Mathematics

LOWER DIVISION

Prerequisites: All mathematics courses have prereqs. Thus, to be eligible to enroll in a mathematics course, a student must have received a grade of C- or higher in the HSU courses listed as prereqs. In some lower division courses, a student may also satisfy the prereqs with an appropriate score on a mathematics placement exam.

Enrollment in remedial or general education mathematics courses is permitted only for those students who have taken or are exempt from the ELM exam. Students who have not met the specified prereqs need IA to enroll.

In courses marked with asterisks*, credit earned may not count toward unit requirements for graduation, for GE, or for any major.

MATH 40. Elementary Algebra (3) **FS.*** Transition from arithmetic to algebra; operations on real numbers and algebraic expressions; polynomials, fractional expression, square roots; solving elementary equations and word problems. [Prereq: ELM score of 41 or less. Rep once.]

MATH 42. Beginning Algebra (5) **FS.*** Arithmetic review; signed numbers; polynomial arithmetic; first and second degree equations; exponents, rational expressions, and equations; radical expressions and equations; linear systems; introduction to logarithms. [Prereq: ELM score of 36 to 41. Rep once.]

MATH 43. Skills for Quantitative Literacy (2) **FS.*** Quantitive and algebraic methods at the level of intermediate algebra that supports the development of quantitative literacy. Completes mandated remediation in the context of a general education course. Requires concurrent enrollment in MATH 103i. [Prereq: MATH 40 or MATH 42 or ELM score of 42 or higher.]

MATH 44. Intermediate Algebra (3) **FS.*** Fundamental operations, laws, terminology, and notation of algebra; concepts of expression, set, variable, function, graph, equality, equations, and identity; drill with fractions, exponents, and radicals; linear and quadratic equations; systems of equations; introduction to logarithms. [Prereq: MATH 40 or MATH 42 or ELM score of 42 or higher. Rep once.]

MATH 99. Supplementary Instruction in Mathematics (2) **FS.*** For students needing help in mathematics courses. Enroll concurrently in supported class. [CR/NC.]

MATH 103. Contemporary Mathematics (3) **FS.** Nonmathematicians see some of the character of mathematics. Topics vary. [Prereq: math remediation completed or not required. GE.]

MATH 103I. Mathematics as a Liberal Art (3). Ways mathematics uses quantitative, geometrical, algebraic, and statistical thinking in problem solving. Requires concurrent enrollment in math 43. Meets GE area B only with successful completion of MATH 43. Not recommended as preparation for MATH 115. [Prereq: MATH 40 or MATH 42 or ELM score of 42 or higher. Coreq: MATH 43. GE.]

MATH 104. Finite Mathematics (3). Topics include linear models, systems of linear equations, linear programming with two variables, financial mathematics, sets, basic probability and an introduction to descriptive statistics. [Prereq: math remediation completed or not required. GE.]

MATH 105. Calculus for the Biological Sciences & Natural Resources (3) **FS.** Differential and integral calculus. Apply to biological sciences, including exponential growth and decay. [Prereq: (MATH 113 and MATH 114) or MATH 115. GE.]

MATH 106. Calculus for Business & Economics (4). Logarithmic and exponential functions. Derivatives, integrals; velocity, curve sketching, area; marginal cost, revenue, and profit, consumer savings; present value. [Prereq: math remediation completed or not required. GE.]

MATH 108. Critical Thinking in Mathematics (3). Develop and apply critical thinking and problem-solving skills by exploring patterns and mathematical themes in school and society. Intended primarily for prospective preschool and elementary teachers. [Prereq: math remediation completed or not required. GE.]

MATH 109. Calculus I (4) **FS.** Limits, continuity, derivatives, integrals, and their applications. [Prereq: MATH 114 or MATH 115 or MATH 106. GE.]

MATH 110. Calculus II (4) **FS.** Logarithmic and exponential functions, inverse trigonometric functions, techniques of integration, infinite sequences and series, conic sections, polar coordinates. [Prereq: MATH 109 or completed Calculus I.]

MATH 113. College Algebra (3). First-degree and absolute value equations and inequalities; composite and inverse functions; polynomial, rational, exponential, algebraic and logarithmic functions; their properties and transformations; permutations and factorials; binomial theorem; complex numbers. [Prereq: MATH 42 or MATH 44 or equivalent. Rec: take three or more years of high school mathematics including Algebra II.]

MATH 114. Trigonometry (3). Trigonometric functions, their graphs and inverses, radian measure, solving triangles, trigonometric identities and equations, laws of sines and cosines, polar coordinates, complex numbers in trigonometric form, De Moivre's theorem, vectors. [Prereq: MATH 113 or equivalent.]

MATH 115. Algebra & Elementary Functions (4) **FS.** In-depth treatment of exponential, logarithmic, trigonometric, and polynomial functions. [Prereq: MATH 42 or MATH 44 or equivalent. Rec: take three or more years of high school mathematics including Algebra II.]

MATH 205. Multivariate Calculus for the Biological Sciences & Natural Resources (3) **S.** Differential equations, partial derivatives, double integrals, and curve fitting techniques; vectors; applications. [Prereq: MATH 105 or completed Calculus I, or IA.]

MATH 210. Calculus III (4) **FS.** Vectors; parametric equations; 3-dimensional analytic geometry; vector-valued functions; partial derivatives; multiple integrals; introduction to line integrals. [Prereq: MATH 110.]

MATH 240. Introduction to Mathematical Thought (3). Mathematical reasoning, writing, and proofs; sets, functions, topics in discrete mathematics, problem formulation, problem solving. [Prereq: MATH 110.]

MATH 241. Elements of Linear Algebra (3) **FS.** Linear systems, matrices, determinants, linear independence, bases, eigenvalues, and eigenvectors. [Prereq: MATH 205 or MATH 210 (C)]

MATH 253. Discrete Mathematics (3). Sets, functions, relations, algorithms, induction, recursion, combinatorics, graphs, trees, and propositional logic. [Prereq: MATH 114 (C), or MATH 115 and CS 111.]

MATH 280. Selected Topics in Mathematics (.5-3). [Prereq: IA. Rep.]

UPPER DIVISION

MATH 301. Mathematics & Culture: Historical Perspective (3) **S.** Various cultures' influence on development of mathematics. "Pythagorean" theorem before/after Pythagoras; history of pi from biblical to modern times; primes and perfect numbers from Euclid to today; evolution of algebra from Omar Khayyam to Renaissance and beyond. Meets history requirement for math secondary education, but for math majors does not count toward 26 units of 300-level (or above) courses. [Prereq: MATH 114 or MATH 115. DCG-n. GE.]

MATH 308B - MATH 308C. Mathematics for Elementary Education (3-3) **FS.** Develop advanced perspective of concepts, structures, and algorithms of math constituting the core of K-8 math curriculum: the real number system; number theory; algebra and functions; geometry and measurement; probability and statistics; mathematical reasoning. Take in B-C order. Does not apply toward math major/minor. [Prereq: completed lower division GE math or higher, and MATH 308B (for 308C). Prior IA required for majors other than LSCD, LSEE, or CDEE. GE.]

MATH 311. Vector Calculus (2) **F.** Vector fields; line and surface integrals; Green's theorem, divergence theorem, Stokes' theorem; applications. [Prereq: MATH 210 and MATH 241.]

MATH 313. Ordinary Differential Equations (4) **FS.** Systems and series solution methods; applications. Numerical and analytical techniques. [Prereq: MATH 210 and MATH 241.]

MATH 314. Partial Differential Equations (3) **S.** Fourier series; partial differential equations, boundary-value problems, applications. [Prereq: MATH 313. Rec: MATH 311.]

MATH 315. Advanced Calculus (4) **F.** Theory and applications of differential and integral calculus for vectors and several variables. Taylor's theorem and implicit function theorem. Transformations and mappings; line and surface integrals; integral theorems. [Prereq: MATH 210 and MATH 241.]

MATH 316. Real Analysis I (4) **S.** Real numbers, sequences, convergence, supremum and infimum, continuity, uniform continuity, integration, differentiation, Taylor's Theorem. [Prereq: MATH 210 and MATH 240. Strongly rec: MATH 343.]

MATH 340. Number Theory (3) **F.** Divisibility, congruencies, quadratic reciprocity, arithmetic functions, Diophantine equations, introduction to algebraic number theory, computer applications. [Prereq: MATH 240 and MATH 241 and CS 111.]

MATH 343. Introduction to Algebraic Structures (4) **S.** Elementary number theory, integral domains, groups, rings, modules, fields, linear algebras. [Prereq: MATH 240 and MATH 241.]

MATH 344. Linear Algebra (3) **F.** Matrices, vector spaces, linear transformations, canonical forms, characteristic values, applications. [Prereq: MATH 240 and MATH 241.]

MATH 351. Introduction to Numerical Analysis (4) **F.** Error analysis, computer arithmetic; solving equations in one variable; interpolation and polynomial approximation; numerical differentiation and integration; ordinary differential equations; solutions of linear systems. [Prereq: (MATH 205 or MATH 210) and MATH 241 and CS 111. Weekly: 3 hrs lect, 2 hrs lab.]

MATH 361. Introduction to Mathematical Modeling (4) **S.** Modeling techniques. Examples from biological, environmental, and physical sciences: continuous, discrete, stochastic, and computer simulation models. [Prereq: year of calculus and course in computer programming. Rec: course in linear algebra. Weekly: 3 hrs lect, 2 hrs lab.]

MATH 370. School Mathematics from Advanced Viewpoint I (3) **F.** In-depth study of real and complex numbers, functions, equations, polynomials, and trigonometry. Material is rooted in the mathematical content and problems of high school mathematics, but concepts are treated from a mathematically-advanced standpoint. [Prereq: MATH 110 and MATH 240.]

MATH 371. Geometry (3) **S.** Classical and modern problems and concepts. Topics from: plane and solid geometry; Euclidean geometry; deductive approaches, non-Euclidean and alternative characterizations of geometry using synthetic, analytic, and transformational approaches. [Prereq: high school geometry or equivalent, and MATH 240; or IA.]

MATH 381. Tutorial on Mathematical Proofs (1). Develop ability to present clear mathematical exposition and argument. [Concurrent enrollment in an upper division theoretical mathematics course. CR/NC.]

MATH 401. History of Mathematics I (3) **F.** Key mathematical ideas/milestones: from antiquity to evolution of calculus. Research techniques introduced. [Prereq: MATH 205 or MATH 210, and high school geometry or equivalent; or IA. Offered alternate years.]

MATH 413. Advanced Ordinary Differential Equations (3) **S.** Existence and uniqueness of solutions; linear systems and vector-matrix differential equations; oscillation and comparison theorems; nonlinear differential equations and stability. [Prereq: MATH 313 or equivalent. Offered alternate years.]

MATH 416. Real Analysis II (3) **F.** Sequences and series of functions, uniform convergence, power series, metric spaces. [Prereq: MATH 316. Strongly rec: MATH 343. Offered alternate years.]

MATH 418. Introduction to Complex Analysis (3) **S.** Analytic and meromorphic functions, power series, singularities, and residues. [Prereq: MATH 210 and MATH 240. Offered alternate years.]

MATH 443. Advanced Algebraic Structures (3) **F.** Advanced topics in groups, rings, and fields; polynomials and Galois theory; applications. [Prereq: MATH 343. Offered alternate years.]

MATH 470. School Mathematics from an Advanced Viewpoint II (3) **S.** Connect undergraduate mathematics to the math curriculum of grades 7-14. Integrated projects: algebra, geometry, probability and statistics, discrete math, number theory, history of mathematics, applications of mathematics, and classical problems. Specific mix of topics depends on student background. [Prereq: senior mathematics major and IA.]

MATH 474. Graph Theory (3) **F.** Finite graphs, trees, digraphs, Eulerian and Hamiltonian graphs, mappings, graphs as models, coloring problems, and application of graph theory. [Prereq: MATH 240 or IA. Offered alternate years.]

MATH 480. Selected Topics in Mathematics (1-4). [Prereq: IA. Rep.]

MATH 481. Workshop in Tutoring Mathematics (1). Teaching techniques applicable to a tutorial setting. Primarily for students concurrently tutoring math. [CR/NC. May count for credit only toward a major in mathematics (education). Prereq: IA. Rep twice.]

MATH 485. Seminar in Mathematics (1-2). Current literature, research, problem solving. [Prereq: IA. Rep. No more than two units may apply to the major. CR/NC.]

MATH 499. Directed Study (.5-3). Directed reading and conferences on special topics. [Rep by topic; multiple enrollments in term.]

GRADUATE

MATH 521. Applied Stochastic Processes (3) **S.** Markov processes, Kolmogorov forward and backward equations, queuing theory, birth and death processes, diffusion processes, renewal theory; Brownian motion. [Prereq: MATH 313 or MATH 344 or STAT 323.]

MATH 561. Dynamic Systems (4) **F.** Linear and nonlinear systems of difference equations and differential equations as applied to mathematical models of real dynamic phenomena; bifurcation theory. [Prereq: MATH 313 and MATH 344.]

MATH 562. Model Fitting (4). Contemporary approaches to fitting descriptive and mechanistic models to data. Topics include likelihoods, parameter estimation, information-theoretic criteria, time series, and numerical methods. [Prereq: MATH 313 and STAT 323, or IA.]

MATH 580. Selected Topics in Mathematics (1-4). [Prereq: IA. Rep.]

MATH 595. Mathematical Modeling Practicum (3) **F.** Practical experience constructing and analyzing mathematical models. [Coreq: MATH 561 or IA. Rep.]

MATH 685. Seminar in Mathematics (1-2). Review and report on current literature and problems. [Rep.]

MATH 690. Thesis/Project (1-4). Guided investigation of a problem of mathematical significance, culminating in a formal report in compliance with HSU standards. [Prereq: IA. Rep.]

MATH 695. Directed Research (1-2). Individual research on advanced problems. [Prereq: grad standing. Rep.]

MATH 699. Independent Study (.5-3). Directed reading and conferences on special topics. [Rep.]

CREDENTIAL/LICENSURE

MATH 700. In-Service Professional Development in Mathematics (.5-3). Directed studies for professionals in mathematics desiring advanced or specialized instruction, especially that leading to credentialing and certification. [Prereq: IA. CR/NC. Rep.]

MATH 701. In-Service Professional Development in Mathematics Education (.5-5). Directed studies for professionals in mathematics desiring advanced or specialized instruction in curricular or pedagogical areas of K-16 mathematics. [Prereq: IA. Rep.]

MATH 707. Elementary Mathematics from an Advanced Viewpoint (1-3). Topics of interest to high school teachers: algebra, geometry, probability and statistics, number theory, history of mathematics, applications of mathematics, classical problems. Topics depend on student backgrounds. [Prereq: IA. Rep.]

sustainability-focused; *sustainability-related; activ activity; (C) may be concurrent; coreq corequisite(s); CR/NC mandatory credit/no credit; DA dept approval; disc discussion;*

Mathematics
2017-2018 Humboldt State University Catalog