MATHEMATICS (MATH)

MATH 1001. Quantitative Reasoning. (3 Credits)
This course is an alternative in Area A of the Core Curriculum and is not intended to supply sufficient algebraic background for students who intend to take Precalculus, Trigonometry, or the Calculus sequence for mathematics and science majors. This course places quantitative skills and reasoning in the context of experiences that students will likely encounter. It emphasizes processing information in context from a variety of representations, understanding of both the information and the processing, and understanding which conclusions can be reasonably determined. A graphing calculator is required. MATH 1001 is a math course for non-science majors and may be used as a prerequisite to MATH 2205 and/or MATH 1145. Students receiving credit for MATH 1001 cannot receive credit for MATH 1111. Prerequisite: MATH 0099, MATH 0987, MATH 0989 or satisfactory math scores to place into co-requisite remediation or higher. Offered: Fall, Spring, Summer .

MATH 1101. Mathematical Modeling. (3 Credits)
This course is an introduction to mathematical modeling using graphical, numerical, symbolic, and verbal techniques to describe and explore real-world data and phenomena. Emphasis is on the use of elementary functions to investigate and analyze applied problems and questions, supported by the use of appropriate technology, and on effective communications of quantitative concepts and resuts. MATH 1101 may be taken as a substitute for MATH 1001: Quantitative Reasoning.

MATH 1111. College Algebra. (3 Credits)
This course includes a study of topics in real numbers, linear and quadratic equations, complex numbers, various types of other functions and their graphs, exponential and logarithmic functions, systems of linear equations and inequalities. Offered: Fall, Spring, Summer.

MATH 1112. Trigonometry. (3 Credits)
MATH 1112 Trigonometry (3-0-3) This course covers trigonometric functions. The topics include identities, solutions of triangles, complex numbers, conics, and vectors. A graphing calculator is required. Students receiving credit for MATH 1112 cannot receive credit for MATH 1113. Prerequisite: MATH 1111 or consent of Division Dean. Offered: All semesters.

MATH 1113. Pre-Calculus. (3 Credits)
This course is the study of functions and their graphs. Topics include trigonometric functions, exponential and logarithmic functions, transcendental functions and polar coordinates. Prerequisite: MATH 1111 Offered: Fall, Spring, Summer.

MATH 1211. Calculus I. (4 Credits)
This is a beginning course in calculus. Topics include differentiation and integration of algebraic and trigonometric functions, with applications to graphs of functions, rectilinear motion, maxima and minima, areas, volumes and work. Prerequisite: MATH 1113 Offered: Fall, Spring, Summer .

MATH 1401. Intro to Statistics. (3 Credits)
This course is a course in basic statistics. Topics include descriptive statistics, probability, distributions, hypothesis testing, inferences, correlation, and regression.

MATH 1501. Calculus I. (4 Credits)
Topics to include functions, limits, continuity, the derivative, antidifferentiation, the definite integral, and applications.

MATH 2008. Foundation of Numbers and Operations. (3 Credits)
This course is an Area F introductory mathematics course for teacher education majors. This course will emphasize the understanding and use of the major concepts of number and operations. As a general theme, strategies of problem solving will be used and discussed in the context of various topics. Prerequisite(s): MATH 1101, MATH 1111, MATH 1113, or approved equivalent Offered: Fall, Spring, Summer.

MATH 2111. Linear Algebra. (3 Credits)
This course concentrates on operations with vectors, matrices, systems of linear equations, determinants, vector spaces, linear trans- formations, eigenvalues and eigenvectors. Prerequisite: MATH 1211 Offered: Fall, Spring, Summer .

MATH 2212. Calculus II. (4 Credits)
This course is a continuation of Calculus I. Topics include differentiation and integration of transcendental functions, techniques of integration, arc length, surface or volumes, force, work, and introduction to differential equations, improper integrals, sequences and series and parametric equations. Prerequisite: MATH 1211 Offered: Fall, Spring, Summer .

MATH 2213. Calculus III. (4 Credits)
Topics include vectors, the calculus of vector-valued functions, polar coordinates, spherical coordinates, function of several variables, directional derivatives, Lagrange multipliers and multiple integrals. Prerequisite: MATH 2212 Offered: Fall, Spring, Summer .

MATH 2411. Introduction to Statistics. (3 Credits)
This course will include an introduction to probability and basic concepts of descriptive and inferential statistics. The computer and graphing calculators will be an integral part of this course. Prerequisites: MATH 1001, 1111 or 1113 Offered: Fall, Spring, Summer .

MATH 3000. Numbers and Their Applications. (3 Credits)
This course will cover the basic properties of the system of natural numbers, the system of whole numbers, the system of rational numbers and the system of real numbers. This course will also cover nomenclature and representations of numbers, number patterns, elements of number theory and applications. Prerequisite: MATH 1111 or MATH 1113. The candidate must earn a minimum grade of 'B' to receive credit on the program of study for this course. Offered: Fall, Spring .

MATH 3005. Advanced Topics in Elementary Mathematics. (3 Credits)
This is an introductory course of theory and applications of content and pedagogy for early childhood majors. Focus will be on instructional strategies, materials, and lesson planning for mathematics classes grades K-8 with an emphasis on basic mathematical concepts and national curriculum recommendations. Students will be introduced to manipulatives and technology needed to engage students in grades K-8. Students are required to have calculators and access to computers and printers. Prerequisites: MATH and admission to teacher education. Offered: Fall, Spring.

MATH 3101. Introduction to Number Theory. (3 Credits)
Introduction to the classical arithmetic properties of the integers. Divisibility properties, primes and their distribution, congruencies, Diophantine equations and their applications, number-theoretic functions, Fermat and Euler theorems, continued fractions, Fibonacci numbers, Pythagorean triples and perfect numbers. Prerequisite: MATH 2212 Offered: Fall, Spring .

MATH 3111. Discrete Structures. (3 Credits)
This course includes topics such as logic, set relations, functions, counting techniques, mathematical induction, representations, combinatorial problems, elementary graph theory, network flow, recursion and finite state machine. Prerequisite: MATH 1113 Offered: Fall, Spring .

MATH 3112. Discrete Mathematics. (3 Credits)
This course includes a study of topics in combinatorial mathematical processes. Topics in mathematical induction, set theory, number theory, combinations, permutations, probability theory including the induction principle, relations, recursions, the counting principle, generating functions, logic, and graph theory are covered. Prerequisite: MATH 1113. The candidate must earn a minimum grade of 'B' to receive credit on the program of study for this course. Offered: Fall, Spring .

MATH 3211. Ordinary Differential Equations. (3 Credits)
This course includes topics in ordinary differential equations: separable equations, homogeneous and non homogeneous equations, exact equations, Euler equations, non- linear ordinary differential equations, the study of Laplace transforms and how to use them to solve practical problems as well as solving systems of linear differential equations. Prerequisite: MATH 2212 Offered: Fall, Spring .

MATH 3213. Modern Geometry. (3 Credits)
This course is the study of metric, affine and projective geometries by means of groups of transformations and their invariants on the Euclidean plan. Prerequisite: MATH 2111. The candidate must earn a minimum grade of 'B' to receive credit on the program of study for this course. Offered: Fall, Spring.

MATH 3311. Geometry & Applications. (3 Credits)
This is an in-depth course designed to provide students with the knowledge and skills of geometry concepts and the applications of geometry in the K-8 mathematics classroom. Focus will include Euclidean Geometry, its postulates and theorems, instructional strategies, technology infusion, learning theories, ethical issues, and assessment of instruction in geometry. Past and current curriculum issues in geometry will be addressed. It will also include an analysis of curriculum trends and content in geometry as related to the Georgia Common Core Standards and the GACE II. Prerequisites: MATH 1111 and MATH 1113 Offered: Fall, Spring.

MATH 3314. Math Statistics. (3 Credits)
Calculus-based course in probability and statistics covering probability distributions, probability densities, random variables, sampling, experimental design and nonparametric statistics and decision theory. Prerequisite: MATH 2212 Offered: Fall, Spring .

MATH 3357. Business Calculus for Analytics. (3 Credits)
This course teaches business applications of calculus for Analytics. Typically for Business Majors but can be taken by anyone with Quantitative Reasoning and above.

MATH 3411. Statistical Methods. (3 Credits)
This course deals basic statistical methods encountered in applications. Topics covered include normal distribution, confidence interval, statistical inferences, hypothesis testing, regression and correlation, categorical data and non-parametric methods, analysis of variance. Statistical methods will be a major requirement for the mathematics program. It supports our efforts to strengthen our program and offer more Applied Mathematics courses to our majors who are seeking employment in areas requiring the use of statistics as well as those majors who intend to pursue graduate programs in statistics. Prerequisite: Math 2411 Offered: Fall, Spring .

MATH 3413. Introduction to Combinatorics. (3 Credits)
This course is the study of basic graph theory, permutations, combinations, inclusion-exclusion principle, recurrence relations, generation functions, occupancy problems, applications to probability theory, geometry of the plane, maps on the sphere, coloring problems, finite structures, systems of distinct representatives, existence problems, magic squares, and Latin squares. Prerequisite: MATH 2111 Offered: Fall, Spring .

MATH 3423. Introduction to Operations Research. (3 Credits)
This course is the study of deterministic and stochastic models including transportation and assignment problems, network analysis, decision theory, queuing theory and simulation. Prerequisite: MATH 2111 Offered: Fall, Spring .

MATH 4111. Modern Algebra I. (3 Credits)
This course covers basic concepts in groups, rings, integral domains, homeomorphisms and isomorphism of groups. Prerequisite: MATH 2212 Offered: Fall, Spring .

MATH 4112. Modern Algebra II. (3 Credits)
This course covers elementary concepts in ring theory and field theory. Prerequisite: MATH 4111 Offered: Fall, Spring .

MATH 4211. Elements of Analysis I. (3 Credits)
This course is the study of the real number system, point- set theory of the real line, global and local properties of continuous functions, Law of Mean, convergence of sequences and series, and the Theory of Riemann Integration. Prerequisite: MATH 2213 Offered: Fall, Spring .

MATH 4212. Elements of Analysis II. (3 Credits)
This course is the study of functions of several variables, implicit-function theorems, vectors in Rn, linear transformations in Rn, calculus of functions in higher dimensional Euclidean spaces, multiple integrals, line and surface integrals. Prerequisite: MATH 4211 Offered: Fall, Spring .

MATH 4214. Introduction to Complex Variables. (3 Credits)
The course includes a study of analytic, harmonic, continuous, and logarithmic functions, Cauchy-Riemann equations, power series, branch point, contours and contour integrals, Cauchy's theorem, and applications. Prerequisite: MATH 2213 Offered: Fall, Spring .

MATH 4215. Numerical Analysis. (3 Credits)
This course will provide an introductory knowledge of elementary numerical methods found useful in the field of computing. This will include number representation and errors, locating roots of equations, interpolation and numerical differentiation, numerical integration, minimization and maximization multivariate functions. Prerequisite: MATH 2213 Offered: Fall, Spring .

MATH 4220. Partial Differential Equations. (3 Credits)
This course deals with method of characteristics for first and second order partial differential equations, separation of variables, hyperbolic equations, parabolic equations, elliptic equations, Fourier series, Green's function. This course strengthens the applied math courses offerings in the mathematics program. Prerequisite: MATH 3211 Offered: Fall, Spring, Summer .

MATH 4313. Topology. (3 Credits)
This course is the study of elementary topology. The topics include point set theory, topological spaces, metric spaces, subspaces, continuous mapping, homeomorphisms, connectedness, compactness, and intuitive concepts in topology. Prerequisite: MATH 4211 .

MATH 4330. Math of Compound Interest. (3 Credits)
Simple interest, discount interest, compound interest, ordinary annuities, annuities certain, debt retirement methods, investing in stocks and bonds, and capital budgeting, future and present value of continuous streams, variable payment annuities, variable block of payments, stochastic payments, risk of default, and stochastic interest annuities, and topics in modeling and hedging. Offered: Fall, Spring.

MATH 4332. Math of Demography. (3 Credits)
This course deals with the mathematics encountered in demography and applications. Topics include: data collection and demographical statistics, measures of mortality and fertility, life tables and census data, stationary and stable population theories, population projections, use of census data, US and Canadian life tables, and the renewal equations. Offered: Fall, Spring.

MATH 4511. History of Mathematics. (3 Credits)
This course includes topics in numeral systems, Babylonian and Egyptian mathematics, Pythagorean and Euclidean mathematics, Hindu and Arabian mathematics, European mathematics from the Dark Ages to the Present. Prerequisite: Senior standing Offered: Fall, Spring .

MATH 4921. Senior Project 1. (1 Credit)
Students will broaden their educational experiences studying, understanding and reviewing technical literature in the areas of mathematics, mathematical applications, organizing and writing research papers, proposals, attending seminars and preparing professional-level presentations. Students will draw upon and synthesize knowledge from their previous course work and out-class experiences. Through revision of both the proposals and the oral presentations, students will improve their ability to communicate the main ideas. Offered: Fall, Spring, Summer.

MATH 4922. Senior Project II. (2 Credits)
Students will broaden their educational experiences studying, understanding and reviewing technical literature in the areas of mathematics, mathematical applications, organizing and writing research papers, proposals, attending seminars and preparing professional-level presentations. Students will draw upon and synthesize knowledge from their previous course work and out-class experiences. Project implementation should satisfy all requirements accomplished during the course MATH 4921. Through revision, critiquing, and justification of the proposals and the oral presentations, students will strengthen their abilities and competence communicating deep understanding of their work in oral and written forms. Offered: Fall, Spring, Summer.