MATHEMATICS (MATH)

No credit will be given for any 100- level mathematics course taken subsequent to a 200-level course with the exception of Math 241 or Math 267 without permission of the Department Head of Mathematics.

Under special circumstances, the Department Head may grant permission for a student who does not meet the prerequisites for a course to take that course.

92. Transitional Math. Credit 3 hours. A course in intermediate algebra skills including linear equations, linear functions, systems of linear functions, inequalities, polynomials and factoring, rational expressions, radicals and rational exponents, and quadratic equations. The course is designed to prepare students for College Algebra. The final course grade will be on a Pass (P) or Unsatisfactory (U) basis. Credit hours earned do not count toward graduation. A Laboratory fee is required for this course. (Fall, Spring, Summer)

155. College Algebra with Fundamentals. Credit 5 hours. Prerequisite: A score of 19 or above on the Mathematics section of the ACT or an appropriate score on the C OMPASS exam or MATH 092. A study of families of functions and their graphs. Topics include linear, polynomial, rational, exponential and logarithmic functions, and systems of equations. Functions will be used to model and solve application-based problems. This course will also include algebra fundamentals including operations with exponents, polynomial and rational expression, factoring polynomial expressions, solving linear, polynomial, rational, and literal equations. A student may not receive credit for both MATH 155 and MATH 161. A Laboratory fee is required for this course. (Fall, Spring, Summer)

161. College Algebra. Credit 3 hours. Prerequisite: A score of 21 or above on the Mathematics section of the ACT. A study of families of functions and their graphs. Topics include linear, polynomial, rational, exponential and logarithmic functions, and systems of equations. Functions will be used to model and solve application-based problems. A student may not receive credit for both MATH 155 and MATH 161. A Laboratory fee is required for this course. (Fall, Spring, Summer)

161H. Honors College Algebra. Credit 3 hours. Prerequisite: A score of 21 or higher on the Mathematics section of the ACT and Authorization of the Director of the Honors Program. A study of families of functions, conic sections, and sequences and series. The families of functions studied will include linear, quadratic, polynomial, rational, exponential, and logarithmic. These functions will be used to model and solve real world problems with the aid of calculators and computers. Emphasis will be placed on the communication of solutions to problems and mathematical ideas through oral presentations and writing. (As Needed)

162. Plane Trigonometry. Credit 3 hours. Prerequisite: Math 155 or 161. The study of trigonometric functions. Topics include the laws of sine and cosine, the trigonometric functions and their graphs, inverse trigonometric functions, trigonometric identities and equations, complex numbers, graphs of parametric equations and graphs in polar coordinates. Trigonometry and trigonometric functions will be used to model and solve real world applications. (Fall, Spring, Summer)

163. Calculus for the Biological, Business and Social Sciences. [LCCN: CMAT 1233, Algebra and Trigonometry]. Credit 3 hours. Prerequisites: Math 155 or 161. An introduction to differential and integral calculus designed for students majoring in business, biology, psychology, industrial technology, economics, and other social sciences. Topics include limits, the first and second derivative, the first and second derivative tests for relative extrema, the definite and indefinite integral, and the Fundamental Theorem of Calculus. Calculus will be used to solve real world applications. (Fall, Spring, Summer)

165. Precalculus with Trigonometry. Credit 3 hours. Prerequisite: Math 155 or 161 or ACT score in mathematics of 25 or higher. Topics will include a study of conic sections, general quadratic equations, systems of linear and general quadratic equations, exponential, logarithmic, and rational functions, properties and applications of trigonometric functions. A Laboratory fee is required for this course. (Fall, Spring, Summer)

167. Elementary Number Structure. Credit 3 hours. Prerequisite: Math 155 or 161. Basic concepts of fractions, decimals, percentage, geometry, computational facility, number theory and problem solving. This course may not be used to satisfy the General Education requirements. (Fall, Spring, Summer)

168.[1] Geometry for Elementary and Middle School Teachers. Credit 3 hours. Prerequisite: Math 167. This course is designed to prepare the student to teach the geometry of the K-8 curriculum. Topics include basic concepts and properties of two- and three-dimensional space: perimeter, area, volume, parallelism, perpendicularity, congruence, similarity, transformations and constructions. This course may not be used to satisfy the General Education requirements. (Fall, Spring, Summer)

[1]May not be used for a major or minor in Mathematics. For the purpose of certification in secondary education, this course is considered below the calculus level.

185. Contemporary Mathematics. [LCCN: CMAT 1103, Contemporary Math]. Credit 3 hours. Prerequisite: Math 155 or 161. An introduction to topics in contemporary mathematics. Topics may be selected from the theory of finance, perspective and symmetry in art, formal Aristotelian logic, graph theory, probability and odds, elementary number theory, optimization, numeracy in the real world, and historical topics in mathematics that have influenced contemporary mathematics. (Spring)

200. Calculus I. [LCCN: CMAT 2115, Calculus I]. Credit 5 hours. Prerequisites: Math 165 or a score of 28 or ACT score in mathematics of 28 or higher. The first of a standard three-course sequence on the foundations of differential and integral calculus. Topics include limits, the derivatives, techniques of differentiation, applications of the derivative, antiderivatives, definite integrals, and the calculus of transcendental functions. (Fall, Spring, Summer)

201. Calculus II. [LCCN: CMAT 2125, Calculus II].Credit 5 hours. Prerequisite: Math 200. The second of a standard three-course sequence on calculus. Topics include integration techniques, applications of the definite integral, and infinite series. Calculus will be used in the solution of real world applications. (Fall, Spring, Summer)

223. Foundations of Discrete Mathematics. Credit 3 hours. Prerequisite: Math 200. This course is designed to introduce students to the techniques of writing mathematical proofs. Topics include logic, quantified statements, elementary number theory, sets, and functions and relations. (Fall, Spring)

241. Elementary Statistics. [LCCN: CMAT 1303, Introductory Statistics]. Credit 3 hours. Prerequisite: Math 155 or 161. Graphical display of data, measures of central tendency and variability, sampling theory, the normal curve, standard scores, Student's T, Chi Square, and correlation techniques. (Fall, Spring, Summer)

267. Data Analysis with Probability. Credit 3 hours. Prerequisite: Math 167. This course is designed to introduce and develop the basic concepts of probability and data analysis, and to examine the role of probability in statistical thinking. Topics include probability, data collection and representation, measures of central tendency and variability, the normal curve, standard scores, correlation and regression, and the use of statistics in making predictions and generalizations. A graphing calculator is required for this course. Note: the pedagogical techniques modeled in this course are especially useful for students interested in teaching in the K-8 curriculum. (Fall, Spring, Summer)

309. College Geometry. Credit 3 hours. Prerequisite: Math 223. A study of axiomatic systems, advanced Euclidean geometry, hyperbolic geometry, and geometric transformations. (As Needed)

311. History of Mathematics. Credit 3 hours. Prerequisite: Mathematics 200. A survey of the history of mathematics from ancient times. Mathematical topics studied include number bases, Pythagorean triples, figurative numbers, construction of tangent lines to curves, and solutions of cubic and quartic equations. (As Needed)

312. Calculus III. Credit 3 hours. Prerequisite: Math 201. The third of a standard three-course sequence on calculus. Topics include vectors and geometry of 3-space, vector-valued functions, directional derivatives, and multiple and line integrals. (Fall, Spring)

350. Applied Differential Equations. Credit 3 hours. Prerequisite: Math 201. An introduction to differential equations with an emphasis on conceptual ideas and the use of computer algebra systems in solving real-world application problems. Solutions of differential equations will be found symbolically, graphically, and numerically. Topics will include linear first order equations, higher order equations, linear systems of equations, nonlinear systems, and chaos in dynamical systems. (Fall, Spring)

360. Applied Linear Algebra. Credit 3 hours. Prerequisites: Math 201 and Math 223. An introduction to linear algebra from a conceptual standpoint. Emphasis will be put on working in R^2 and R^3. Topics will include matrices and systems of equations, determinants, vector spaces, and linear transformations. (Fall, Spring)

367. Topics in Elementary Mathematics. Credit 4 hours. Prerequisites: Math 168. An extension of the structure of the rational and real numbers using the role of axiomatic systems; the concepts of exactness and approximation, applications of proportional reasoning; dimensional analysis and scientific notation; simple logic; modular systems; and the use of matrices and spread sheets. This course involves 3 hour lecture and 1 hour field experience per week.(Fall, Spring)

370. Introduction to Abstract Algebra. Credit 3 hours. Prerequisites: Math 309 or Math 360. An introduction to abstract algebra concentrating on elementary group theory. Topics will include cyclic groups, abelian groups, symmetric groups, and other groups of low order. Subgroups, centralizers, and homomorphisms will also be discussed. (Fall)

380. Applied Statistics with Probability. Credit 3 hours. Prerequisite: Math 201. An introduction to data analysis and the use of computer software packages to organize, summarize, and analyze data. Discussion will include the basic rules of probability, commonly used discrete and continuous distributions, random sampling and sampling distributions, regression analysis, parameter estimation, hypothesis testing, and analysis of variance techniques. (Fall, Spring)

383. Independent Projects in Mathematics. Credit 1-6 hours. Prerequisites: Junior standing, 2.5 adjusted grade point average, and permission of the Department Head. An opportunity for students to apply mathematics in a specific assignment under the direction of a faculty member of the Department of Mathematics. Specific assignments may include, but are not limited to, projects and/or service learning opportunities in business, industry, commercial, governmental or educational agencies. This course may be taken/repeated for a maximum of 6 hours credit. This course cannot be used to satisfy mathematics requirements for any degree program. (As Needed)

391. Internship in Mathematics. Credit 3-12 hours. Prerequisites: Junior standing, 2.5 adjusted grade point average, and permission of the Department Head. Internship in mathematics provides a student with experience in the application of mathematics in an assignment selected and approved by the University with a

cooperating business, industry, governmental or educational setting. Credit hours are earned at a rate of one semester hour for each 40 hours of approved work experience. The course may be taken/repeated for a maximum of 12 hours credit. This course cannot be used to satisfy mathematics requirements in any degree program. (As Needed)

402/506. Differential Equations. Credit 3 hours. Prerequisite: Math 312 and Math 350. Course on solutions of systems of linear ordinary differential equations, techniques of Laplace transforms and infinite series in solving ordinary differential equations, method of separation of variables in solving partial differential equations, Fourier series, and special functions. (As Needed)

407/507. Topics in Mathematics. Credit 3 hours. Prerequisite: Permission of the Department Head. Contemporary topics in mathematics and mathematics education. Credit for this course may be acquired more than once. Maximum credit six hours. (As Needed)

409/509. Linear Algebra. Credit 3 hours. Prerequisite: Math 360. Course on vector spaces, bases, inner-products, linear transformations and their matrix representations, traces, determinants, Cayley-Hamilton Theorem, nonsingularity, and applications which include solving systems of linear equations. (As Needed)

410/510. Theory of Numbers. Credit 3 hours. Prerequisite: Math 201 and Math 223. An introduction to the properties of integers, number congruences, multiplicative functions, primitive roots, and quadratic residues. (As Needed)

414/514. Fundamental Concepts of Geometry. Credit 3 hours. Prerequisite: Math 309 or Math 360 or Math 370. Deductive methods in mathematics; origins and development of concepts of geometry including geometric transformations, transformation groups and hyperbolic, elliptical and real projective geometry. (As Needed)

417/517. Mathematical Statistics. Credit 3 hours. Prerequisites: Math 223 and Math 312. Basic mathematics of statistics from a prerequisite of calculus. Basic concepts of probability, properties of discrete and continuous distributions. (Fall)

421/523. Abstract Algebra. Credit 3 hours. Prerequisite: Math 370. A course on groups, rings, integral domains, ideals, ring homomorphisms, and fields. (As Needed)

425. Applications of Combinatorics and Graph Theory. Credit 3 hours. Prerequisite: Math 360. An introduction to the fundamentals of combinatorics including algebra of enumeration, algorithms, recurrence relations, graph theory with decision trees, discrete structures, languages and finite state machines, finite fields. (As Needed)

427/527. Introduction to Topology. Credit 3 hours. Prerequisites: Math 312 and Math 360. An introduction to point-set topology and metric spaces. Topics include topological spaces, topological equivalency, metric spaces, compact spaces, connected spaces, Hausdorff spaces, and separation theorems. (As Needed)

431/533. Numerical Analysis. Credit 3 hours. Prerequisite: Math 350 and Computer Science 280. Numerical methods for solving nonlinear equations and systems of linear equations, approximations of functions by polynomial and spline interpolations, and numerical solutions of differential equations. (As Needed)

441/544. Real Analysis. Credit 3 hours. Prerequisite: Math 312 and Math 360. A rigorous study of calculus. Topics include the epsilon & delta approach to limits, sequences, continuity, the derivative, and the Riemann integral. (Spring)

450/550. Complex Analysis. Credit 3 hours. Prerequisites: Math 223 and Math 312. A course on the theory of functions of a single complex variable. Topics may include algebraic operations of complex numbers, elementary functions, limits, analytic functions, Cauchy-Riemann equations, anti-differentiation, contour integrals, Cauchy's theorem, residues, poles, and infinite series. (As Needed)

467. Elementary Calculus Concepts. Credit 3 hours. Prerequisite: Math 267. An investigation of the difference between the concepts of discrete and continuous; the concept of rates of change, differentiation, integration and the notion of limits; and an examination of the history of calculus. The course can be used only to satisfy the mathematics requirement for elementary education majors. (Spring)

485. Capstone in Mathematics for Secondary Teachers. Credit 4 hours. Prerequisites: Math 311 and Math 360. This course is designed to expand and strengthen students' understanding of secondary mathematics through the study of algebra and number theory, measurement, functions, data analysis and probability, and discrete mathematics. The course will help students to connect the key ideas in high school mathematics with the higher-level mathematics studied in college courses through explorations, laboratory activities, technology and service-learning experiences. Students majoring or minoring in mathematics in the College of Science and Technology may not use this course as a 400-level mathematics elective. (Fall)

490. Senior Thesis. Credit 3 hours. Prerequisite: Senior standing. Under the direction of a faculty advisor, the student will complete a thesis paper on a mathematical topic agreed upon by the student and advisor. (As Needed)

494/594. Introduction to Reading and Research in Mathematics. Credit 1-3 hours. Prerequisite: Permission of the Head of the Department of Mathematics. A course devoted to research in selected areas of mathematics. Course may be repeated for up to six hours total credit. (As Needed)

495/595. Introduction to Reading and Research in Mathematics. Credit 1-3 hours. Prerequisite: Permission of Department Head. A course devoted to research in selected areas of mathematics. Course may be repeated for up to six hours total credit. (As Needed)

605. Applied Statistics. Credit 3 hours. Prerequisite: Math 200 or permission of Department Head. Topics include exploratory analysis of data, sample design and experimental design, normal distributions, sampling distributions, quality control charts, confidence intervals and tests of hypotheses for one and two samples, inference for contingency tables, regression and correlation, and one-way analysis of variance. Statistical packages such as SPSS, Minitab, and SAS may be used. (As Needed)

615. Coding Theory and Cryptography. Credit 3 hours. Prerequisite: Math 200 and permission of the Department Head. An introduction to the fundamentals of coding theory, linear codes, and error-correcting codes. Elements of cryptography including cryptosystems such as RSA, DES, and AES, and identification schemes. (As Needed)

617. Applications of Combinatorics and Graph Theory. Credit 3 hours. Prerequisite: Math 201 and Math 223 or permission of the Department Head. An introduction to the fundamentals of combinatorics including algebra of enumeration and its interrelations with finite structures, graph theory and its applications, interrelations with data structures and methods of optimizations, and groups and finite fields and their applications. (As Needed)

635. Linear and Matrix Algebra I. Credit 3 hours. Prerequisite: Math 360. A course in linear algebra and its applications. Topics may include linear transformation, inner product spaces, similarity and normal operators, systems of equations, orthogonal projections, Gram-Schmidt orthogonalization, eigenvalues and eigenspaces, diagonalizations, and canonical forms. (As Needed)

640. Applied Algebra I. Credit 3 hrs. Prerequisite: Math 370. A course in algebraic structures and their applications. Topics may include lattices, group, rings, fields, semigroups, and boolean algebras. (As Needed)

645. Analysis I. Credit 3 hours. Prerequisite: Math 441. A course in analysis and its applications. Topics may include derivatives in higher dimensions, types of integration (Riemann-Stieltjes, Darboux, Lebesgue), Fourier series, fast Fourier transforms, Laplace transforms, metric spaces, Banach spaces, and Banach algebras.(As Needed)

690. Special Topics in Mathematics. Credit 3 hours. Selected topics in Mathematics that are new or unique and not covered in existing courses. This course may be taken twice for credit if different topics are studied. (As Needed)

770. Thesis. Credit 1-6 hours each semester, with 6 hours needed for graduation. The student must enroll in the thesis course each semester the thesis is in progress. The thesis is graded Pass-Fail.(Fall, Spring, Summer)