Mathematical Science

**MATH 1306** College Algebra for the Non-Scientist (3 semester hours) This course is intended for students NOT continuing on to precalculus or calculus. The course is designed to develop both abstract thinking and a practical approach to problem solving. The emphasis is on understanding rather than purely computational skills. Topics include logic, sets, the real numbers, linear equations and their applications, functions, and graphs. Cannot be used to satisfy major requirements for majors in the Schools of Natural Sciences and Mathematics or Management, or degree requirements for the School of Engineering and Computer Science. Not all MATH/STAT courses may be counted toward various degree plans. Please consult your degree plan to determine the appropriate MATH/STAT course requirements. Prerequisite: A score of 20% on ALEKS math placement exam. (3-0) Y

**MATH 1314 (MATH 1314)** College Algebra (3 semester hours) Topics chosen from areas such as equations and inequalities, rational expressions, exponents, radicals and logarithms, functions, and graphs. Exam section required for **MATH 1314**. Cannot be used to satisfy major requirements for majors in the Schools of Natural Sciences and Mathematics or Management, or degree requirements for the School of Engineering and Computer Science. Not all MATH/STAT courses may be counted toward various degree plans. Please consult your degree plan to determine the appropriate MATH/STAT course requirements. Prerequisite: A score of 35% on ALEKS math placement exam. (3-0) S

**MATH 1316 (MATH 1316)** Trigonometry (3 semester hours) Angular measure, trigonometric functions, their properties; trigonometric identities, equations, and applications; trigonometric form of complex number and related topics. Cannot be used to satisfy major requirements for majors in the School of Natural Sciences and Mathematics or Management, or degree requirements for the School of Engineering and Computer Science. Not all MATH/STAT courses may be counted toward various degree plans. Please consult your degree plan to determine the appropriate MATH/STAT course requirements. Prerequisite: A score of 35% on ALEKS math placement exam, a grade of at least a C- in **MATH 1314**, or concurrent enrollment in **MATH 1314**. (3-0) S

**MATH 1325 (MATH 1325)** Applied Calculus I (3 semester hours) Functions and graphs, differentiation, maxima and minima, exponential and logarithmic functions, integration, applications of integrals. Cannot be used to satisfy degree requirements for majors in the School of Engineering and Computer Science or major requirements in the School of Natural Sciences and Mathematics. Not all MATH/STAT courses may be counted toward various degree plans. Please consult your degree plan to determine the appropriate MATH/STAT course requirements. Cannot be used to replace **MATH 2417** or **MATH 2413**. Prerequisite: A score of 55% on ALEKS math placement exam or a grade of at least a C- in **MATH 1314**. (3-0) S

**MATH 1326** Applied Calculus II (3 semester hours) Applications of differential equations, functions of several variables, least squares modeling, multiple integrals, infinite series. Cannot be used to satisfy degree requirements for B.S. majors in Schools of Engineering and Computer Science or Natural Sciences and Mathematics. Not all MATH/STAT courses may be counted toward various degree plans. Please consult your degree plan to determine the appropriate MATH/STAT course requirements. Cannot be used to replace **MATH 2414** or **MATH 2419**. Prerequisite: A grade of at least a C- in **MATH 1325**. (3-0) S
**MATH 2312** (MATH 2312) Precalculus (3 semester hours) Real numbers, subsets of real line, absolute value; algebra of functions, domain, range, composition, inverse; elements of analytical geometry including vectors in plane, conics, polar coordinates, translation and rotation of axes and related topics. Not all MATH/STAT courses may be counted toward various degree plans. Please consult your degree plan to determine the appropriate MATH/STAT course requirements. Prerequisite: A score of 55% on ALEKS math placement exam or a grade of at least a C- in MATH 1314 and MATH 1316. (3-0) S

**MATH 2333** Matrices, Vectors, and Their Application (3 semester hours) Matrices, vectors, determinants, inverses, systems of linear equations, and applications. Cannot be used to satisfy degree requirements for majors in the School of Engineering and Computer Science or major requirements in the School of Natural Sciences and Mathematics. Cannot be used to replace MATH 2418. Not all MATH/STAT courses may be counted toward various degree plans. Please consult your degree plan to determine the appropriate MATH/STAT course requirements. Prerequisite: MATH 1314 or equivalent. (3-0) S

**MATH 2413** (MATH 2413) Differential Calculus (4 semester hours) Course covers topics in differential calculus of functions of one variable; topics include limits, continuity, derivative, chain rule, implicit differentiation, mean value theorem, maxima and minima, curve sketching, derivatives of inverse trigonometric functions, antiderivative, substitution method, and applications. Three lecture hours and two discussion hours a week; problem section required with MATH 2413, and will also be registered for exam section. Not all MATH/STAT courses may be counted toward various degree plans. Please consult your degree plan to determine the appropriate MATH/STAT course requirements. Prerequisite: A score of 70% on ALEKS math placement exam or a grade of at least a C- in MATH 2312. (3-2) S

**MATH 2414** (MATH 2414) Integral Calculus (4 semester hours) Course covers topics in integral calculus, sequences and series. Topics include the fundamental theorem of calculus, methods of integration, improper integrals, and applications. Sequences, series convergency tests, power series. Introduction to the multivariable calculus, partial differentiation, double and iterated integrals. Three lecture hours and two discussion hours a week; problem section required with MATH 2414, and will also be registered for exam section. Not all MATH/STAT courses may be counted toward various degree plans. Please consult your degree plan to determine the appropriate MATH/STAT course requirements. Cannot be used to replace MATH 2419. Prerequisite: A grade of C- or better in either MATH 2417 or in MATH 2413 or equivalent. (3-2) S

**MATH 2415** (MATH 2415) Calculus of Several Variables (4 semester hours) The course covers differential and integral calculus of functions of several variables. Topics include vector valued and scalar functions, partial derivatives, directional derivatives, chain rule, Lagrange multipliers, multiple integrals, double and triple integrals, the line integral, Green's theorem, Stokes' theorem, Divergence theorem. Three lecture hours and two discussion hours a week; problem section required with MATH 2415, and will also be registered for exam section. Not all MATH/STAT courses may be counted toward various degree plans. Please consult your degree plan to determine the appropriate MATH/STAT course requirements. Prerequisite: A grade of C- or better in MATH 2414. (3-2) S

**MATH 2417** (MATH 2417) Calculus I (4 semester hours) Functions, limits, continuity, differentiation; integration of function of one variable; logarithmic, exponential, and inverse trigonometric functions; techniques of integration, and applications. Three lecture hours and two discussion hours a week; problem section required with MATH 2417, and will also be registered for exam section. Not all MATH/STAT courses may be counted toward various degree plans. Please consult your degree plan to determine the
appropriate MATH/STAT course requirements. Prerequisite: A minimal placement score 75% on ALEKS math placement exam or a grade of at least a C- in MATH 2312 or an equivalent course. (3-2) S

**MATH 2418 (MATH 2418)** Linear Algebra (4 semester hours) Systems of linear equations, determinants, vectors and vector spaces, linear transformations, eigenvalues and eigenvectors, quadratic forms. Three lecture hours and two discussion hours a week; problem section required with MATH 2418, and will also be registered for exam section. Not all MATH/STAT courses may be counted toward various degree plans. Please consult your degree plan to determine the appropriate MATH/STAT course requirements. Prerequisite: A grade of at least a C- in either MATH 2417 or in MATH 2413. (3-2) S

**MATH 2419 (MATH 2419)** Calculus II (4 semester hours) Continuation of MATH 2417. Improper integrals, sequences, infinite series, power series, parametric equations and polar coordinates, vectors, vector valued functions, functions of several variables, partial derivatives and applications, multiple integration. Three lecture hours and two discussion hours a week; problem section required with MATH 2419, and will also be registered for exam section. Not all MATH/STAT courses may be counted toward various degree plans. Please consult your degree plan to determine the appropriate MATH/STAT course requirements. Prerequisite: A grade of at least a C- in MATH 2417. (3-2) S

**MATH 2420 (MATH 2420)** Differential Equations with Applications (4 semester hours) Topics covered will be drawn from the following list: First order differential equations, system of linear differential equations, stability, series solutions, special functions, Sturm-Liouville problem, Laplace transforms and linear differential equations and applications in physical sciences and engineering using computers. Three lecture hours and two discussion hours a week; problem section required with MATH 2420, and will also be registered for exam section. Not all MATH/STAT courses may be counted toward various degree plans. Please consult your degree plan to determine the appropriate MATH/STAT course requirements. Prerequisite: A grade of at least a C- in either MATH 2415 or in MATH 2419, and a grade of at least a C- in MATH 2418 or equivalent. (3-2) S

**MATH 2451** Multivariable Calculus with Applications (4 semester hours) Vectors, matrices, vector functions, partial derivatives, divergence, curl, Laplacian, multiple integrals, line and surface integrals, Green's, Stokes', and Gauss' theorems, and applications in physical sciences and engineering. Topics drawn from implicit function theorem, differential forms and vector fields. Three lecture hours and two discussion hours per week; problem section required with MATH 2451. Not all MATH/STAT courses may be counted toward various degree plans. Please consult your degree plan to determine the appropriate MATH/STAT course requirements. Prerequisite: A grade of at least a C- in either MATH 2415 or in MATH 2419, and a grade of at least C- in MATH 2418 or equivalent. (3-2) S

**MATH 2V90** Topics in Mathematics - Level 2 (1-6 semester hours) Special topics in mathematics outside the normal course of offerings. May be repeated for credit as topics vary (9 hours maximum). Instructor consent required. ([1-6]-0) S

**MATH 3301** Mathematics for Elementary and Middle School Teachers (3 semester hours) This course is intended to develop future teachers' depth of mathematical understanding by examining concepts in school mathematics from an advanced perspective. Topics include: numeration systems; arithmetic algorithms, prime factorization and other properties of the integers; proportional reasoning involving fractions and decimals; counting methods; and basic ideas of geometry and measurement. Problem solving is stressed. Cannot be used to satisfy: [1] undergraduate mathematics core requirement, [2] degree
requirements by students in Mathematics, [3] electives, or [4] certification requirements in 8-12 mathematics. Prerequisite: **MATH 1306** or **MATH 1314** or equivalent. (3-0) S

**MATH 3303** Introduction to Mathematical Modeling (3 semester hours) An introduction to construction, use, and analysis of empirical and analytical mathematical models. Emphasis on using appropriate technology with tools such as curve fitting, probability and simulation, difference and differential equations, and dimensional analysis. Cannot be used to satisfy mathematics requirements by students in Mathematics and cannot be used to satisfy electives. Prerequisites: **MATH 2418** and a grade of at least a C- in either **MATH 2415** or in **MATH 2419**. (3-0) Y

**MATH 3305** Foundations of Measurement and Informal Geometry (3 semester hours) An analysis, from an advanced perspective, of the basic concepts and methods of geometry and measurement. Topics include visualization, geometric figures and their properties; transformations and symmetry; congruence and similarity; coordinate systems; measurement (especially length, area, and volume); and geometry as an axiomatic system. Emphasis on problem solving and logical reasoning. Cannot be used to satisfy: [1] undergraduate mathematics core requirement, [2] degree requirements by students in Mathematics, [3] electives, or [4] certification requirements in 8-12 mathematics. Prerequisites: (**MATH 2312** and **MATH 3301**) or equivalent. (3-0) Y

**MATH 3307** Mathematical Problem Solving for Teachers (3 semester hours) Development of the ability to solve mathematical problems and communicate their solutions through the study of strategies and heuristics. Practice in solving problems involving ideas from number theory, algebra, combinatorics and probability, etc. Communicating mathematics, logical reasoning, and connections between mathematical topics will be emphasized. Cannot be used to satisfy degree requirements by students in Mathematics or electives. Prerequisites: **MATH 2312** and (**MATH 3305** or **MATH 3321**). (3-0) Y

**MATH 3310** Theoretical Concepts of Calculus (3 semester hours) Mathematical theory of calculus. Limits, types of convergence, power series, differentiation, and Riemann integration. Prerequisite: A grade of at least a C- in either **MATH 2415** or in **MATH 2419**. (3-0) S

**MATH 3311** Abstract Algebra I (3 semester hours) Groups, rings, fields, vector spaces modules, linear transformations, and Galois theory. Prerequisite: A grade of at least a C- in either **MATH 2415** or in **MATH 2419**, and a grade of at least C- in **MATH 2418** or equivalent. (3-0) S

**MATH 3312** Abstract Algebra II (3 semester hours) Continuation of **MATH 3311**. Prerequisite: **MATH 3311**. (3-0) Y

**MATH 3321** Geometry (3 semester hours) Elements of Euclidean, non-Euclidean, and projective geometry. Topics covered will be drawn from the following list: triangles and their distinguishing points, Euler line, nine point circle, extremum problems, circles and spheres, inversions, the circles of Apollonius, projective geometry, axioms of the projective plane, Desargues' theorem, conics, elementary facts of the non-Euclidean geometries. Prerequisite: A grade of at least a C- in either **MATH 2415** or in **MATH 2419**. (3-0) Y

**MATH 3379** Complex Variables (3 semester hours) Geometry and algebra of complex numbers, functions of a complex variable, power series, integration, calculus of residues, conformal mapping. Prerequisites: **MATH 2451** and **MATH 3310**. (3-0) S

**MATH 3380** Differential Geometry (3 semester hours) Curves and surfaces, multilinear algebra, alternating
tensors, tangent vectors, tangent space, vector fields, differential forms; Curvature and torsion of curves, Riemannian metrics, curvature of surfaces, isometries, geodesics, Gauss map, First and Second Fundamental Forms, area on surfaces, Gauss-Bonnet Theorem, surfaces with constant negative curvature and elements of hyperbolic geometry. Prerequisites: MATH 2451 and MATH 2418 and MATH 2420 or equivalent courses. (3-0) Y

MATH 4301 Mathematical Analysis I (3 semester hours) Sets, real number system, metric spaces, real functions of several variables. Riemann-Stieltjes integration and other selected topics. Prerequisites: MATH 2451 and MATH 3310. (3-0) S

MATH 4302 Mathematical Analysis II (3 semester hours) Continuation of MATH 4301. Prerequisite: MATH 4301. (3-0) S

MATH 4332 Scientific Math Computing (3 semester hours) Topics covered include introduction to Unix shells, basic and advanced use of Matlab for mathematical and scientific problem solving. Course is conducted in a computer classroom and assignments include applications in numerical and statistical analysis, image processing, and signal processing. Prerequisites: MATH 2418 and a grade of at least a C- in either MATH 2415 or in MATH 2419. (3-0) S

MATH 4334 Numerical Analysis (3 semester hours) Solution of linear equations, roots of polynomial equations, interpolation and approximation, numerical differentiation and integration, solution of ordinary differential equations, computer arithmetic, and error analysis. Students cannot receive credit for both MATH 4334 and ENGR 4334. Prerequisites: (CE 1337 or CS 1337 or TE 1337) and (MATH 2418 and MATH 2451). (Same as CS 4334) (3-0) Y

MATH 4341 Topology (3 semester hours) Elements of general topology, topological spaces, continuous functions, connectedness, compactness, completeness, separation axioms, and metric spaces. Prerequisites: MATH 2451 and MATH 3310. (3-0) S

MATH 4355 Methods of Applied Mathematics (3 semester hours) Topics include some frequently used tools in applied mathematics: Laplace and Fourier transforms, special functions, systems, signals, and their applications in physical sciences and engineering. Prerequisites: MATH 2418 and MATH 2420. (3-0) T

MATH 4362 Partial Differential Equations (3 semester hours) This course presents a survey of classical and numerical methods for the solution of linear and nonlinear boundary value problems governed by partial differential equations. Modeling and application-related issues are included throughout. Prerequisites: MATH 2420 and MATH 2451. (3-0) Y

MATH 4381 Structure of Modern Geometry (3 semester hours) The course is designed to familiarize students with the geometrical concepts which relate to two and three dimensional geometry and the mathematical techniques used in the study of geometry. The emphasis is both on the development of understanding of the concepts and the ability to use the concepts in proving theorems. The course includes study of axiom systems, transformational geometry, and an introduction to non-Euclidean geometries, supplemented by other topics as determined by the instructor. Prerequisite: A grade of at least a C- in MATH 2418 or equivalent. (3-0) Y

MATH 4390 Senior Research and Advanced Writing (3 semester hours) For students conducting independent research and scientific writing. Individual instruction course designed to develop skills for
research and clear, precise and accurate scientific writing. Topics will vary from section to section depending upon the interests of the student, but will be selected from a specific area of mathematics. Subject and scope to be determined on an individual basis. Satisfies the Advanced Writing Requirement. Prerequisite: Senior level standing in Mathematics. (3-0) S

**MATH 4399** Senior Honors in Mathematics (3 semester hours) For students conducting independent research for honors theses or projects. Satisfies advanced writing requirement. (3-0) S

**MATH 4v03** Independent Study in Mathematics (1-6 semester hours) Independent study under a faculty member's direction. Student must obtain approval from participating math sciences faculty member and the undergraduate advisor. Can satisfy Communication elective (3 hours) if it has a major writing/report component. May be repeated for credit (9 hours maximum). Prerequisite: Instructor consent required. ([1-6]-0) S

**MATH 4v91** Undergraduate Topics in Mathematics (1-9 semester hours) Subject matter will vary from semester to semester. May be repeated for credit as topics vary (9 hours maximum). Prerequisite: Instructor consent required. ([1-9]-0) S