MATH:692 Seminar in Mathematics (3 Credits)
Prerequisite: Permission of advisor. Seminar-type discussion on topics in mathematics leading to supervised research project. (Formerly 3450:692)

MATH:695 Practicum in Mathematics (1-3 Credits)
(May be repeated) Prerequisite: Graduate teaching assistant or permission. Training and experience in college teaching of mathematics. May not be used to meet degree requirements. Credit/noncredit. (Formerly 3450:695)

MATH:697 Individual Reading: Mathematics (1-3 Credits)
(May be repeated for a total of four credits) Prerequisites: Graduate standing and permission. Directed studies in mathematics at graduate level under guidance of selected faculty member. (Formerly 3450:697)

MATH:698 Master's Research (1-6 Credits)
(May be repeated) Prerequisite: Permission of advisor. Research in suitable topics in mathematics or applied mathematics culminating in a research paper. May not be used to meet master's degree requirements for mathematics or applied mathematics. (Formerly 3450:698)

MATH:699 Master's Thesis (3 Credits)
Prerequisite: Permission. A properly qualified candidate for the master's degree may obtain three credits for research that culminates in a public oral presentation of the faculty-supervised thesis. (Formerly 3450:699)

MATH:721 Functional Analysis I (3 Credits)
Prerequisites: [MATH 510 and MATH 621] or departmental permission. These courses are sequential. Study of normed linear spaces and transformations between them with an emphasis on the formulation and analysis of differential and integral equations as operator equations on these spaces. (Formerly 3450:721)

MATH:722 Functional Analysis II (3 Credits)
Prerequisites: [MATH 510 and MATH 621] or departmental permission. These courses are sequential. Study of normed linear spaces and transformations between them with an emphasis on the formulation and analysis of differential and integral equations as operator equations on these spaces. (Formerly 3450:722)

MATH:728 Matrix Iterative Analysis (3 Credits)
Prerequisite: Departmental permission. Basic Iterative methods, Matrix Properties and Concepts, Linear and Nonlinear equation solver, Semi-iterative and conjugate-gradient methods. (Formerly 3450:728)

MATH:730 Advanced Numerical Solution of Partial Differential Equations (3 Credits)
Prerequisites: [MATH 522 and MATH 528], or MATH 628, or departmental permission. Derivation, analysis, and implementation of difference and variational-based methods for the solution of partial differential equations and systems of differential equations. (Formerly 3450:730)

MATH:732 Advanced Partial Differential Equations II (3 Credits)
Prerequisites: [MATH 522 and MATH 532] or departmental permission. Well-posedness of elliptic, hyperbolic and parabolic problems. Variational Methods for Elliptic problems, Conservation Laws and numerical methods, potential theory and integral equations. (Formerly 3450:732)

MATH:733 Asymptotic Methods & Nonlinear Analysis I (3 Credits)
Prerequisites: [MATH 633 and MATH 634] or equivalent. Survey of asymptotic and perturbation methods as applied to integrals and differential equations. Topics: bifurcation and stability with applications from the physical sciences and engineering. (Formerly 3450:733)

MATH:734 Asymptotic Methods & Nonlinear Analysis II (3 Credits)
Prerequisites: [MATH 633 and MATH 634] or equivalent. Survey of asymptotic and perturbation methods as applied to integrals and differential equations. Topics: bifurcation and stability with applications from the physical sciences and engineering. (Formerly 3450:734)

MATH:735 Dynamical Systems (3 Credits)
Prerequisite: MATH 522 or departmental permission. The study of mathematical models of systems which evolve over time. An introduction to maps and applications to ordinary differential equations. (Formerly 3450:735)