MATHEMATICS (MATH)

Vertically-related courses in this subject field are: MATH 170-MATH 175-MATH 275-MATH 471-MATH 472.

Credit Limitations: MATH 108 carries no credit after MATH 137 or MATH 143; MATH 137 carries no credit after MATH 143; MATH 143 carries no credit after MATH 160 or MATH 170; MATH 170 carries 2 credits after MATH 160; MATH 160 carries no credit after MATH 170; MATH 215 carries no credit after MATH 461 or MATH 471.

MATH 108 Intermediate Algebra
3 credits
Carries no credit after MATH 137 or MATH 143. Review of algebra including factoring, rational expressions, exponents, radicals, quadratic equations, equations of lines. Taught using the Polya Math Center, a studio environment featuring group study, one-to-one interaction with instructors, computer-mediated modules, and lectures. Does not satisfy general education requirement.

MATH 123 Math in Modern Society
3 credits
Gen Ed: Mathematics
Discussion of some aspects of mathematical thought through the study of problems taken from areas such as logic, political science, management science, geometry, probability, and combinatorics; discussion of historical development and topics discovered in the past 100 years.

MATH 130 Finite Mathematics
3 credits
Gen Ed: Mathematics
Systems of linear equations and inequalities, matrices, linear programming, and probability.
Prereq: Sufficient score on SAT, ACT, or math placement test; or MATH 108 with a "C" or better. Required test scores can be found here: http://www.uidaho.edu/registrar/registration/placement.

MATH 137 Algebra with Applications
3 credits
Gen Ed: Mathematics
Carries no credit after MATH 143. Algebraic, exponential, logarithmic functions, systems of equations, applications.
Prereq: A grade of "C" or better in MATH 108 or sufficiently high score on SAT, ACT, or math placement test. It is recommended that MATH 137 be taken within two years of passing MATH 108 or its equivalent. MATH 137 is not sufficient preparation for MATH 170. Students intending to take MATH 170 should enroll in MATH 143 instead. Required test scores can be found here: http://www.uidaho.edu/registrar/registration/placement.

MATH 143 College Algebra
3 credits
Gen Ed: Mathematics
Carries no credit after MATH 160 or MATH 170; carries 2 credits after MATH 137. Algebraic, exponential, logarithmic functions; graphs of conics; zeros of polynomials; systems of equations, induction. Taught using the Polya Math Center, a studio environment featuring group study, one-to-one interaction with instructors, computer-mediated modules, and lectures.
Prereq: Sufficient score on SAT, ACT, or math placement test; or MATH 108 with grade of C or better. It is recommended that MATH 143 be taken within two years of passing MATH 108 or its equivalent. Required test scores can be found here: http://www.uidaho.edu/registrar/registration/placement.

MATH 144 Analytic Trigonometry
1 credit
Not open for cr to students who have previous high school or college cr in trigonometry. Trigonometric functions, inverse functions, applications. Taught using the Polya Math Center, a studio environment featuring group study, one-to-one interaction with instructors, computer-mediated modules, and lectures.
Prereq: Sufficient score on SAT, ACT, or math placement test. Students may qualify by enrolling concurrently in MATH 143 or MATH 170. Required test scores can be found here: http://www.uidaho.edu/registrar/registration/placement.

MATH 160 Survey of Calculus
4 credits
Gen Ed: Mathematics
Carries no credit after MATH 170. Overview of functions, and graphs, derivatives, integrals, exponential and logarithmic functions, functions of several variables, and differential equations. Primarily for students who need only one semester of calculus, such as students in business or architecture.
Prereq: Sufficient score on SAT, ACT, or math placement test, or MATH 137 with a C or better, or MATH 143 with a C or better. Required test scores can be found here: http://www.uidaho.edu/registrar/registration/placement.

MATH 170 Calculus I
4 credits
Gen Ed: Mathematics
Carries 2 credits after MATH 160. Functions, limits, continuity, differentiation, integration, applications, differentiation and integration of transcendental functions. Primarily for students in engineering, mathematics, science or computer science.
Prereq: MATH 143 (with a grade of C or better) and MATH 144 (concurrent enrollment in MATH 144 is allowed although it is recommended that students complete MATH 144 before enrolling in MATH 170); or demonstrated proficiency through a sufficiently high score on the ACT, SAT, or math placement test. Required test scores can be found here: http://www.uidaho.edu/registrar/registration/placement.

MATH 175 and MATH 176.

MATH 175 Calculus II
4 credits
Gen Ed: Mathematics
Differentiation and integration of transcendental functions, integration techniques, general mean value theorem, numerical techniques, and series.
Prereq: MATH 170 with a grade of C or better.

MATH 176 Discrete Mathematics
3 credits
Induction, set theory, graph theory, number systems, Boolean algebra, and elementary counting.
Prereq: MATH 143 or sufficiently high score on SAT, ACT, or math placement test. Required test scores can be found here: http://www.uidaho.edu/registrar/registration/placement.

MATH 204 (s) Special Topics
Credit arranged.

MATH 215 Proof via Number Theory
3 credits
An introduction to mathematical thinking and proof through the development of the basic results of elementary number theory. Emphasis on techniques of mathematical proofs, reading and writing proofs, and fundamental mathematical structures.
Prereq: MATH 175 and MATH 176.
MATH 275 Calculus III
3 credits
Gen Ed: Mathematics
Vectors, functions of several variables, and multiple integration.
Prereq: MATH 175.

MATH 299 (s) Directed Study
Credit arranged.

MATH 310 Ordinary Differential Equations
3 credits
Classification, initial and boundary value problems of one variable, exact equations, methods of solving higher-order linear equations, second-order equations with constant coefficient, series solutions, systems of linear equations, Laplace transforms, and existence theorems. Recommended preparation: MATH 275.
Prereq: MATH 175.

MATH 315 HON: Topics in Pure Mathematics
3 credits
A topic selected each yr that develops skill and appreciation for theoretical nature of mathematics.
Prereq: Permission of director of University Honors Program.

MATH 330 Linear Algebra
3 credits
Linear equations, matrices, linear transformations, eigenvalues, diagonalization; applications. Recommended Preparation: MATH 175.
Prereq: MATH 160 or MATH 170.

MATH 371 Mathematical Physics
3 credits
Cross-listed with PHYS 371
Mathematical techniques needed in upper-division physics courses, including vector analysis, matrices, Sturm-Liouville problems, special functions, partial differential equations, complex variables.
Prereq: PHYS 212/PHYS 212L and MATH 275.

MATH 376 Discrete Mathematics II
3 credits
Selected topics from discrete mathematics such as graph theory, modeling, and optimization. Recommended for computer science majors.
Prereq: MATH 176 or Permission.

MATH 385 Theory of Computation
3 credits
Cross-listed with CS 385
Mathematical models of computation, including finite automata and Turing machines. (Fall only)
Prereq: Permission.

MATH 386 Theory of Numbers
3 credits
Second course on number theory, including a historical treatment of efforts to answer basic questions on the density and possible forms of prime numbers. Topics may include: quadratic reciprocity, cubic reciprocity, quadratic forms, genus theory, higher reciprocity laws, Hilbert class field, the prime number theorem, Dirichlet's theorem on primes in an arithmetic progression, elliptic curves, and modular forms.
Prereq: MATH 215.

MATH 388 History of Mathematics
3 credits
Cross-listed with HIST 388.
History of the development of mathematical ideas from ancient cultures to the present, including the relationship of those ideas to the cultures that produced them as well as an understanding of the mathematics involved. Cooperative: open to WSU degree-seeking students.
Prereq: MATH 175 or Permission.

MATH 390 Analysis of Algorithms
3 credits
Cross-listed with CS 390
Measures of efficiency; standard methods and examples in the design, implementation, and analysis of algorithms. (Spring only)
Prereq: MATH 175 and CS 121.

MATH 391 Modern Geometry
3 credits
Euclidean and non-Euclidean geometries, plus topics chosen from projective, transformational, and computational geometry. Recommended Preparation: MATH 215.
Prereq: High School Geometry and MATH 176, or Instructor Permission.

MATH 395 Transformational Geometry
3 credits
Transformational Geometry
Cross-listed with MTHE 527
Geometry concepts of congruence, parallelism, and similarity using rigid motions; the group structure of the collection of isometries and their matrix representations. For graduate credit, additional transformational approaches for calculus integration strategies are required. The course is of particular interest to secondary mathematics teaching majors.
Prereq: MATH 330 or equivalent.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
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</thead>
<tbody>
<tr>
<td>MATH 430</td>
<td>Advanced Linear Algebra</td>
<td>3</td>
<td>Vector spaces, linear transformations, characteristic polynomial, eigenvectors, Hermitian and unitary operators, inner products, quadratic forms, Jordan canonical form, applications. Prereq: MATH 215 and MATH 330 or Instructor Permission.</td>
</tr>
<tr>
<td>MATH 432</td>
<td>Numerical Linear Algebra</td>
<td>3</td>
<td>Analysis of efficiency and accuracy of large linear algebra problems; special emphasis on solving linear equations and finding eigenvalues. Prereq: MATH 275, MATH 330, and knowledge of a computer language.</td>
</tr>
<tr>
<td>MATH 435 (s)</td>
<td>Topics in Applied Mathematics</td>
<td>Credit arranged</td>
<td>Topics chosen from fields of current interest in applied mathematics; inquire at the Department of Mathematics for a description of topics for future semesters. Prereq: Permission.</td>
</tr>
<tr>
<td>MATH 437</td>
<td>Mathematical Biology</td>
<td>3</td>
<td>Modeling biological phenomena, mostly through differential equations; mathematical topics include stability analysis and limit cycles for nonlinear ODE's, spatial diffusion and traveling waves for PDE's; biological topics include models of predator-prey systems, infectious diseases, and competition. Cooperative: open to WSU degree-seeking students. Prereq: MATH 310 or Permission.</td>
</tr>
<tr>
<td>MATH 438</td>
<td>Mathematical Modeling</td>
<td>3</td>
<td>Topics in the use of mathematics to model phenomena from science, business, economics, and engineering. Prereq: CS 120, MATH 310 and MATH 330, or Instructor Permission.</td>
</tr>
<tr>
<td>MATH 451</td>
<td>Probability Theory</td>
<td>3</td>
<td>Cross-listed with STAT 451 Random variables, expectation, special distributions (normal, binomial, exponential, etc.), moment generating functions, law of large numbers, central limit theorem. Cooperative: open to WSU degree-seeking students. (Fall only) Prereq: MATH 275, or Permission. Coreq: MATH 275.</td>
</tr>
<tr>
<td>MATH 452</td>
<td>Mathematical Statistics</td>
<td>3</td>
<td>Cross-listed with STAT 452 Estimation of parameters, confidence intervals, hypothesis testing, likelihood ratio test, sufficient statistics. Cooperative: open to WSU degree-seeking students. (Spring only) Prereq: MATH 451 or Permission.</td>
</tr>
<tr>
<td>MATH 453</td>
<td>Stochastic Models</td>
<td>3</td>
<td>Joint-listed with MATH 538, Cross-listed with STAT 453 Markov chains, stochastic processes, and other stochastic models; applications. Additional projects/assignments required for graduate credit. Cooperative: open to WSU degree-seeking students. Prereq: MATH 451 or Permission.</td>
</tr>
<tr>
<td>MATH 461</td>
<td>Abstract Algebra I</td>
<td>3</td>
<td>Groups, rings, and fields. (Fall only) Prereq: MATH 215 and MATH 330; or Permission.</td>
</tr>
<tr>
<td>MATH 462</td>
<td>Abstract Algebra II</td>
<td>3</td>
<td>Groups, rings, and fields. (Spring only) Prereq: MATH 461.</td>
</tr>
<tr>
<td>MATH 471</td>
<td>Introduction to Analysis I</td>
<td>3</td>
<td>Topology of Euclidean n-space, limit and continuity, differentiation, integration. (Fall only) Prereq: MATH 275 and MATH 215; or Permission.</td>
</tr>
<tr>
<td>MATH 472</td>
<td>Introduction to Analysis II</td>
<td>3</td>
<td>Topology of Euclidean n-space, limit and continuity, differentiation, integration. (Spring only) Prereq: MATH 471 or Permission.</td>
</tr>
<tr>
<td>MATH 476</td>
<td>Combinatorics</td>
<td>3</td>
<td>Elementary counting methods, generating functions, recurrence relations, Polya's enumeration, enumeration of graphs, trees, searching, combinatorial algorithms. Recommended Preparation: MATH 176, or MATH 215, or MATH 376. Prereq: MATH 175 and MATH 330.</td>
</tr>
<tr>
<td>MATH 480</td>
<td>Partial Differential Equations</td>
<td>3</td>
<td>Intro to Fourier analysis, application to solution of partial differential equations; classical partial differential equations of engineering and physics. Prereq: MATH 310 or Permission.</td>
</tr>
<tr>
<td>MATH 494</td>
<td>Seminar in Mathematical Biology</td>
<td>1</td>
<td>Oral presentation of research approaches, research results and literature review of mathematical biology including mathematical modeling of biological systems. Cooperative: open to WSU degree-seeking students.</td>
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<tr>
<td>MATH 499 (s)</td>
<td>Directed Study</td>
<td>Credit arranged</td>
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<tr>
<td>MATH 500</td>
<td>Master's Research and Thesis</td>
<td>Credit arranged</td>
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<tr>
<td>MATH 501 (s)</td>
<td>Seminar</td>
<td>Credit arranged</td>
<td></td>
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<tr>
<td>MATH 502 (s)</td>
<td>Directed Study</td>
<td>Credit arranged</td>
<td></td>
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<tr>
<td>MATH 504 (s)</td>
<td>Special Topics</td>
<td>Credit arranged</td>
<td></td>
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</tbody>
</table>
MATH 505 (s) Professional Development  
Credit arranged  
Cr earned in this course will not be accepted toward grad degree programs.  
Prereq: Permission.

MATH 510 Seminar on College Teaching of Mathematics  
1 credit  
Development of skills in the teaching of college mathematics; includes structure of class time, test construction, and various methods of teaching mathematics; supervision of teaching assistants in their beginning teaching assignments. Graded P/F.  
Prereq: Permission.

MATH 511 Topology I  
3 credits  
Basic concepts of point set and algebraic topology. Cooperative: open to WSU degree-seeking students.

MATH 512 Topology II  
3 credits  
Basic concepts of point set and algebraic topology.

MATH 514 Algebraic Topology I  
3 credits  
Basic homotopy theory, covering spaces, homology theory, and applications.

MATH 518 Differentiable Manifolds  
3 credits  
Fundamentals of smooth manifolds, tangent spaces, vector fields, Lie groups, integration on manifolds, and applications. Cooperative: open to WSU degree-seeking students.  
Prereq: MATH 521 and MATH 472.

MATH 519 Numerical Methods  
3 credits  
Cross-listed with PHYS 528. Joint-listed with MATH 428.  
Systems of equations, root finding, error analysis, numerical solution to differential equations, interpolation and data fitting, numerical integration, related topics and applications. Additional projects and/or assignments required for graduate credit in PHYS 528.  
Prereq: MATH 310.

MATH 522 Complex Variables  
3 credits  
Theory of functions of a complex variable. Cooperative: open to WSU degree-seeking students.

MATH 524 Real Variables  
3 credits  
Measure and integration theory for functions of one or several variables.

MATH 525 Probability Theory  
3 credits  
Random variables, characteristic functions, convergence theorems, central limit theorem, conditional probability, and stochastic processes as developed from a measure theoretic basis.  
Prereq: MATH 535 or Permission.

MATH 526 Stochastic Models  
3 credits  
Joint-listed with MATH 453, Cross-listed with STAT 544  
Markov chains, stochastic processes, and other stochastic models; applications. Additional projects/assignments required for graduate credit. Cooperative: open to WSU degree-seeking students.  
Prereq: MATH 451 or Permission.
MATH 563 Mathematical Genetics
3 credits
Cross-listed with BIOL 563
Investigation of aspects of evolutionary biology with an emphasis on stochastic models and statistical methods; topics include: diffusion methods in molecular evolution, gene genealogies and the coalescent, inferring coalescent times from DNA sequences, population subdivision and F statistics, likelihood methods for phylogenetic inference, statistical hypothesis testing, the parametric bootstrap. Cooperative: open to WSU degree-seeking students. 
Prereq: MATH 160 or MATH 170 and STAT 251 or STAT 301 .

MATH 571 Functional Analysis I
3 credits
Linear topological spaces and linear operators. 
Prereq: MATH 535.

MATH 572 Functional Analysis II
3 credits
Linear topological spaces and linear operators. 
Prereq: MATH 571.

MATH 575 Graph Theory I
3 credits
Basic concepts and theorems; topics include trees and connectivity, eulerian and hamiltonian graphs, graph colorings, matchings, graph decomposition, and extremal graph theory.

MATH 576 Graph Theory II
3 credits
Basic concepts and theorems; topics include trees and connectivity, eulerian and hamiltonian graphs, graph colorings, matchings, graph decomposition, and extremal graph theory.
Prereq: Instructor Permission.

MATH 578 Combinatorial Optimization
3 credits
Optimization problems on graphs, network flow problems, complexity analysis of algorithmic solutions, and related topics.

MATH 579 Combinatorics
3 credits
Topics from enumerative combinatorics, design theory, extremal combinatorics and algebraic combinatorics.

MATH 581 (s) Sem In Combinatorics
1-3 credits, max arranged.

MATH 583 Seminar in Applied Mathematics
3 credits, max arranged
Cooperative: open to WSU degree-seeking students.

MATH 596 MAT Comp Exam
1 credits
Supervised preparation for the Master of Arts in Teaching comprehensive exam. Graded Pass/Fail.

MATH 598 (s) Internship
Credit arranged.

MATH 599 (s) Research
Credit arranged
Research not directly related to a thesis or dissertation. 
Prereq: Permission.

MATH 600 Doctoral Research and Dissertation
Credit arranged.