

MATHEMATICS (MATH)

MATH 1500 Mathematics Support 3 s.h.

This course provides additional support to students in their mathematics courses. Does not count toward the degree. May be repeated. Grading is ABC/NC.

Prereq.: Permission of the Department of Mathematics and Statistics.

MATH 1500R Mathematics Support Calculus 2 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 real numbers, equations and inequalities, linear, quadratic, polynomial, exponential, and logarithmic functions, graphing techniques, systems of equations, and applications. It includes corequisite support for students requiring remediation in mathematics while studying college algebra. Emphasis will be placed on prerequisite skills needed for college algebra as well as just in time review through the use of appropriate technology. The course fulfills the general education requirements for mathematics.

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 Level 35 or higher.

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. This course includes support for students requiring remediation in mathematics while they are studying trigonometry. Emphasis will be placed on prerequisite skills needed for trigonometry as well as just in time review through the use of appropriate technology.

Prereq.: YSU Math Placement Test Level 20 and a grade of C or better in MATH 1510 or 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, MATH 1571, MATH 1571H, or MATH 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 1 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 or C or better in either MATH 1510 or MATH 1510C.

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 1571H Honors Calculus 1 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 1513, minimum grade of "C", or MATH 1510 and MATH 1511, minimum grade of "C" in both courses, or at least Level 70 on the Mathematics Placement Test.

Gen Ed: Mathematics.

MATH 1572 Calculus 2 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.: C or better in MATH 1571, MATH 1571H, MATH 1581, or MATH 1581H.

Gen Ed: Mathematics.

MATH 1572H Honors Calculus 2 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.: C or better in MATH 1571, MATH 1571H, MATH 1581, or MATH 1581H.

Gen Ed: Mathematics.

MATH 1581 Calculus for the Health Sciences 1 4 s.h.

This is the first course in a two-semester sequence of calculus courses intended for students majoring in the biological or environmental sciences and/or preparing for admission to medical, pharmaceutical, dental, veterinary, or other life-science-related professional schools. We will cover definitions of trigonometric functions, solving trigonometric equations, functions, limits and derivatives, exponential and logarithmic functions, and applications.

Prereq.: At least Level 70 on the YSU Mathematics Placement Test or "C" or better in MATH 1510/MATH 1510C and MATH 1511/MATH 1511C or "C" or better in MATH 1513.

Gen Ed: Mathematics.

MATH 1581H Honors Calculus for the Health Sciences 1 4 s.h.

This is the first course in a two-semester sequence of calculus courses intended for students majoring in the biological or environmental sciences and/or preparing for admission to medical, pharmaceutical, dental, veterinary, or other life-science-related professional schools. We will cover definitions of trigonometric functions, solving trigonometric equations, functions, limits and derivatives, exponential and logarithmic functions, and applications.

Prereq.: At least Level 70 on the YSU Mathematics Placement Test or "C" or better in MATH 1510/MATH 1510C and MATH 1511/MATH 1511C or "C" or better in MATH 1513.

Gen Ed: Mathematics.

MATH 1582 Calculus for the Health Sciences 2 4 s.h.

This is the second course in a two-semester sequence of calculus courses intended for students majoring in the biological or environmental sciences and/or preparing for admission to medical, pharmaceutical, dental, veterinary, or other life-science-related professional schools. We will cover indefinite and definite integrals, probability, functions of several variables, least squares, differential equations.

Prereq.: "C" or better in MATH 1571, MATH 1571H, MATH 1581, or MATH 1581H.

Gen Ed: Mathematics.

MATH 1582H Honors Calculus for the Health Sciences 2 4 s.h.

This is the second course in a two-semester sequence of calculus courses intended for students majoring in the biological or environmental sciences and/or preparing for admission to medical, pharmaceutical, dental, veterinary, or other life-science-related professional schools. We will cover indefinite and definite integrals, probability, functions of several variables, least squares, differential equations.

Prereq.: "C" or better in MATH 1571, MATH 1571H, MATH 1581, or MATH 1581H.

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 and their applications. This sequence will be offered at most once during each academic year.

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.

Coreq.: MATH 1586H.

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.

Coreq.: MATH 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.

Gen Ed: Mathematics.

MATH 2623H Honors Quantitative Reasoning 3 s.h.

Mathematics models emphasizing basic ideas in mathematics and statistics, stressing concept formation rather than manipulative skills.

Prereq.: at least Level 20 on the Mathematics Placement Test or Level 10 on Mathematics Placement Test and concurrent enrollment in MATH 2623C.

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 .

Gen Ed: Mathematics.

MATH 2661C Mathematics for Elementary Teachers I 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. This course includes corequisite support for students requiring remediation in mathematics. Emphasis will be placed on prerequisite skills needed for Algebra, Number and Operations, and Quantity topics as well as just in time review through the use of appropriate technology.

Gen Ed: Mathematics.

MATH 2662 Mathematics for Elementary Teachers 2 4 s.h.

A conceptual development of mathematics topics underlying today's Pre-K-grade 5 curriculum (Decimals, Ratios, Percents, Geometry, Measurement, Probability & Statistics). 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.

Gen Ed: Mathematics.

MATH 2665 Foundations of Middle School Mathematics 2 4 s.h.

Conceptual foundations of topics from geometry, measurement, and probability. 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 or C or better in either MATH 1510 or MATH 1510C.

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.: Grade of "C" or better in MATH 1570 or MATH 1571.

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 2673H Honors 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.

Coreq.: MATH 2687H.

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.

Coreq.: MATH 2686H.

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. Emphases include 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. Existence, uniqueness. First order equations. Higher order linear equations. 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 3705H Honors Differential Equations 3 s.h.

Methods and theory of solving differential equations with applications. Existence, uniqueness. First order equations. Higher order linear equations. 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.: C or better in either MATH 1572, MATH 1572H, 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.: C or better in either MATH 1572, MATH 1572H, 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 or MATH 1572H.

MATH 3720 Linear Algebra and Matrix Theory 3 s.h.

Matrices; matrix operations; linear transformations; applications.

Prereq.: "C" or better in either MATH 1572, MATH 1572H, or MATH 1585H.

MATH 3720H Honors Linear Algebra and Matrix Theory 3 s.h.

Matrices; matrix operations; linear transformations; applications.

Prereq.: "C" or better in either MATH 1572, MATH 1572H, 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.: "C" or better in 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.: "C" or better in MATH 2673, MATH 2673H, or MATH 2686H or permission of the instructor.

MATH 3745H Honors Topics in Mathematical Modeling 3 s.h.

3745h. 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.: "C" or better in MATH 2673, MATH 2673H, 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. or Coreq.: MATH 3715.

MATH 3750H Honors History of Mathematics 3 s.h.

A survey of the historical development of mathematics.

Prereq. or Coreq.: 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.: "C" or better in MATH 3715 and one of MATH 2673, MATH 2673H, 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 or C or better in either MATH 1510 or MATH 1510C.

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.: C or better in MATH 2665 and Level 35 on the Mathematics Placement Test or C or better in MATH 2665 and C or better in either MATH 1510 or MATH 1510C.

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 4822 Abstract Algebra 2 3 s.h.

A continuation of MATH 3721 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, finite fields, 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.: "C" or better in 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 geometry; connections to other branches of mathematics and applications.

Prereq.: "C" or better in 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 Poincaré-Bendixon theorem, biological models, stability via Liapunov functions, asymptotic methods, and boundary value problems.

Prereq.: MATH 3705 and MATH 3720.

MATH 4857 Partial Differential Equations 3 s.h.

Introduction to partial differential equations (PDE) including solution techniques and applications. Classifications of the basic types of PDE's (hyperbolic, parabolic and elliptic) and dependence on boundary and initial conditions. Topics include Fourier series, integral transforms (Fourier, Laplace), and applications in vibrations, electricity, heat transfer, fluids or other selected topics.

Prereq.: MATH 3705 and MATH 3720.

MATH 4869 Functions, Calculus, and Applications for Middle School Teachers 3 s.h.

Polynomial and exponential functions, limits, derivatives, integrals, and applications. Interpretation of slope and area in graphs of functions from applied settings. Applications of limits to the derivations of geometric formulas. Relations between tables, graphs, and the symbolic representation of functions.

Prereq.: "C" or better in MATH 3767 or consent of instructor.

MATH 4870 Mathematics Concepts for Middle School Teachers 3 s.h.

Problem solving from a broad spectrum of mathematics topics (Number Sense and Operations; Algebra, Functions, and Calculus; Measurement and Geometry; Statistics, Probability, and Discrete Mathematics) designed to prepare future middle school mathematics teachers to address Common Core Standards. May be repeated 2 times.

Prereq.: MATH 1564, 2665, MATH 3767, MATH 3768, MATH 4869, and either STAT 2601, STAT 2625 or STAT 2625C.

MATH 4872 Teaching Mathematics in Secondary Schools 3 s.h.

Techniques and materials for effective teaching of secondary school mathematics will be discussed. Not applicable toward the mathematics major or minor. May be repeated once.

Prereq.: Limited to AYA Integrated Mathematics majors who obtained a C or better in MATH 1572, 1572H or MATH 1585H or consent of instructor.

MATH 4875 Complex Variables 3 s.h.

Complex numbers and their geometric representation, analytic functions of a complex variable, contour integration, Taylor and Laurent series, residues and poles, conformal mapping.

Prereq.: MATH 3751 or equivalent.

MATH 4880 Introduction to Topology 3 s.h.

An introduction to the basic concepts of general topology: compactness, connectedness, and continuity in topological spaces.

Prereq.: MATH 3721 and MATH 3751.

MATH 4882 Mathematical Biology Research 1-3 s.h.

Introduction to research in mathematical biology through an interdisciplinary study of a topic in biology and mathematics. May be repeated once. Grading is Traditional/PR. Listed also as BIOL 4882.

Prereq.: MATH 1571 or permission of the instructor.

MATH 4896 Senior Undergraduate Research Project 2 s.h.

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. May be repeated once.

Prereq.: 24 s.h. of mathematics applicable to the mathematics major including either MATH 3721 or MATH 3751 and permission of the department chairperson.

Gen Ed: Capstone.

MATH 5821 Topics in Abstract Algebra 4 s.h.

A course in abstract algebra aimed at developing a broad understanding of the subject. Credit will not be given for both MATH 3721 and MATH 5821.

Prereq.: Permission of graduate coordinator or department chair.

MATH 5825 Advanced Linear Algebra 3 s.h.

A study of abstract vector spaces, linear transformations, duality, canonical forms, the spectral theorem, and inner product spaces.

Prereq.: MATH 3721.

MATH 5828 Number Theory 3 s.h.

A study of congruences, Diophantine equations, quadratic residues, special number theory functions, and selected applications.

Prereq.: MATH 3721.

MATH 5835 Introduction to Combinatorics and Graph Theory 3 s.h.

The pigeonhole principle; permutations, combinations, the binomial theorem; the inclusion-exclusion principle; recurrence relations; graphs and digraphs, paths and cycles, trees, bipartite graphs and matchings.

Prereq.: C or better in either MATH 3715 or CSCI 3710 and C or better in MATH 3720.

MATH 5845 Operations Research 3 s.h.

An introduction to operations research with emphasis on mathematical methods. Topics may include: linear programming, sensitivity analysis, duality theory, transportation problems, assignment problems, transshipment problems, and network problems.

Prereq.: MATH 3715 and MATH 3720.

MATH 5849 Computational Methods for Problems in the Physical Sciences 3 s.h.

Use of contemporary computational approaches to conduct research in the physical sciences using Matlab and supercomputers. Algorithm development and formal exercise tasks may vary depending on the stage of the course, student abilities, and the topic under consideration. Provides application of the techniques discussed in the class to real world situations.

Prereq.: MATH 3705 and PHYS 2610.

Cross-Listed: CSIS 5849 and PHYS 5849.

MATH 5851 Topics in Analysis 4 s.h.

A course in analysis aimed at developing a broad understanding of the subject. Credit will not be given for both MATH 3751 and MATH 5851.

Prereq.: Permission of graduate coordinator or department chair.

MATH 5852 Real Analysis 2 3 s.h.

Uniform convergence of sequences of functions and some consequences; functions on n -space: derivatives in vector spaces, mean value theorem, Taylor's formula, inverse mapping theorem, implicit mapping theorem.

Prereq.: MATH 3720 and MATH 3751 or equivalent.

MATH 5860 Numerical Analysis 1 3 s.h.

The theory and techniques of numerical computation. The solution of a single equation, interpolation methods, numerical differentiation and integration, direct methods for solving linear systems.

Prereq.: MATH 3720 and CSIS 2610 and MATH 2673, MATH 2673H, or MATH 2686H.

MATH 5861 Numerical Analysis 2 3 s.h.

Numerical methods of initial-value problems, eigenvalue problems, iterative methods for linear and nonlinear systems of equations, and methods involving least squares, orthogonal polynomials, and fast Fourier transforms.

Prereq.: MATH 5860 or equivalent.

MATH 5895 Selected Topics in Mathematics 2-3 s.h.

The study of a standard mathematical topic in depth or the development of a special area of mathematics. May be repeated twice.

Prereq.: 24 s.h. of mathematics applicable to the mathematics major including either MATH 3721 or MATH 3751.

MATH 6901 Mathematics Workshop 1-6 s.h.

Intensive study and activity in a topic related to mathematics, its applications, or the teaching of mathematics. May be repeated. Grading is S/U.

Prereq.: Permission of graduate coordinator.

MATH 6905 College Teaching of Mathematics 1 s.h.

Intensive preparation for teaching lower-level mathematics courses, featuring formal instruction and orientation on teaching issues, evaluated presentations, mentored classroom instruction, and weekly teaching seminars. Topics include course design, policies, syllabi, grading; classroom teaching problems; orientation in Mathematics Assistance Center, specific lower-level mathematics courses, online tutorial services. Required of graduate assistants in the Department of Mathematics and Statistics and to be taken each semester the student is a graduate assistant. Grading is S/U. Does not count toward credit in the program.

MATH 6910 Advanced Engineering Mathematics 1 3 s.h.

Theory and solution techniques used in engineering applications. Topics include brief review of ordinary differential equations and linear algebra; vector calculus, integral theorems, complex analysis, series, residue theory, potential theory, special functions, integral transforms, partial differential equations and applications in mathematical modeling.

Prereq.: MATH 3705.

MATH 6911 Advanced Engineering Mathematics 2 3 s.h.

Theory and solution techniques used in engineering applications. Topics include brief review of ordinary differential equations and linear algebra; vector calculus, integral theorems, complex analysis, series, residue theory, potential theory, special functions, integral transforms, partial differential equations and applications in mathematical modeling.

Prereq.: MATH 6910.

MATH 6915 Mathematical Foundations 3 s.h.

Order-theoretic and monadic foundations of mathematics: ordered structures; topologies; powerset operators of a function; applications to continuity, compactness, algebra, logic, and calculus.

Prereq.: MATH 3721 Abstract Algebra I and MATH 3751 Real Analysis I, or permission of graduate coordinator.

MATH 6922 Advanced Topics in Group and Ring Theory 3 s.h.

A continuation of MATH 5821 with special emphasis on groups acting on sets, Sylow's Theorem and its applications, ring homomorphisms, ideals, and polynomial rings. Credit will not be given for MATH 4822 and MATH 6922.

Prereq.: MATH 3721 or MATH 5821.

MATH 6923 Advanced Topics in Field Theory 3 s.h.

This course introduces the major results in advanced field theory. These results include splitting fields, algebraic extensions, finite extensions, cyclotomic polynomials, and finite fields. Credit will not be given for MATH 4823 and MATH 6923.

Prereq.: MATH 4822 or MATH 6922.

MATH 6936 Advanced Topics and Research in Graph Theory 3 s.h.

This is a research-based course in graph theory that builds upon knowledge learned in MATH 5835. The research process of a mathematician will be introduced and exercised while exploring advanced topics in graph theory and making discoveries through independent research.

Prereq.: MATH 5835.

MATH 6955 Advanced Differential Equations 3 s.h.

Proofs of existence and uniqueness of nonautonomous, nonlinear equations. Additional topics may include advanced linear systems, partial differential equations, and integral equations.

Prereq.: MATH 5852 and either MATH 3705 or MATH 4855 or permission of graduate coordinator.

MATH 6957 Partial Differential Equations 3 s.h.

An introduction to partial differential equations (PDE) and their applications. The classification of the basic types of linear partial differential equations, development of how boundary and initial conditions affect solutions, exploration, and application of solution techniques for PDEs and explosions in orthogonal functions will be presented.

Prereq.: MATH 3705 and MATH 3720 or equivalent.

MATH 6975 Complex Analysis 1 3 s.h.

Analytic and meromorphic functions of a complex variable, contour integration, the Cauchy-Goursat theorem, Taylor and Laurent series, residues and poles, conformal mapping. Credit will not be given for both MATH 4875 and MATH 6975.

Prereq.: MATH 3751 or permission of graduate coordinator.

MATH 6980 Topology 1 3 s.h.

Basic concepts of topological spaces and mappings between them, including compactness, connectedness, and continuity. Credit will not be given for both MATH 4880 and MATH 6980.

Prereq.: MATH 3721 Abstract Algebra I and MATH 3751 Real Analysis I, or permission of graduate coordinator.

MATH 6981 Topology 2 3 s.h.

Separation, metrization, compactification. Additional topics will be selected from point-set topology, fuzzy topology, algebraic topology, combinatorial topology, topological algebra.

Prereq.: MATH 4880 or MATH 6980, or permission of graduate coordinator.

MATH 6990 Independent Study 1-3 s.h.

Study under the supervision of a staff member. May be repeated.

Prereq.: Consent of graduate coordinator.

MATH 6995 Special Topics 1-3 s.h.

Specialized topics selected by the staff. May be repeated up to 12 semester hours.

Prereq.: Permission of graduate coordinator and department chair.

MATH 6996 Mathematical Project 1-3 s.h.

Individual research project culminating in a written report or paper, though not as broad in scope as a thesis. May be repeated once if the second project is in a different area of mathematics.

MATH 6999 Thesis 3 s.h.

A student may register for six semester hours in one semester or for three semester hours in each of two semesters.

MATH 7005 Advanced Topics in Categorical Topology 3 s.h.

Content varies with each offering. Implements ideas from MATH 6915, MATH 6980, MATH 6981, and studies categorical methods in topology and related concrete categories. Emphasis on current literature and open questions. May be repeated with approval of graduate coordinator.

Prereq.: MATH 6915, MATH 6980, MATH 6981, or equivalent, or permission of the graduate coordinator.

MATH 7015 Advanced Topics in Foundations of Topology 3 s.h.

Content varies with each offering, implements ideas from MATH 6915, MATH 6980, MATH 6981, and studies foundations of topology from a variety of viewpoints (algebraic, categorical, logical, order theoretic, powerset theoretic, set theoretic, etc.). Emphasis on current literature and open questions. May be repeated with approval of graduate coordinator.

Prereq.: MATH 6915, MATH 6980, MATH 6981, or equivalent, or permission of graduate coordinator.

MATH 7025 Advanced Topics in General Topology 3 s.h.

Content varies with each offering, implements ideas from MATH 6915, MATH 6980, MATH 6981, and studies various topics in point-set topology. Emphasis on current literature and open questions. May be repeated with approval of graduate coordinator.

Prereq.: MATH 6980, MATH 6981, or equivalent, or permission of graduate coordinator.

MATH 7035 Advanced Topics in Lattice-Valued Topology 3 s.h.

Content varies with each offering. Implements ideas from MATH 6915, MATH 6980, MATH 6981, and studies topology from the standpoint of lattice-valued (fuzzy) subsets. Emphasis on current literature and open questions. May be repeated with approval of graduate coordinator.

Prereq.: MATH 6915, MATH 6980, MATH 6981, or equivalent, or permission of the graduate coordinator.

MATH 7045 Advanced Topics in Topological Analysis 3 s.h.

Content varies with each offering. Implements ideas from MATH 6915, MATH 6980, MATH 6981, and studies the overlap between topology and abstract analysis (topological games, topological groups, separate versus joint continuity, etc.). Emphasis on current literature and open questions. May be repeated with approval of graduate coordinator.

Prereq.: MATH 6915, MATH 6980, MATH 6981, or equivalent, or permission of graduate coordinator.

MATH 7055 Seminar in Topology and Abstract Analysis 3 s.h.

Content varies with each offering. Implements ideas from MATH 6915, MATH 6980, MATH 6981, and focuses on current research activities of seminar participants. Student registrants are expected to make at least one major presentation each month of the term. May be repeated with approval of graduate coordinator.

Prereq.: Permission of graduate coordinator.