MATHEMATICS (MATH)

MATH 100A Intermediate Algebra
Prerequisites: One year high school algebra and appropriate score on the Math Placement Exam
Notes: Credit earned in MATH 100A will not count toward degree requirements.
Description: Review of the topics in a second-year high school algebra course taught at the college level. Includes: real numbers, 1st and 2nd degree equations and inequalities, linear systems, polynomials and rational expressions, exponents and radicals. Heavy emphasis on problem solving strategies and techniques.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: MATH 100A; MATH 101; MATH 103
Groups: Introductory Mathematics

MATH 101 College Algebra
Prerequisites: Appropriate placement exam score and either two years of high school algebra or a grade of P, C, or better in MATH 100A
Notes: Credit for both MATH 101 and 103 is not allowed.
Description: Real numbers, exponents, factoring, linear and quadratic equations, absolute value, inequalities, functions, graphing, polynomial and rational functions, exponential and logarithmic functions, system of equations.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: CRIM 300; MATH 101; MATH 102; MATH 104; METR 100
Groups: Introductory Mathematics

MATH 102 Trigonometry
Prerequisites: One year high school geometry and either two years high school algebra, one semester high school precalculus, and a qualifying score on the Math Placement Exam; or a grade of C, P, or better in MATH 101
Notes: Credit toward the degree may be earned in only one of MATH 102 or 103.
Description: Trigonometric functions, identities, trigonometric equations, solution of triangles, inverse trigonometric functions and graphs.
Credit Hours: 2
Max credits per semester: 2
Max credits per degree: 2
Format: LEC
Prerequisite for: AGRO 361, GEOL 361, NRES 361, SOIL 361, WATS 361; ASCI 340; MATH 102; MATH 104; MATH 106; METR 100
Groups: Introductory Mathematics

MATH 103 College Algebra and Trigonometry
Prerequisites: Appropriate placement exam score, one year high school geometry, and two years high school algebra. For students with previous college math courses, permission is also required.
Notes: For students with previous college math courses, permission is also required.
Description: First and second degree equations and inequalities, absolute value, functions, polynomial and rational functions, exponential and logarithmic functions, trigonometric functions and identities, laws of sines and cosines, applications, polar coordinates, systems of equations, graphing, conic sections.
Credit Hours: 5
Max credits per semester: 5
Max credits per degree: 5
Format: LEC
Prerequisite for: AGRO 361, GEOL 361, NRES 361, SOIL 361, WATS 361; MATH 103; MATH 104; MATH 106; SOFT 160
Groups: Introductory Mathematics

MATH 104 Applied Calculus
Prerequisites: Appropriate placement exam score or a grade of P (pass), or C or better in MATH 101
Notes: Credit for both MATH 104 and 106 is not allowed.
Description: Rudiments of differential and integral calculus with applications to problems from business, economics, and social sciences.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: ABUS 341, MRKT 341; ACCT 200; ACCT 308; ACCT 309; ACCT 313; AGRO 361, GEOL 361, NRES 361, SOIL 361, WATS 361; AGRO 472, AGRO 872, NRES 472, NRES 872, SOIL 472, WATS 472; BLAW 371; BLAW 371H; BLAW 372; BSEN 355; ECON 215; ECON 215H; ECON 311; FINA 361; FINA 361H; FORS 411; MATH 104; METR 100; MNGT 301; MNGT 301H; MRKT 341H, RAIR 341H; SCMA 331; SCMA 335; SCMA 350; SCMA 350H
ACE: ACE 3 Math/Stat/Reasoning
Groups: Introductory Mathematics

MATH 106 Calculus I
Prerequisites: One year high school geometry; two years algebra and one year precalculus-trigonometry in high school or MATH 102 or MATH 103 or equivalent
Notes: Credit for both MATH 104 and MATH 106 is not allowed. Math Placement Policy applies.
Description: Functions of one variable, limits, differentiation, exponential, trigonometric and inverse trigonometric functions, maximum-minimum, and basic integration theory (Riemann sums) with some applications.
Credit Hours: 5
Max credits per semester: 5
Max credits per degree: 5
Format: LEC
Prerequisite for: ABUS 341, MRKT 341; ACCT 200; ACCT 308; ACCT 309; ACCT 313; AGRO 225, BSEN 225; AGRO 361, GEOL 361, NRES 361, SOIL 361, WATS 361; AGRO 472, AGRO 872, NRES 472, NRES 872, SOIL 472, WATS 472; BLAW 371; BLAW 371H; BLAW 372; BSEN 355; CHME 114; CNST 241; CNST 252; CNST 306; CSCE 235; CSCE 235H; ECON 215; ECON 215H; ECON 311; FINA 361; FINA 361H; FORS 411; MATH 106; MATH 107; METR 100; MNGT 301; MNGT 301H; MRKT 341H, RAIR 341H; SCMA 331; SCMA 335; SCMA 350; SCMA 350H
ACE: ACE 3 Math/Stat/Reasoning
Groups: Introductory Mathematics
MATH 107 Calculus II
Prerequisites: A grade of P, C or better in MATH 106
Description: Integration theory, techniques of integration; applications of definite integrals; series, Taylor series, vectors, cross and dot products, lines and planes, space curves.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC
Prerequisite for: ABUS 341, MRKT 341; ACCT 200; ASTR 204; BLAW 371; BLAW 371H; CHME 202; CHME 331; ECEN 211; ECEN 224; ECON 215; ECON 311; FINA 361; FINA 361H; MATH 107; MATH 208; MATH 380, MATH 380H, STAT 380, STAT 380H, RAIK 270H; MECH 223; METR 100; METR 223; MNGT 301; MNGT 301H; MRKT 341H, RAIK 341H; SCMA 331; SCMA 335; SCMA 350; SCMA 350H
ACE: ACE 3 Math/Stat/Reasoning
Groups: Introductory Mathematics

MATH 107H Honors: Calculus II
Prerequisites: Good standing in the University Honors Program or by invitation; and a grade of "B" or better in MATH 106 or equivalent
Description: For course description, see MATH 107.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC
Prerequisite for: ABUS 341, MRKT 341; ACCT 200; ASTR 204; BLAW 371; BLAW 371H; CHME 202; CHME 331; ECEN 211; ECEN 224; ECON 215; ECON 311; FINA 361; FINA 361H; MATH 107; MATH 208; MATH 380, MATH 380H, STAT 380, STAT 380H, RAIK 270H; MECH 223; METR 100; METR 223; MNGT 301; MNGT 301H; MRKT 341H, RAIK 341H; SCMA 331; SCMA 335; SCMA 350; SCMA 350H
ACE: ACE 3 Math/Stat/Reasoning
Groups: Introductory Mathematics

MATH 107R Analytic Geometry and Calculus II
Prerequisites: A grade of P, C or better in MATH 106
Notes: Open only to students who previously completed the 5 credit hour Math 107 at UNL and wish to improve their grade.
Description: Integration theory, techniques of integration, applications of definite integrals, series, Taylor series, vectors, cross and dot products, lines and planes, space curves.
Credit Hours: 5
Max credits per semester: 5
Max credits per degree: 5
Format: LEC
Prerequisite for: ABUS 341, MRKT 341; ACCT 200; ASTR 204; BLAW 371; BLAW 371H; CHME 202; CHME 331; ECEN 211; ECEN 224; ECON 215; ECON 311; FINA 361; FINA 361H; MATH 107; MATH 208; MECH 223; METR 100; MNGT 301; MNGT 301H; MRKT 341H, RAIK 341H; SCMA 331; SCMA 335; SCMA 350; SCMA 350H
ACE: ACE 3 Math/Stat/Reasoning
Groups: Introductory Mathematics

MATH 189H University Honors Seminar
Prerequisites: Good standing in the University Honors Program or by invitation; placement score on the Math Placement Examination (MPE) at the MATH 104-level or above.
Notes: Topics vary. A University Honors Seminar 189H is required of all students in the University Honors Program.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: METR 100
ACE: ACE 3 Math/Stat/Reasoning
Groups: Introductory Mathematics

MATH 198 Freshman Seminar
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 24
Format: LEC
Prerequisite for: METR 100
ACE: ACE 3 Math/Stat/Reasoning
Groups: Seminars, Ind Study, Topics

MATH 198H Honors: Freshman Seminar
Prerequisites: Good standing in the University Honors Program or by invitation.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 24
Format: LEC
Prerequisite for: METR 100
ACE: ACE 3 Math/Stat/Reasoning
Groups: Seminars, Ind Study, Topics

MATH 203 Contemporary Mathematics
Notes: Not open to students with credit or concurrent enrollment in MATH 106 or MATH 203J.
Description: Applications of quantitative reasoning and methods to problems and decision making in the areas of management, statistics, and social choice. Includes networks, critical paths, linear programming, sampling, central tendency, inference, voting methods, power index, game theory, and fair division problems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
ACE: ACE 3 Math/Stat/Reasoning
Groups: Introductory Mathematics
MATH 203J Contemporary Math  
Prerequisites: Must be admitted to the College of Journalism  
Notes: Not open to students with credit or concurrent enrollment in MATH 106 or MATH 203.  
Description: Applications of quantitative reasoning and methods to problems and decisions making in areas of particular relevance to College of Journalism and Mass Communication, such as governance, finance, statistics, social choice, and graphical presentation of data. Financial mathematics, statistics and probability (sampling, central tendency, and inference), voting methods, power index, and fair division problems.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Format: LEC  
ACE: ACE 3 Math/Stat/Reasoning  
Groups: Introductory Mathematics

MATH 208 Calculus III  
Prerequisites: A grade of P, C or better in MATH 107  
Description: Vectors and surfaces, parametric equations and motion, functions of several variables, partial differentiation, maximum-minimum, Lagrange multipliers, multiple integration, vector fields, path integrals, Green’s Theorem, and applications.  
Credit Hours: 4  
Max credits per semester: 4  
Max credits per degree: 4  
Format: LEC  
Prerequisite for: ABUS 341, MRKT 341; ACTS 401; BLAW 371; BLAW 371H; BLAW 372; ECEN 215; ECEN 306; ECEN 328; ECON 311; FINA 361; FINA 361H; MATH 208; MATH 310; MATH 325; MATH 435; MECH 321; MECH 325H; MECH 373; MECH 373H; MECH 421, MECH 821, ENGR 421; MNGT 301; MNGT 301H; MRKT 341H, RAIK 341H; SCMA 331; SCMA 335; SCMA 350; SCMA 350H; STAT 462  
ACE: ACE 3 Math/Stat/Reasoning  
Groups: Introductory Mathematics

MATH 208H Honors: Calculus III  
Prerequisites: Good standing in the University Honors Program or by invitation  
Description: Vectors and surfaces, parametric equations and motion, functions of several variables, partial differentiation, maximum-minimum, Lagrange multipliers, multiple integration, vector fields, path integrals, Green’s Theorem, and applications.  
Credit Hours: 4  
Max credits per semester: 4  
Max credits per degree: 4  
Format: LEC  
Prerequisite for: ABUS 341, MRKT 341; ACTS 401; BLAW 371; BLAW 371H; BLAW 372; ECEN 215; ECEN 306; ECEN 328; ECON 311; FINA 361; FINA 361H; MATH 208; MATH 310; MATH 325; MATH 435; MECH 321; MECH 325H; MECH 373; MECH 373H; MECH 421, MECH 821, ENGR 421; MNGT 301; MNGT 301H; MRKT 341H, RAIK 341H; SCMA 331; SCMA 335; SCMA 350; SCMA 350H; STAT 462  
ACE: ACE 3 Math/Stat/Reasoning  
Groups: Introductory Mathematics

MATH 221 Differential Equations  
Crosslisted with: MATH 821  
Prerequisites: A grade of P or C; or better in MATH 208/208H  
Description: First- and second-order methods for ordinary differential equations including: separable, linear, Laplace transforms, linear systems, and some applications.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Format: LEC  
Prerequisite for: AGEN 344, BSEN 344; AGEN 957, BSEN 957, CIVE 957, GEOL 957; BSEN 311; BSEN 317; BSEN 326, CIVE 326; CHME 835; CIVE 310; CIVE 310H; ECEN 213; ECEN 216; ECEN 304; ECEN 306; ECEN 328; MATH 430; MATH 442; MECH 310, MECH 310H; MECH 381; MECH 925; MECH 933; MECH 936; MECH 938; METR 312  
ACE: ACE 3 Math/Stat/Reasoning  
Groups: Advanced Mathematics Courses

MATH 221H Honors:Differential Equations  
Prerequisites: Good standing in the University Honors Program or by invitation  
Description: For course description, see MATH 221/821.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Format: LEC  
Prerequisite for: AGEN 344, BSEN 344; AGEN 957, BSEN 957, CIVE 957, GEOL 957; BSEN 311; BSEN 317; BSEN 326, CIVE 326; CIVE 310; CIVE 310H; ECEN 213; ECEN 216; ECEN 304; ECEN 306; ECEN 328; MATH 430; MATH 442; MECH 310, MECH 310H  
ACE: ACE 3 Math/Stat/Reasoning  
Groups: Advanced Mathematics Courses

MATH 238 Mathematical Methods for Biology and Medicine  
Crosslisted with: MATH 838  
Prerequisites: Grade of P, C, or better in MATH 106/106B or MATH 108H.  
Notes: MATH 838 will not count toward a MA or MS degree in MATH or STAT. Some computation and visualizations in MATH 238/838 will be done with Matlab.  
Description: Mathematical modeling, discrete and continuous probability, parameter estimation, discrete and continuous dynamical systems, and Markov chains. Application of mathematical models in the life sciences. Methods include regression analysis, cobweb diagrams, the phase line, nullcline analysis, eigenvalue analysis, linearization, and likelihood analysis. Applications include fisheries, stage-structured populations, pharmacokinetics, epidemiology, and medical testing.  
Credit Hours: 5  
Max credits per semester: 5  
Max credits per degree: 5  
Format: LEC  
Groups: Advanced Mathematics Courses

MATH 239 Advanced Mathematics Courses  
Prerequisite for: AGEN 344, BSEN 344; AGEN 957, BSEN 957, CIVE 957, GEOL 957; BSEN 311; BSEN 317; BSEN 326, CIVE 326; CIVE 310; CIVE 310H; ECEN 213; ECEN 216; ECEN 304; ECEN 306; ECEN 328; MATH 430; MATH 442; MECH 310, MECH 310H  
ACE: ACE 3 Math/Stat/Reasoning  
Groups: Advanced Mathematics Courses
MATH 300 Mathematics Matters
Prerequisites: Parallel TEAC 308 or Parallel TEAC 416D; admission to the College of Education and Human Sciences; removal of any mathematics entrance deficiencies.
Notes: Credit toward the degree may be earned in only one of: MATH 300 or MATH 300M. MATH 300 is designed for elementary education majors with mathematics as an area of concentration.
Description: Numbers and operations. Develop an understanding of mathematics taught in the elementary school.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: TEAC 308
Groups: Introductory Mathematics

MATH 300M Mathematics as a Second Language
Prerequisites: Admission to the College of Education and Human Sciences.
Notes: MATH 300M is open only to a middle grades teaching endorsement program student. Credit towards degree may be earned in only one of: MATH 300, or MATH 300M. MATH 300M is designed to strengthen the mathematics knowledge of the middle-level mathematics teacher.
Description: Develop a deeper understanding of "number and operations". The importance of careful reasoning, problem solving, and communicating mathematics, both orally and in writing. Connections with other areas of mathematics and the need for developing the "habits of mind of a mathematical thinker".
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Groups: Introductory Mathematics

MATH 301 Geometry Matters
Prerequisites: MATH 300, with a grade of C or Pass or better.
Notes: Credit towards the degree may be earned in only one of: MATH 301. Designed for elementary education majors with mathematics as an area of concentration.
Description: Geometry and measurement. Develop an understanding of geometry as taught in the elementary school.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Groups: Introductory Mathematics

MATH 302 Math Modeling
Description: Using mathematics to model solutions or relationships for realistic problems taken from the middle school curriculum. The mathematics for these models are a mix of algebra, geometry, sequences (dynamical systems, queueing theory), functions (linear, exponential, logarithmic), and logic. Mathematical terminology, concepts and principles. Calculator based lab devices, graphing calculators, and computers as tools to collect data, to focus on concepts and ideas, and to make the mathematics more accessible. Math 300 is a strongly recommended prerequisite. Math 302 is intended for middle grades teaching endorsement majors with a mathematics emphasis and/or to elementary education majors who want a mathematics concentration.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Groups: Introductory Mathematics

MATH 304 Experimentation, Conjecture, and Reasoning
Prerequisites: Admission to the College of Education and Human Sciences.
Description: How to express mathematical solutions and ideas logically and coherently in both written and oral forms in the context of problem solving. Inductive and deductive logical reasoning skills through problem solving. Present and critique logical arguments in verbal and written forms. Problem topics taken from topics nationally recommended for middle school mathematics.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Groups: Introductory Mathematics

MATH 306 Number Theory and Cryptology for Middle Level Teachers
Prerequisites: Admission to the College of Education and Human Sciences.
Description: Basic number theory results which are needed to understand the number theoretic RSA cryptography algorithm. Primes, properties of congruences, divisibility tests, linear Diophantine equations, linear congruences, Chinese Remainder Theorem, Wilson's Theorem, Fermat's Little Theorem, Euler's Theorem, and Euler's phi function. Integers with connections to the middle school curriculum and mathematical reasoning.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Groups: Introductory Mathematics
MATH 310 Introduction to Modern Algebra
Prerequisites: MATH 208
Description: Elementary number theory, including induction, the Fundamental Theorem of Arithmetic, and modular arithmetic. Introduction to rings and fields as natural extension of the integers. Particular emphasis on the study of polynomials with coefficients in the rational, real, or complex numbers.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: MATH 350; MATH 407; MATH 408; MATH 417; MATH 430; MATH 450; MATH 452; MATH 471; MATH 809, MATH 409
ACE: ACE 3 Math/Stat/Reasoning
Groups: Advanced Mathematics Courses

MATH 310H Honors: Introduction to Modern Algebra
Prerequisites: Good standing in the University Honors Program or by invitation.
Description: For course description, see MATH 310.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: MATH 350; MATH 407; MATH 408; MATH 417; MATH 430; MATH 450; MATH 452; MATH 471; MATH 809, MATH 409
ACE: ACE 3 Math/Stat/Reasoning
Groups: Advanced Mathematics Courses

MATH 314 Linear Algebra
Crosslisted with: MATH 814
Prerequisites: MATH 208
Notes: Not open to MA or MS students in mathematics or statistics
Description: Fundamental concepts of linear algebra, including properties of matrix arithmetic, systems of linear equations, vector spaces, inner products, determinants, eigenvalues and eigenvectors, and diagonalization.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: MATH 405; MATH 442; MATH 471; MATH 809, MATH 409
ACE: ACE 3 Math/Stat/Reasoning
Groups: Advanced Mathematics Courses

MATH 314H Honors: Applied Linear Algebra (Matrix Theory)
Prerequisites: Good standing in the University Honors Program or by invitation.
Description: For course description, see MATH 314.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: MATH 405; MATH 442; MATH 471; MATH 809, MATH 409
ACE: ACE 3 Math/Stat/Reasoning
Groups: Advanced Mathematics Courses

MATH 316 Case Studies in Theoretical Ecology
Crosslisted with: BIOS 316, NRES 316
Prerequisites: Permission.
Notes: Case studies are structured around preparation for subsequent independent research (BIOS 498 or MATH 496).
Description: Introduction to biological literature, applied mathematics, computer programming, and/or statistical techniques relevant to particular questions in ecology, evolution, and behavior. Typical mathematical topics include discrete dynamics, systems of differential equations, matrix algebra, or statistical inference and probability.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Groups: Advanced Mathematics Courses

MATH 322 Advanced Calculus
Crosslisted with: MATH 822
Description: Uniform convergence of sequences and series of functions, Green's theorem, Stoke's theorem, divergence theorem, line integrals, implicit and inverse function theorems, and general coordinate transformations.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: METR 965
Groups: Advanced Mathematics Courses

MATH 325 Elementary Analysis
Prerequisites: MATH 208
Description: An introduction to mathematical reasoning, construction of proofs, and careful mathematical writing in the context of continuous mathematics and calculus. Topics may include the real number system, limits and continuity, the derivative, integration, and compactness in terms of the real number system.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: METR 965
Groups: Advanced Mathematics Courses

MATH 350 Geometry for High School Teaching
Prerequisites: MATH 310
Notes: NOT open to MATH majors EXCEPT those under degree option "E" who are seeking a secondary mathematics teaching endorsement.
Description: Modern elementary geometry, plane transformations and applications, the axiomatic approach, Euclidean constructions. Additional topics vary.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: MATH 408
Groups: Introductory Mathematics
MATH 380 Statistics and Applications
Crosslisted with: MATH 380H, STAT 380, STAT 380H, RAIK 270H
Prerequisites: MATH 107 or 107H
Notes: Credit toward the degree can not be earned in STAT 218 if taken after or taken in parallel with STAT/MATH 380.
Description: Probability calculus; random variables, their probability distributions and expected values; t, F and chi-square sampling distributions; estimation; testing of hypothesis; and regression analysis with applications.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: ABUS 341, MRKT 341; BLAW 371; BLAW 371H; BLAW 372; ECEN 325; ECEN 355; ECEN 850, ECEN 450; ECON 311; FINA 361; FINA 361H; MATH 809, MATH 409; MECH 343; MNST 301; MNST 301H; MRKT 345; MRKT 350; MRKT 446; SCMA 331; SCMA 335; SCMA 350; SCMA 350H; SCMA 350L
ACE: ACE 3 Math/Stat/Reasoning
Groups: Advanced Mathematics Courses

MATH 380H Statistics and Applications
Crosslisted with: MATH 380, STAT 380, STAT 380H, RAIK 270H
Prerequisites: MATH 107 or 107H
Notes: Credit toward the degree can not be earned in STAT 218 if taken after or taken in parallel with STAT/MATH 380.
Description: Probability calculus; random variables, their probability distributions and expected values; t, F and chi-square sampling distributions; estimation; testing of hypothesis; and regression analysis with applications.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: ABUS 341, MRKT 341; BLAW 371; BLAW 371H; BLAW 372; ECEN 325; ECEN 355; ECEN 850, ECEN 450; ECON 311; FINA 361; FINA 361H; MATH 809, MATH 409; MECH 343; MNST 301; MNST 301H; MRKT 345; MRKT 350; MRKT 446; SCMA 331; SCMA 335; SCMA 350; SCMA 350H; SCMA 350L
ACE: ACE 3 Math/Stat/Reasoning
Groups: Advanced Mathematics Courses

MATH 394 Topics in Contemporary Mathematics
Prerequisites: Sophomore standing and removal of all entrance deficiencies in mathematics.
Description: Topics course for students in academic fields not requiring calculus. Emphasis on understanding and mathematical thinking rather than mechanical skills. Topic varies.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 6
Format: LEC
Groups: Advanced Mathematics Courses

MATH 399 Independent Study in Mathematics
Prerequisites: Prior arrangement with and permission of individual faculty member.
Credit Hours: 1-24
Min credits per semester: 1
Max credits per semester: 24
Max credits per degree: 24
Format: IND
Groups: Seminars, Ind Study, Topics

MATH 399H Honors Course
Prerequisites: For candidates for degrees with distinction, with high distinction, or with highest distinction in the College of Arts and Sciences.
Credit Hours: 1-4
Min credits per semester: 1
Max credits per semester: 4
Max credits per degree: 4
Format: IND
Groups: Seminars, Ind Study, Topics

MATH 405 Discrete and Finite Mathematics for High School Teaching
Prerequisites: MATH 314 or 314H recommended
Notes: Credit is not allowed for both CSCE 235 and MATH 405. NOT open to MATH majors EXCEPT those under degree option "E" who are seeking a secondary mathematics teaching endorsement.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Groups: Advanced Mathematics Courses

MATH 407 Mathematics for High School Teaching I
Prerequisites: MATH 208 and 310
Notes: NOT open to MATH majors EXCEPT those under degree option "E" who are seeking a secondary mathematics teaching endorsement.
Description: Analysis of the connections between college mathematics and high school algebra and precalculus.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Groups: Advanced Mathematics Courses

MATH 408 Mathematics for High School Teaching II
Prerequisites: MATH 310 and 350
Description: Analysis of the connections between college mathematics and high school algebra and geometry.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Groups: Advanced Mathematics Courses

MATH 409 Mathematics for High School Teaching III
Prerequisites: MATH 310 and 350
Description: Analysis of the connections between college mathematics and high school algebra and geometry.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Groups: Advanced Mathematics Courses

MATH 409H Honors Course
Prerequisites: For candidates for degrees with distinction, with high distinction, or with highest distinction in the College of Arts and Sciences.
Credit Hours: 1-4
Min credits per semester: 1
Max credits per semester: 4
Max credits per degree: 4
Format: IND
Groups: Seminars, Ind Study, Topics

MATH 410 Mathematics for High School Teaching IV
Prerequisites: MATH 310 and 350
Description: Analysis of the connections between college mathematics and high school algebra and geometry.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Groups: Advanced Mathematics Courses

MATH 419 Special Topics in Mathematics
Prerequisites: Permission.
Credit Hours: 1-24
Min credits per semester: 1
Max credits per semester: 24
Max credits per degree: 24
Format: LEC
Groups: Seminars, Ind Study, Topics
MATH 409 Math for High School Teachers II, Using Math to Understand Our World
Crosslisted with: MATH 809
Prerequisites: Math 310, Math 314, Math 380/Stat 380
Notes: Not open to MA or MS students in Mathematics. This course is for students seeking a mathematics major under the Education Option and for students in CEHS who are seeking their secondary mathematics teaching certificate.
Description: Designed around a series of projects in which students create mathematical models to examine the mathematics underlying several socially-relevant questions.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MATH 415 Theory of Linear Transformations
Crosslisted with: MATH 815
Prerequisites: Math 314/814 and either Math 325 or Math 310
Description: Topics fundamental to the study of linear transformations on finite and infinite dimensional vector spaces over the real and complex number fields including: subspaces, direct sums, quotient spaces, dual spaces, matrix of a transformation, adjoint map, invariant subspaces, triangularization and diagonalization. Additional topics may include: Riesz Representation theorem, projections, normal operators, spectral theorem, polar decomposition, singular value decomposition, determinant as an n-linear functional, Cayley-Hamilton theorem, nilpotent operators, and Jordan canonical form.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MATH 417 Group Theory
Prerequisites: MATH 310
Description: Elementary group theory, including cyclic, dihedral, and permutation groups; subgroups, cosets, normality, and quotient groups; fundamental isomorphism theorems; the theorems of Cayley, Lagrange, and Cauchy; and if time allows, Sylow’s theorems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MATH 423 Complex Analysis
Crosslisted with: MATH 823
Prerequisites: Math 221 or Math 325.
Description: Complex numbers, functions of complex variables, analytic functions, complex integration, Cauchy’s integral formulas, Taylor and Laurent series, calculus of residues and contour integration, conformal mappings, harmonic functions. Applications of these concepts in engineering, physical sciences, and mathematics.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Groups: Advanced Mathematics Courses

MATH 424 Introduction to Partial Differential Equations
Crosslisted with: MATH 824
Prerequisites: MATH 221
Notes: Not open to MA or MS students in mathematics or statistics.
Description: Derivation of the heat, wave, and potential equations; separation of variables method of solution; solutions of boundary value problems by use of Fourier series, Fourier transforms, eigenfunction expansions with emphasis on the Bessel and Legendre functions; interpretations of solutions in various physical settings.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Groups: Advanced Mathematics Courses

MATH 425 Mathematical Analysis
Prerequisites: MATH 325 or permission
Description: Real number system, topology of Euclidean space and metric spaces, compactness, sequences, series, convergence and uniform convergence, and continuity and uniform continuity.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Groups: Advanced Mathematics Courses

MATH 427 Mathematical Methods in the Physical Sciences
Crosslisted with: MATH 827
Prerequisites: MATH 221.
Description: Matrix operations, transformations, inverses, orthogonal matrices, rotations in space. Eigenvalues and eigenvectors, diagonalization, applications of diagonalization. Curvilinear coordinate systems, differential operations in curvilinear coordinate systems, Jacobians, changes of variables in multiple integration. Scalar, vector and tensor fields, tensor operations, applications or tensors. Complex function theory, integration by residues, conformal mappings.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Groups: Advanced Mathematics Courses

MATH 428 Principles of Operations Research
Crosslisted with: MATH 828
Prerequisites: MATH 314 and either STAT 380 or MECH 321.
Description: Introduction to techniques and applications of operations research. Includes linear programming, queueing theory, decision analysis, network analysis, and simulation.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
ACE: ACE 10 Integrated Product
Groups: Advanced Mathematics Courses
MATH 430 Ordinary Differential Equations
Prerequisites: MATH 221 or 221H, and either MATH 310 or MATH 325
Description: Qualitative behavior of solutions of systems of differential equations, including existence and uniqueness, extendibility, and periodic solutions. The Putzer algorithm, Floquet theory, matrix norms, linearization, stability theory, and period-doubling and chaos.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Groups: Advanced Mathematics Courses

MATH 432 Linear Optimization
Crosslisted with: MATH 832
Prerequisites: MATH 314 and either MATH 310 or MATH 325
Description: Mathematical theory of linear optimization, convex sets, simplex algorithm, duality, multiple objective linear programs, formulation of mathematical models.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Groups: Advanced Mathematics Courses

MATH 433 Nonlinear Optimization
Crosslisted with: MATH 833
Prerequisites: MATH 314/814 and MATH 310 or MATH 325
Description: Mathematical theory of unconstrained and constrained optimization for nonlinear multivariate functions, particularly iterative methods, such as quasi-Newton methods, least squares optimization, and convex programming. Computer implementation of these methods.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Groups: Advanced Mathematics Courses

MATH 435 Math in the City
Prerequisites: Math 208 and at least two of Math 221, Math 314, Math 380
Description: A research experience modeling problems of current interest to the local community, businesses, or government.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Groups: Advanced Mathematics Courses

MATH 439 Mathematical Models in Biology
Crosslisted with: MATH 839
Prerequisites: MATH 107 or permission
Notes: MATH 439/839 has a small laboratory component.
Description: Discrete and continuous models in ecology; population models, predation, food webs, the spread of infectious diseases, and life histories. Elementary biochemical reaction kinetics; random processes in nature. Use of software for computation and graphics.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Groups: Advanced Mathematics Courses

MATH 440 Numerical Analysis I
Crosslisted with: CSCE 440, CSCE 840, MATH 840
Prerequisites: CSCE 155A, CSCE 155E, CSCE 155H, CSCE 155N, CSCE 155T, or SOFT 160; Math 107.
Notes: Credit toward the degree may be earned in only one of the following: CSCE/MATH 440/840 and MECH 480/880.
Description: Principles of numerical computing and error analysis covering numerical error, root finding, systems of equations, interpolation, numerical differentiation and integration, and differential equations. Modeling real-world engineering problems on digital computers. Effects of floating point arithmetic.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Groups: Advanced Mathematics Courses
MATH 447 Numerical Linear Algebra
Crosslisted with: CSCE 447, CSCE 847, MATH 847
Prerequisites: MATH 314
Description: Mathematics and algorithms for numerically stable matrix and linear algebra computations, including solution of linear systems, computation of eigenvalues and eigenvectors, singular value decomposition, and QR decomposition.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Groups: Advanced Mathematics Courses

MATH 450 Combinatorics
Prerequisites: MATH 310 or 310H or 325.
Description: Theory of enumeration and/or existence of arrangements of objects: Pigeonhole principle, inclusion-exclusion, recurrence relations, generating functions, systems of distinct representatives, combinatorial designs and other applications.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Groups: Advanced Mathematics Courses

MATH 452 Graph Theory
Prerequisites: MATH 310 or MATH 325
Notes: Selected applications.
Description: Theory of directed and undirected graphs. Trees, circuits, subgraphs, matrix representations, coloring problems, and planar graphs. Methods which can be implemented by computer algorithms.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Groups: Advanced Mathematics Courses

MATH 456 Differential Geometry I
Prerequisites: MATH 221 or 221H; MATH 314 or 314H; and MATH 322.
Description: Introduction to a selection of topics in modern differential manifolds, vector bundles, vector fields, tensors, differential forms, Stoke's theorem, Riemannian and semi-Riemannian metrics, Lie Groups, connections, singularities. Includes gauge field theory, catastrophe theory, general relativity, fluid flow.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Groups: Advanced Mathematics Courses

MATH 471 Introduction to Topology
Prerequisites: Math 314 and either Math 325 or 310
Description: Elementary point-set and geometric topology. Point-set topics include topological spaces, continuous functions, homeomorphisms, connectedness, compactness, quotient spaces. Geometric topology topics include Euler characteristic, classification of surfaces, and other applications.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: MATH 856

MATH 487 Probability Theory
Crosslisted with: MATH 887
Prerequisites: Math 314 and Math 325
Description: Probability, conditional probability, Bayes' theorem, independence, discrete and continuous random variables, density and distribution functions, multivariate distributions, probability and moment generating functions, the central limit theorem, convergence of sequences of random variables, random walks, Poisson processes and applications.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Groups: Advanced Mathematics Courses

MATH 489 Stochastic Processes
Crosslisted with: MATH 889
Prerequisites: MATH 314 and STAT/MATH 380 (or STAT 880)
Description: Markov chains, continuous-time Markov processes, the Poisson process, Brownian motion, introduction to stochastic calculus.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
ACE: ACE 10 Integrated Product
Groups: Advanced Mathematics Courses

MATH 495 Seminar
Prerequisites: MATH 208 or 208H; and permission.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 6
Format: LEC
Groups: Seminars, Ind Study, Topics

MATH 496 Seminar in Mathematics
Crosslisted with: MATH 896
Prerequisites: Permission.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 6
Format: LEC
Groups: Seminars, Ind Study, Topics
MATH 497 Reading Course

Prerequisites: Senior standing and especially qualified Juniors; and permission.

Credit Hours: 1-4
Min credits per semester: 1
Max credits per semester: 4
Max credits per degree: 4
Format: IND
Groups: Seminars, Ind Study, Topics