

MATHEMATICS (MAT)

MAT 105. Mathematics with Applications. (3 Credits)

I, II. Prerequisite: Satisfaction of English and reading academic readiness indicators and either satisfaction of mathematics academic readiness indicators* or concurrent enrollment in MAT 105P. This course is designed to strengthen computational skills, mathematical reasoning, problems-solving skills, and mathematical reading/ communication skills while focusing on real-world problems. The mathematical topics may include the mathematics of finance, statistics, geometry, combinatorics, mathematical modeling, and algorithms. Use of calculators. Gen. Ed. E-2 [QR].

MAT 105P. Quantitative Support for MAT 105. (1 Credit)

(1) I, II. Corequisite: MAT 105. Corequisite support for students in MAT 105. Emphasis placed on prerequisite skills such as real number sense and operations, problem solving, analyzing graphs, mathematical modeling, and critical thinking. 2 Lab.

MAT 106. Applied Mathematics: _____. (3 Credits)

I, II. Prerequisite: Satisfaction of English and reading academic readiness indicators* and either satisfaction of mathematics academic readiness indicators or concurrent enrollment in MAT 106P. The introduction to the application of mathematics to real-world problems. Topics are from various branches of mathematics such as graph theory, game theory, probability, geometry, and problems from the social sciences. 3 Lec. Gen. Ed. E-2 [QR].

MAT 106P. Quantitative Support for MAT 106. (1 Credit)

I, II. Corequisite: MAT 106. Corequisite support for students in MAT 106. Emphasis placed on prerequisite skills such as real number sense and operations, problem solving, analyzing graphs, mathematical modeling, and critical thinking. 2 Lab.

MAT 110. Intro to Algebraic Functions. (3 Credits)

I, II. Prerequisite: Completion of all University developmental requirements. Algebraic modeling with linear, quadratic, polynomial, rational, exponential and logarithmic functions, equations, and inequalities. 3 Lec/1 Lab. Gen Ed. E-2 [QR].

MAT 111A. Quantitative Support: MAT 112A. (0.5 Credits)

I, II. Formerly MAT 112AP. Corequisite: MAT 112A. Corequisite support for students in MAT 112A. Emphasis placed on prerequisite skills such as real number sense and operations, problem solving, analyzing graphs, factoring, exponents, mathematical modeling, and critical reading and thinking. Credit will not be awarded to students who have credit for MAT 112AP. 2 Lab.

MAT 111B. Quantitative Support: MAT 112B. (0.5 Credits)

I, II. Formerly MAT 112BP. Corequisite: MAT 112B. Corequisite support for students in MAT 112B. Emphasis on prerequisite skills including real number sense and operations, problem solving, graphs, factoring, exponents, logarithms, matrices, sequences, mathematical modeling, and critical reading and thinking. Credit will not be awarded to students who have credit for MAT 112BP. 2 Lab.

MAT 112. Algebra with Applications. (3 Credits)

(3) I, II. Prerequisite: MAT 098 or MAT 110 with a minimum grade of "C", a minimum score of 22 on the mathematics portion of the ACT, a minimum score of 510 on the mathematics portion of the SAT, or a passing score on an algebra placement test. Students will solve application problems involving linear and quadratic equations, matrices, systems of linear equations, series and sequences, logarithmic and exponential equations; and analyze graphs of linear, quadratic, exponential, logarithmic and power functions. 3 Lec/1 Lab. Gen. Ed. E-2.

MAT 112A. Algebra: Polynomials. (1.5 Credits)

I, II. Prerequisite/ Corequisite: Satisfaction of English and reading academic readiness indicators and either satisfaction of algebra readiness indicators* or concurrent enrollment in MAT 111A. Students will solve application problems involving linear, quadratic, and power equations and analyze graphs of linear, quadratic, and power functions. Credit will not be awarded to students who have credit for MAT 112. 3 Lec /1 Lab. Gen. Ed. E-2 [QR]. General Education credit will not be awarded until after successful completion of both MAT 112A and MAT 112B.

MAT 112AP. Quantitative Support for MAT 112A. (0.5 Credits)

(.5) I, II. Corequisite: MAT 112A. Corequisite support for students in MAT 112A. Emphasis placed on prerequisite skills such as real number sense and operations, problem solving, analyzing graphs, factoring, exponents, mathematical modeling, and critical reading and thinking. 2 Lab.

MAT 112B. Algebra: Functions & Matrices. (1.5 Credits)

I, II. Prerequisite/Corequisite: MAT 112A (C) and either satisfaction of algebra readiness indicators* or concurrent enrollment in MAT 111B. Students will solve application problems involving matrices, systems of linear equations, series and sequences, logarithmic and exponential equations; and analyze graphs of exponential and logarithmic functions. Credit will not be awarded to students who have credit for MAT 112. 3 Lec /1 Lab. Gen. Ed. E-2 [QR]. General Education credit will not be awarded until after successful completion of both MAT 112A and MAT 112B.

MAT 112BP. Quantitative Support for MAT 112B. (0.5 Credits)

(.5) I, II. Corequisite: MAT 112B. Corequisite support for students in MAT 112B. Emphasis on prerequisite skills including real number sense and operations, problem solving, graphs, factoring, exponents, logarithms, matrices, sequences, mathematical modeling, and critical reading and thinking. 2 Lab.

MAT 114. College Algebra. (3 Credits)

(3) I, II. Formerly MAT 107. Prerequisite: MAT 098 or MAT 110 with a minimum grade of "C", a minimum score of 22 on the mathematics portion of the ACT, a minimum score of 530 on the mathematics portion of the SAT, or a passing score on an algebra placement test. Real and complex numbers, integer and rational exponents, polynomial and rational equations and inequalities, graphs of functions and relations, exponential and logarithmic functions. Use of graphing calculators. Credit will not be awarded to students who have credit for MAT 107. 3 Lec/1 Lab. Gen Ed. E-2.

MAT 115. Introduction to Mathematica. (1 Credit)

I, II. Prerequisite: MAT 112 or 114 with a minimum grade of "C", or a minimum score of 23 on the mathematics portion of the ACT or a minimum score of 550 on the mathematics portion of the SAT. Use of Mathematica. Numeric, algebraic, and symbolic capabilities, two and three dimensional graphics with animation, decisions, looping, and list manipulation.

MAT 116. Problem Solving with Math. (2 Credits)

A. Prerequisite: MAT 115. Basic concepts include functional programming, procedural programming, rule-based programming, recursion, numerics, and graphics programming.

MAT 120. Trigonometry. (3 Credits)

I, II. Prerequisite: Prerequisite: MAT 112 or 112B or 114 with a grade of "C" or better, or a Math ACT score of 22 or higher, or a Math SAT score of 560 or higher. Radians and degrees, graphs of trigonometric functions, inverse functions, right and oblique triangles, vectors, and real-world applications. Gen. Ed. E-2 [QR].

MAT 122. Precalculus Mathematics. (5 Credits)

(5) I, II. Formerly MAT 109. Prerequisite: MAT 112 or 114 with a grade of "C" or better, a minimum score of 23 on the mathematics portion of the ACT, or a minimum score of 550 on the mathematics portion of the SAT. Polynomial, rational, exponential, logarithmic, and trigonometric functions and inverses. Sequences and series, systems of linear and nonlinear equations and inequalities, the complex number system, vectors, the binomial theorem, mathematical induction, and conic sections. Use of graphing calculators. Credit will not be awarded to those students who have credit for MAT 109. Gen. Ed. E2.

MAT 201. Mathematical Concepts for Middle and Elementary School Teachers I. (3 Credits)

I, II. Prerequisites: MAT 112 or higher with a grade of "C" or better, and a passing score on a Mastery Exam. (The prerequisite course requirement can be met by a combination of MAT 106 and a 23 or higher on the mathematics portion of the ACT.) Concepts beyond algorithmic computation are emphasized. Sets and functions, whole numbers, integers, rational numbers, decimals and real numbers, numeration, and elementary number theory.

MAT 202. Mathematical Concepts for Middle and Elementary School Teachers II. (3 Credits)

I, II. Prerequisites: MAT 201 and another MAT course numbered 112 or higher with a C or better in each and a passing score on a mastery test. (The MAT requirement of a MAT course numbered 112 or higher can be met by a combination of MAT 106 and a 23 or higher on the mathematics portion of the ACT.) Concepts stressed over manipulation. Geometry, measurement, metric system, probability and basic statistics.

MAT 203. Geometry for 7-12 Teachers. (3 Credits)

II. Prerequisites: admission to a teacher certification program; and either MAT 244 with a grade of C or better or a combination of four courses: MAE 201; MAE 202; MAE 302 or EME 301; and one of MAT 112, MAT 114, MAT 211, or MAT 234 or 234 H, with a grade of C or better in each course and a combined grade point of 2.75 in the four courses. Angles and their measurement, right triangle trigonometry, perpendicular lines, congruent triangles, circles, arcs, and angles, constructions and loci, area and volume, similarity, graphing, selected topics from analytic geometry.

MAT 211. Applied Calculus. (3 Credits)

A. Prerequisite: MAT 112 or 112B or 114 or 120 or 122 with a grade of "C" or better, or a minimum score of 23 on the mathematics portion of the ACT or a minimum score of 550 on the mathematics portion of the SAT. Functions and graphs, differentiation, integration, exponential and logarithmic functions, and applications for business, economics, and science. Credit will not be awarded to students who have credit for MAT 261. Gen. Ed. Element 2.

MAT 211L. Applied Calculus Lab. (1-2 Credits)

I, II. Formerly MAT 217. Prerequisite or Corequisite: MAT 211. This optional lab is to accompany a regular lecture class in Applied Calculus. 2-4 Lab. Credit will not be awarded to students who have credit for MAT 217.

MAT 234. Calculus I. (4 Credits)

Formerly MAT 124. Prerequisite: MAT 122 with a grade of "C" or better, a minimum score of 27 on the mathematics portion of the ACT, or a minimum score of 640 on the mathematics portion of the SAT or a passing score on a calculus placement test. Functions, limits, and continuity, derivatives and applications, integration, and introduction to and use of the computer package Mathematica or other appropriate technology. Credit will not be awarded to students who have credit for MAT 124. Gen. Ed. E-2.

MAT 234L. Calculus I Lab. (1-2 Credits)

I, II. Formerly MAT 217. Prerequisite or Corequisite: MAT 234. This optional lab is to accompany a regular lecture class in Calculus I. 2-4 Lab. Credit will not be awarded to students who have credit for MAT 217.

MAT 239. Linear Algebra and Matrices. (3 Credits)

(3) I, II. Formerly MAT 214. Prerequisite: MAT 234 or 234H with a grade of "C" or better. Real and complex vector spaces, linear transformations, matrix theory, with applications, through the introduction of eigenvalues and eigenvectors, determinants, inner product spaces, the use of technology. Credit will not be awarded to students who have credit for MAT 214.

MAT 244. Calculus II. (4 Credits)

I, II. Formerly MAT 224. Prerequisite: MAT 234, or 234H with minimum grade of "C" or better. Fundamental integration techniques, numerical integration, applications of integration, improper integrals, differential equations, infinite series, polar and parametric equations, and use of Mathematica or other appropriate technology. Credit will not be awarded to students who have credit for MAT 224, 224H, or 244N.

MAT 244L. Calculus II Lab. (1-2 Credits)

I, II. Formerly MAT 218. Prerequisite or Corequisite: MAT 244. This optional lab is to accompany a regular lecture class in Calculus II. 2-4 Lab. Credit will not be awarded to students who have credit for MAT 218.

MAT 254. Calculus III. (4 Credits)

I, II. Formerly: MAT 225. Prerequisite: MAT 244 with a minimum grade of "C" or better. Functions of several variables, limits and continuity, partial derivatives, multiple integrals, vector calculus including Green's, Divergence, and Stoke's theorems, cylindrical and spherical coordinates and use of Mathematica. Credit will not be awarded to students who have credit for MAT 225, 225H.

MAT 254L. Calculus III Lab. (1-2 Credits)

I, II. Formerly MAT 219. Prerequisite or Corequisite: MAT 254. This optional lab is to accompany a regular lecture class in Calculus III. 2-4 Lab. Credit will not be awarded to students who have credit for MAT 219.

MAT 301. Logic and Set Theory. (3 Credits)

A. Prerequisites: MAT 214, 224 or 224H with minimum grades of $\geq C$ and a grade point average of at least 2.5 in MAT 124, 214, and 224, or departmental approval. Logic, proof techniques, set theory, relations, functions, cardinality, introduction to advanced mathematics.

MAT 303. Mathematical Models and Applications. (3 Credits)

II. Prerequisite: A grade of C or higher in MAT 112, 114, 211, 234, or 234H. Prerequisites or Corequisites: MAT 203 with a grade of C or better. The course emphasizes conceptual understanding and communication of mathematical topics through modeling, problem solving, and technology. Topics include algebra, geometry, probability, statistics, and real-world situations. Credit does not count toward the B.S. in mathematics nor the B.S. in mathematics teaching nor the mathematics minor.

MAT 306. Discrete Mathematics. (3 Credits)

II. Prerequisites: MAT 239 and 244 each with with a minimum grade of "C" and at least 2.5 GPA in all mathematics courses. Counting principles, permutations, combinations, recurrence relations, graphs, representations of graphs as matrices, trees, networks, difference equations, and linear programming.

MAT 308. Modern Algebra I. (3 Credits)

I. Prerequisite: MAT 301 with a minimum grade of "C" (2.0). Groups, cyclic and permutation groups, homomorphisms, subgroups and factor groups, Fundamental Theorem of Finite Abelian Groups, rings, fields, integral domains, and ideals.

MAT 315. Introduction to Analysis. (3 Credits)

II. Prerequisite: MAT 301, 225 or MAT 225H with a minimum grade of "C". Real number system, sets and functions, limits, continuity, uniform continuity, Taylor's theorem, laws of the mean, the Riemann integral, allied topics.

MAT 334. Modern College Geometry I. (3 Credits)

A. Prerequisite or Corequisite: MAT 301 with a minimum grade of $\geq C$. \geq Euclid's parallel postulate, axiom systems, finite geometries.

MAT 349. Applied Learning in Mathematics. (0.5-8 Credits)

I, II; (1-6) SUMMER ONLY. Prerequisite: departmental approval. Work in placements related to academic studies. Credit does not apply to major or minor requirements. Total hours: eight, associate; sixteen, baccalaureate. A minimum of 80 hours of employment are required for each semester hour of academic credit.

MAT 349A. Cooperative Study: Mathematics. (0.5-8 Credits)

(1-8) I, II; (1-6) SUMMER ONLY. Prerequisite: departmental approval. Work in placements related to academic studies. Credit does not apply to major or minor requirements. Total hours: eight, associate; sixteen, baccalaureate. A minimum of 80 hours of employment are required for each semester hour of academic credit.

MAT 349B. Cooperative Study: Mathematics. (0.5-8 Credits)

Work in placements related to academic studies. Credit does not apply to major or minor requirements.

MAT 349C. Cooperative Study: Mathematics. (0.5-8 Credits)

Work in placements related to academic studies. Credit does not apply to major or minor requirements.

MAT 349D. Cooperative Study: Mathematics. (0.5-8 Credits)

Work in placements related to academic studies. Credit does not apply to major or minor requirements.

MAT 349E. Cooperative Study: Mathematics. (0.5-8 Credits)

Work in placements related to academic studies. Credit does not apply to major or minor requirements.

MAT 349F. Cooperative Study: Mathematics. (0.5-8 Credits)

Work in placements related to academic studies. Credit does not apply to major or minor requirements.

MAT 353. Differential Equations. (3 Credits)

A. Prerequisite: MAT 224 or 224H with a minimum grade of $\geq C$. \geq Differential equations of first order, applications, singular solutions, linear equations with constant coefficients, miscellaneous methods for equations of higher order, solution in series, total differential equations, qualitative methods, systems of linear differential equations, the computer algebra systems.

MAT 380. Mathematics in a Historical. (3 Credits)

A. Prerequisite or Corequisite: MAT 301 or departmental approval. The history of mathematics from ancient beginnings until modern times is studied through problems and through the lives and times of mathematicians.

MAT 408. Modern Algebra II. (3 Credits)

A. Prerequisite: MAT 308 with a minimum grade of $\geq C$. \geq Ring homomorphisms, polynomial rings, unique factorization domains, principal ideal domains, finite fields, field extensions, algebraic extensions, Galois theory, and geometric construction.

MAT 415. Analysis. (3 Credits)

A. Prerequisite: MAT 315 with a minimum grade of $\geq C$. \geq The Riemann integral, the Lebesgue integral, metric spaces, differentiation, sequences and series of functions, allied topics.

MAT 480. Seminar in:____. (1-3 Credits)

A. Prerequisite: departmental approval. Advanced topics in undergraduate mathematics. May be retaken to a maximum of nine hours, provided the topics are different.

MAT 495. Independent Work. (1-3 Credits)

A. Prerequisite: departmental approval. Directed study/ research on a problem or area chosen in consultation with instructor. Final paper required. Student must have the independent study proposal form approved by faculty supervisor and department chair prior to enrollment. May be retaken to maximum of six hours.

MAT 498. Mathematics Capstone. (1 Credit)

A. Prerequisite: senior status as a Mathematics major. Designed to enable students to synthesize and integrate their mathematical and statistical knowledge. Students will learn how to conduct research and present the results.

MAT 501. Applicat of Math for P-9 Teach. (3 Credits)

A. Prerequisite: MAT 303. Topics in the application of mathematical models appropriate for teachers of grades P-9. Credit does not apply toward B.S. or degree requirements for programs offered within this department.

MAT 502. Geom with Tech for P-9 Teah. (3 Credits)

A. Prerequisites: MAT 203 and MAE 305. Topics in geometry appropriate for teachers of grades P-9. Credit does not apply toward either B.S. degree requirements for programs offered within this department.

MAT 505. Foundations of Mathematics. (3 Credits)

A. Prerequisite: MAT 308 with a minimum grade of $\geq C$. \geq The nature of mathematical thought; logical systems; axiomatic concepts and methods; consideration of the work of Hilbert, Peano, Whitehead, Russell, and others.

MAT 506. Number Theory. (3 Credits)

Fundamental properties of integers, linear Diophantine equations, linear and quadratic congruences, famous problems of number theory.

MAT 507. Seminar in Mathematics:____. (1-3 Credits)

Topics vary with offering. May be retaken with advisor approval, provided the topics are different. Credit towards degree requirements will depend on course content.

MAT 520. Mathematical Statistics I. (3 Credits)

I. Cross listed as STA 520. Prerequisite: STA 215 or 270. Prerequisite or Corequisite: MAT 254 or 254H. Descriptive statistics, discrete and continuous probability distributions for one and two variables, functions of random variables, sampling distributions, expectations and generating functions. Credit will not be awarded to students who have credit for STA 520.

MAT 525. Vector Analysis with Applications. (3 Credits)

A. Prerequisite: MAT 225 or 225H with a minimum grade of $\geq C$. \geq Algebra and geometry of vectors; vector functions of a single variable; line, surface, and volume integrals; Divergence Theorem, Stokes's Theorem, Green's Theorem; generalized orthogonal coordinates; Fourier Series; solutions to boundary value problems.

MAT 527. Cryptology. (3 Credits)

(3) A. Prerequisites: Senior standing and MAT 301. Classical cryptosystems, basic number theory, DES, Advanced Encryption Standard, RSA, discrete logs, digital signatures, elliptic curve cryptosystem, lattice methods. It is strongly recommended that students have completed a course in proof writing.

MAT 535. Principles of Geometry. (3 Credits)

A. Prerequisite: MAT 334 with a minimum grade of "C." Two- and three-dimensional analytical Euclidean geometry, alternate geometries such as hyperbolic, Riemannian, taxicab and affine.

MAT 540. Applications of Partial Differential Equations. (3 Credits)

A. Prerequisite: MAT 353 with a minimum grade of "C". Wave, heat/diffusion and potential/Laplace equations, separation of variables, orthogonal sets of functions. Fourier series, boundary value problems, Fourier integrals, maximum principles, the Cauchy problem.

MAT 550. Applications of Complex Analysis. (3 Credits)

A. Prerequisite: MAT 225 or 225H or 353 with a minimum grade of ζ C. ζ Continuity, differentiation, integration, series, residues, and applications to the evaluation of real integrals. Applications of conformal mappings to boundary value problems in heat, electrostatic potential, and fluid flow. Emphasis throughout on computational techniques and applications.

MAT 555. Graph Theory. (3 Credits)

A. Prerequisite: MAT 308 or CSC 320 with a minimum grade of ζ C. ζ Introduction to the theory and applications of graph theory. Topics will include trees, planarity, connectivity, flows, matching, and coloring.

MAT 560. Point Set Topology. (3 Credits)

An introduction to topology with emphasis on Euclidean and other metric spaces. Mappings, connectivity, compactness, formation of new spaces, relationship to analysis.

MAT 565. Mathematics of Structural Bioinformatics. (3 Credits)

(3) A. Prerequisite: Senior standing, MAT 239, 254 and three hours from CSC 160, 174, 177, or 190. Mathematical and computational approaches to analyze and understand macromolecular structure data. Methods for protein structure determination, refinement, evaluation, comparison, and visualization. Protein surface representation and shape comparison. Structure databases.

MAT 577. Introduction to Algebraic Coding Theory. (3 Credits)

(3) A. Prerequisites: Senior standing; MAT 301, or both MAT 214 and departmental approval. Introduction to basic concepts of coding theory, linear codes, perfect codes, cyclic codes, BCH codes, and Reed Solomon codes. Additional topics as time permits. It is strongly recommended that students have completed a course in linear algebra and a course in proof writing.

MAT 701. Applicat of Math for P-9. (3 Credits)

A. Topics in the application of mathematical models appropriate for teachers of grades P-9.

MAT 702. Geo with Tech for P-9 Teachers. (3 Credits)

A. Topics in geometry appropriate for teachers of grades P-9.

MAT 705. Foundations of Math. (3 Credits)

A. The nature of mathematical thought; logical systems, axiomatic concepts and methods; consideration of the work of Hilbert, Peano, Whitehead, Russell, and others. It is strongly recommended that students have completed an abstract algebra course.

MAT 706. Number Theory. (3 Credits)

A. Fundamental properties of integers, linear Diophantine equations, linear and quadratic congruences, famous problems of number theory. It is strongly recommended that students have completed a course requiring proof-writing skills.

MAT 707. Seminar in Mathematics: _____. (1-3 Credits)

A. Topics vary with offering. May be retaken with advisor approval, provided the topics are different. Credit towards degree requirements will depend on the course content.

MAT 720. Mathematical Statistics I. (3 Credits)

I. Cross-listed as STA 720. Descriptive statistics, discrete and continuous probability distributions for one and two variables, functions of random variables, sampling distributions, expectations and generating functions. Credit will not be awarded to students who have credit for STA 720. It is strongly recommended that students have completed eight hours of calculus.

MAT 725. Vector Analysis with Applicati. (3 Credits)

A. Algebra and geometry of vectors; vector functions of a single variable; line, surface, and volume integrals; divergence Theorem, Stokes's Theorem, Green's Theorem; generalized orthogonal coordinates; Fourier Series; solutions to boundary value problems. It is strongly recommended that students have completed twelve hours of calculus.

MAT 727. Cryptology. (3 Credits)

(3) A. Classical cryptosystems, basic number theory, DES, Advanced Encryption Standard, RSA, discrete logs, digital signatures, elliptic curve cryptosystem, lattice methods. It is strongly recommended that students have completed a course in proof writing.

MAT 735. Principles of Geometry. (3 Credits)

A. Two- and three-dimensional analytical Euclidean geometry, alternative geometries, hyperbolic, Riemannian, taxicab, and affine. It is strongly recommended that students have completed a geometry course and a linear algebra course.

MAT 740. Applic of Partial Diff Equatio. (3 Credits)

A. Wave, heat/diffusion and potential/Laplace equations, separation of variables, orthogonal sets of functions. Fourier series, boundary value problems, Fourier integrals, maximum principles, the Cauchy problem. It is strongly recommended that students have completed a course in differential equations.

MAT 750. Appl of Complex Analysis. (3 Credits)

A. Continuity, differentiation, integration, series, residues, and applications to the evaluation of real integrals. Applications of conformal mappings to boundary value problems in heat, electrostatic potential, and fluid flow. Emphasis throughout on computational techniques and applications. Credit will not be awarded to students who have credit for MAT 850. It is strongly recommended that students have completed twelve hours of calculus or eight hours of calculus plus a differential equations course.

MAT 755. Graph Theory. (3 Credits)

A. Introduction to the theory and applications of graph theory. Topics will include trees, planarity, connectivity, flows, matching and coloring. It is strongly recommended that students have completed a course in abstract algebra or discrete structures.

MAT 760. Point Set Topology. (3 Credits)

A. An introduction to topology with emphasis on Euclidean and other metric spaces. Mappings, connectivity, compactness, formation of new spaces, relationship to analysis. It is strongly recommended that students have completed a course requiring proof-writing skills.

MAT 765. Math of Structural Bioinformat. (3 Credits)

(3) A. Mathematical and computational approaches to analyze and understand macromolecular structure data. Methods for protein structure determination, refinement, evaluation, comparison, and visualization. Protein surface representation and shape comparison. Structure databases. It is strongly recommended that students have completed courses in linear algebra and multivariable calculus and have experience in computer programming.

MAT 777. Intro to Alg Coding Theory. (3 Credits)

(3) A. Prerequisites: Senior standing; MAT 301, or both MAT 214 and departmental approval. Introduction to basic concepts of coding theory, linear codes, perfect codes, cyclic codes, BCH codes, and Reed Solomon codes. Additional topics as time permits. It is strongly recommended that students have completed a course in linear algebra and a course in proof writing.

MAT 803. Number/Geometric Con/P-5 Tchrs. (3 Credits)

A. Prerequisite: admission to the MAT program or departmental approval. Numeric and geometric concepts; problem solving with numbers, geometry, and data; reasoning; and connections. Credit does not apply toward the M.S. degree offered within this department. Credit will not be awarded to students who have credit for MAT 202.

MAT 806. Advanced Number Theory. (3 Credits)

A. Basic concepts from analytic and algebraic number theory including the Prime Number Theorem, Dirichlet's Theorem, the Riemann Hypothesis, algebraic integers, ideals and factorization in algebraic number fields. Additional topics as time permits. It is strongly recommended that students have completed courses in number theory, abstract algebra, and real analysis or differential equations.

MAT 809. Modern Algebra. (3 Credits)

A. Study of groups, including the fundamental isomorphism theorems. Sylow Theorems, and finitely generated abelian groups. It is strongly recommended that students have completed an abstract algebra course.

MAT 810. Modern Algebra. (3 Credits)

A. Study of rings, integral domains, unique factorization domains, modules, vector spaces, fields and field extensions, including Galois theory. It is strongly recommended that students have completed an abstract algebra course.

MAT 815. Real Analysis. (3 Credits)

A. Further study of the concepts introduced in MAT 315. The convergence theorems, Lebesgue measure and measurable functions, the Lebesgue integral, Fourier series, allied topics. It is strongly recommended that students have completed a real analysis course.

MAT 839. Co-op or Appl Lrn: Mathematics. (0.5-3 Credits)

A. Prerequisite: departmental approval. May be retaken with approval to a maximum of three credits. Employment with faculty and field supervision in an area related to the student's academic interests. A minimum of eighty hours of employment is required for each academic credit.

MAT 850. Complex Analysis. (3 Credits)

A. The topology of the extended complex plane. The theory of analytic and meromorphic functions including integration, Taylor and Laurent series, Cauchy Integral and Residue Theorems, Argument Principles, Rouché's Theorem, Maximum Modulus Theorems, conformal mappings. It is strongly recommended that students have completed a real analysis course.

MAT 853. Ordinary Differential Equation. (3 Credits)

(3) A. Uniqueness and existence of solutions of initial value problems, maximal intervals of existence, continuous dependence, disconjugacy of boundary value problems, Cauchy functions, Green's functions, and fixed point theory. Additional topics as time permits. It is strongly recommended that students have completed a course in analysis.

MAT 856. Applied Mathematics. (3 Credits)

A. Dynamical systems, linear and nonlinear systems theory, transform methods, integral equations, control theory and optimization, calculus of variations, eigenvalue problems, stability theory, bifurcation. It is strongly recommended that students have completed a course in differential equations.

MAT 865. Applied Linear Algebra. (3 Credits)

(3) A. Vector spaces, LU decomposition, singular value decomposition, orthogonality, and related theory, with applications to least squares, Markov chains, combinatorics, differential equations, and other topics. It is strongly recommended that students have completed a course in linear algebra.

MAT 866. Combinatorial Optimization. (3 Credits)

(3) A. Combinatorial optimization, linear programming, flow and matching theory, traveling salesman problem, and related topics. It is strongly recommended that students have completed a linear algebra course.

MAT 871. Numerical Analysis. (3 Credits)

A. Computer arithmetic. Analysis of errors and stability of well-posed problems. LaGrange, Hermite and spline interpolation. Newton-Cotes, Romberg, and Gaussian quadrature. Consistency, convergence, and stability of numerical integration methods for ordinary initial value problems. Finite difference and shooting methods for two-point boundary value problems. It is strongly recommended that students have completed a real analysis course and have experience with a programming language.

MAT 880. Seminar in:_____ (1-3 Credits)

A. Advanced topics in Mathematics. May be retaken to a maximum of six hours, provided the topics are different. Credit towards degree requirements will depend on the course content.

MAT 890. Independent Study in:_____ (1-3 Credits)

A. Prerequisites: An 800-level course and departmental approval. Independent study on a problem chosen by the student and instructor. Student must have the independent study proposal form approved by faculty supervisor and department chair prior to enrollment. May be retaken to a maximum of nine hours, provided the topics are different.

MAT 898. Applied Mathematics Capstone. (3 Credits)

(3) A. Prerequisite: completion of at least 15 hours toward the M.A. in Applied Mathematics degree. Preparation for mathematical and statistical study. Guided one-on-one study of a mathematical or statistical concept. Use of mathematical typesetting software, presentation software, and research databases.

MAT 899. Thesis in _____ (1-6 Credits)

A.