

# MATHEMATICS (MATH)

## **MATH 0996B. Support for Elementary Stats (2)**

This learning support course provides co-requisite support for students enrolled in MATH 1401 - Elementary Statistics. Topics will parallel topics being studied in MATH 1401 and the course will provide support for the essential skills needed to be successful in MATH 1401. Taken with MATH 1401, topics to be covered will include descriptive statistics, probability theory, confidence intervals, hypothesis testing and other selected statistics topics

**Prerequisites:** A02 with a score of 17 or S15 with a score of 20.0 or S02 with a score of 400 or CPTE with a score of 055 or ACCM with a score of 055 or ACCNGM with a score of 248 or S12 with a score of 440

## **MATH 0998. Support for Math Modeling (1)**

This course is a non-credit bearing course designed to strengthen student's algebra skills for Mathematical Modeling (MATH 1101). This is a co-requisite course that must be taken along with Mathematical Modeling and will cover intermediate and college level algebra concepts that are needed to ensure success in the credit level course, Mathematical Modeling.

**Prerequisites:** A02 with a score of 17 or S02 with a score of 400 or COM2 with a score of 30 or CPTE with a score of 055 or ACCM with a score of 055 or (MATH 0988

## **MATH 0998A. Support for Math Modeling (3)**

This Learning Support course provides corequisite support in mathematics for students enrolled in MATH 1101 – Introduction to Mathematical Modeling. Topics will parallel topics being studied in MATH 1101 and the course will provide support for essential quantitative skills needed to be successful in MATH 1101. Taken with MATH 1101, 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 communication of quantitative concepts and results.

## **MATH 0998B. Support for Math Modeling (2)**

This Learning Support course provides corequisite support in mathematics for students enrolled in MATH 1101 – Introduction to Mathematical Modeling. Topics will parallel topics being studied in MATH 1101 and the course will provide support for essential quantitative skills needed to be successful in MATH 1101. Taken with MATH 1101, 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 communication of quantitative concepts and results.

**Prerequisites:** A02 with a score of 17 or S02 with a score of 400 or S15 with a score of 20.0 or CPTE with a score of 055 or ACCM with a score of 055 or ACCNGM with a score of 248 or S12 with a score of 440

## **MATH 0999. Support for College Algebra (1)**

This course is to be taken concurrently with MATH 1111. Background topics which are necessary for a student to successfully complete MATH 1111 will be covered, with an emphasis on fractions, factoring polynomials, functions, exponents, and operating with radical and rational expressions. Students who complete the co-requisite MATH 1111 with a minimum grade of C will have satisfied the mathematics learning support requirement.

**Prerequisites:** A02 with a score of 18 or S02 with a score of 430 or COM2 with a score of 30 or CPTE with a score of 055 or ACCM with a score of 055 or (MATH 0989

## **MATH 0999B. Support for College Algebra (2)**

This Learning Support course provides corequisite support in mathematics for students enrolled in MATH 1111 – College Algebra. Topics will parallel topics being studied in MATH 1111 and the course will provide support for the essential quantitative skills needed to be successful in MATH 1111. Taken with MATH 1111, this course provides an in-depth study of the properties of algebraic, exponential and logarithmic functions as needed for calculus. Emphasis is on using algebraic and graphical techniques for solving problems involving linear, quadratic, piece-wise defined, rational, polynomial, exponential and logarithmic functions.

**Prerequisites:** A02 with a score of 18 or S02 with a score of 430 or S15 with a score of 22.0 or CPTE with a score of 067 or ACCM with a score of 067 or ACCNGM with a score of 258 or S12 with a score of 480

## **MATH 1101. Intro to Mathematical Modeling (3)**

This 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 communication of quantitative concepts and results. This course in applied college algebra will involve an applications-driven study of functions; linear, quadratic, polynomial, exponential, logarithmic and piecewise-defined models; inverse functions; composition of functions; systems of equations.

**Prerequisites:** MATH 0998A (may be taken concurrently) or MATH 0998B (may be taken concurrently) or MATH 1111 or A02 with a score of 18 or S02 with a score of 430 or S15 with a score of 22.0 or CPTE with a score of 070 or ACCM with a score of 070 or ACCNGM with a score of 260 or S12 with a score of 480

## **MATH 1111. College Algebra (3)**

This course provides an in-depth study of the properties of algebraic, exponential and logarithmic functions as needed for calculus. Emphasis is on using algebraic and graphical techniques for solving problems involving linear, quadratic, piece-wise defined, rational, polynomial, exponential, and logarithmic functions.

**Prerequisites:** MATH 0999B (may be taken concurrently) or MATH 1101 or A02 with a score of 20 or S02 with a score of 480 or S15 with a score of 25.5 or CPTE with a score of 090 or ACCM with a score of 090 or ACCNGM with a score of 273 or S12 with a score of 520

## **MATH 1112. Trigonometry & Analytic Geom (3)**

This course is an in-depth study of the properties of trigonometric functions and their inverses. Topics include circular functions, special angles, solutions of triangles, trigonometric identities and equations, graphs of trigonometric functions, inverse trigonometric functions and their graphs, Law of Sines, Law of Cosines, and vectors.

**Prerequisites:** MATH 1111

**MATH 1113. Pre-Calculus (3)**

This course is an intensive study of the basic functions needed for the study of calculus. Topics include algebraic, functional, and graphical techniques for solving problems with algebraic, exponential, logarithmic, and trigonometric functions and their inverses.

**Prerequisites:** CPTC with a score of 063 or A02 with a score of 24 or S02 with a score of 570 or S12 with a score of 580

**MATH 1221. Finite Mathematics (3)**

This course is a mathematical preparation for the understanding of various quantitative methods in modern management, information technology and social sciences. Topics include: sets, logic and circuits, basic combinatorics including permutations and combinations, probability and probability distributions, systems of linear equations, matrix theory, and linear programming using a geometric approach. Additional topics that may be included are elementary statistical distributions, Markov chains, and game theory.

**Prerequisites:** MATH 1101 or MATH 1111 or MATH 1113 or MATH 1501

**MATH 1241. Survey of Calculus (3)**

A non-rigorous study of differential and integral calculus of functions of one variable with decision applications for business and social sciences. Not open to students with credit for Calculus I, MATH 1501.

**Prerequisites:** MATH 1101 or MATH 1111 or MATH 1113 or CPTC with a score of 063

**MATH 1401. Elementary Statistics (3)**

This is a non-calculus based introduction to statistics. Course content includes descriptive statistics, probability theory, confidence intervals, hypothesis testing, and other selected statistical topics.

**Prerequisites:** MATH 1101 or MATH 1111 or MATH 1113 or MATH 1241 or MATH 1501 or A02 with a score of 18 or ACCM with a score of 070 or S02 with a score of 430 or S15 with a score of 22.0 or CPTE with a score of 070 or ACCNGM with a score of 260 or S12 with a score of 480 or MATH 0996B (may be taken concurrently)

**MATH 1501. Calculus I (4)**

A study of algebraic, trigonometric, logarithmic, and exponential functions including limits, continuity, the derivative, and differentiation, the definite integral, and applications.

**Prerequisites:** MATH 1112A or MATH 1112 or MATH 1113 or CPTC with a score of 080 or A02 with a score of 28 or S02 with a score of 650 or S12 with a score of 670

**MATH 2008. Fndtns of Numbers & Operations (3)**

This course is an Area F introductory mathematics course for early childhood 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.

**Prerequisites:** MATH 1111 or MATH 1113 (may be taken concurrently) or MATH 1101

**MATH 2010. Number Concepts & Relations (3)**

A study of the real number system, its historical development, its subsets and their algebraic properties, the theoretical foundations of its four basic operations, computational issues, and descriptive statistics. Includes a laboratory/practicum component through which pedagogical issues such as multiculturalism are addressed.

**Prerequisites:** MATH 1111 or MATH 1113 (may be taken concurrently)

**MATH 2020. Introductory Discrete Math (3)**

A study of the concepts of finite mathematical structures. Topics include set theory, logic, proof techniques, functions and relations, graphs, trees, and combinatorics.

**Prerequisites:** MATH 1113 (MATH 1113 or MATH 130 or MATH 1221 or MATH 1501 or MATH 151 or MATH 1112 or MATH 1112A)

**MATH 2140. Introductory Linear Algebra (3)**

This course is an introduction to matrix algebra including determinants, vector spaces, linear transformations, and eigenvectors.

**Prerequisites:** (MATH 1501 or MATH 152 or MATH 2502 (may be taken concurrently))

**MATH 2502. Calculus II (4)**

This course is a study of algebraic and transcendental functions with an emphasis on integral calculus and sequences and series. Other topics from single variable calculus include parametric equations and polar coordinates. Applications focus on functions which model real-world situations.

**Prerequisites:** MATH 1501 or MATH 152

**MATH 2503. Calculus III (4)**

This course is a study of three-dimensional analytic geometry, the calculus of vector-valued functions and multivariable calculus. Topics include vector-valued functions, their derivatives, integrals, and applications; limits, continuity, partial derivatives, and extrema of multivariable functions; multiple and line integrals.

**Prerequisites:** MATH 2502 or MATH 251

**MATH 3005. A Transition to Higher Math (3)**

This course is designed to prepare the student for advanced courses in mathematics. Topics include logic, set theory, properties of integers and mathematical induction, relations, and functions.

**Prerequisites:** MATH 2502 (may be taken concurrently) and (MATH 2020 (may be taken concurrently) or MATH 2140 (may be taken concurrently))

**MATH 3006. Communication in Mathematics (1)**

Several techniques for effective public speaking and effective mathematical writing will be presented. Students will learn to use the tools that professional mathematicians use in the preparation of their research for publication and presentation at conferences. It is strongly recommended that MATH 3005 be taken concurrently.

**Prerequisites:** MATH 3005 (may be taken concurrently)

**MATH 3010. Number Concepts & Relations (3)**

A study of the real number system, its historical development, its subsets and their algebraic properties, the theoretical foundations of its four basic operations, computational issues, and descriptive statistics. Includes a laboratory/practicum component through which pedagogical issues such as multiculturalism are addressed. Prerequisite(s): Admission to Middle Level Teacher Education Program.

**Prerequisites:** (MATH 1112 or MATH 1112A or MATH 1113) and (MATH 1231 or MATH 1401)

**MATH 3010S. Number Concepts & Relationship (3)**

This course is a study of the real number system, its historical development and comparison to other numeration systems, its subsets and their algebraic properties, the theoretical foundations of its four basic operations, computational issues, and elementary set and number theory. This course is only open to in-service Georgia teachers.

**MATH 3020. Concepts of Algebra (3)**

This course is a study of functions designed to reinforce knowledge of the algebraic skills and processes taught at the middle grades level and to extend this knowledge to more advanced topics. The course includes probability functions, polynomial functions, rational functions, exponential and logarithmic functions and trigonometric functions. Other topics discussed are the fundamental theorem of algebra, polar coordinates, trigonometric forms of complex numbers, conic sections in rectangular and polar form and the binomial theorem. Includes a laboratory/ practicum component.

**Prerequisites:** (MATH 1112 (may be taken concurrently) or MATH 1113 (may be taken concurrently)) and (MATH 1231 (may be taken concurrently) or MATH 1401 (may be taken concurrently))

**MATH 3030. Concepts of Geometry (3)**

An exploratory approach to the study of plane, solid, analytic, transformational, spherical, and fractal geometry. Specific topics include symmetries of plane figures through rotations, reflections, and translations; construction of plane and solid figures (polygons and polyhedra); perimeter, area, surface area, and volume; triangle properties, including similarity and congruence theorems; Pythagorean Theorem; comparison of Euclidean and spherical geometry; locus of points; fractals; van Hiele levels of geometric understanding; informal and formal proof.

**Prerequisites:** (MATH 1112 (may be taken concurrently) or MATH 1113 (may be taken concurrently)) and (MATH 1231 (may be taken concurrently) or MATH 1401 (may be taken concurrently))

**MATH 3040. Algebra & Alg. Think Elem Tchr (3)**

The course is designed to engage candidates in the important algebraic thinking and algebraic structures that are critical to understanding the use of abstract symbolism when solving problems. The focus will include algebraic thinking that includes recognizing and analyzing patterns, studying and representing relationships, making generalizations, and analyzing how things change. Topics will emphasize understanding and use of the major concepts and techniques of algebra for grades P-5 and grades 6-8 and connections among the two grade-bands.

**Prerequisites:** (MATH 2010 or MATH 2008) and (MATH 1101 or MATH 1111 or MATH 1113)

**MATH 3050. Geometry & Measurement (3)**

An exploratory approach to the study of plane, solid, and transformational geometry. Specific topics include: shapes and their attributes; polygon classifications and properties; symmetries of plane figures through rotations, reflections, and translations; constructions of polygons and solids; measurement (perimeter, area, surface area, and volume); van Hiele levels of geometric understanding; inductive and deductive reasoning. Computer software will be used extensively. You may only apply MATH 3030 or 3050 to your degree program.

**Prerequisites:** (MATH 2010 or MATH 2008) and (MATH 1101 or MATH 1111 or MATH 1113)

**MATH 3099. Math Methods for Computer Sci (1)**

An introductory course with emphasis on the fundamentals of motion of objects in three dimensional space. Topics include quaternion, force, energy, vector calculus, center of mass, geometry of space, arc length, curvature and splines.

**Prerequisites:** (MATH 1231 or MATH 1401) and MATH 2020 and MATH 2140 and MATH 2502

**MATH 3110. Survey of Algebra (3)**

This course is a survey of group, ring, and field theory. Topics include algebraic structures on the integers, the real numbers, and the complex numbers; modular arithmetic; the Euclidean Algorithm; group and ring homomorphisms and isomorphisms; and field extensions with applications to constructions.

**Prerequisites:** MATH 3005

**MATH 3210. Statistics for Social Justice (3)**

This course is designed to introduce students to statistical methods for the design and analysis of research in social justice. Topics include misuses of statistics in the subjugation of disenfranchised communities, deconstruction of statistical studies, and the development and completion of statistical studies to address areas of social justice. Extensive reading is required for the course.

**Prerequisites:** (MATH 1231 or MATH 1401) or PSYC 2105 or SOCI 3510

**MATH 3220. Applied Statistics (3)**

This course is an introduction to multiple regression, analysis of variance, and other selected inference methods. Topics will be selected from chi-square tests, non-parametric statistical methods, analysis of variance using simple experimental designs, and multiple regression methods, including model checking, analysis of residuals, and model building. Throughout the course, real data and computer software will be utilized.

**Prerequisites:** (MATH 1231 or MATH 1401 or PSYC 2105) and (MATH 1241 or MATH 1501 or CHEM 2412 or BUSA 3101)

**MATH 3303. Differential Equations (3)**

This course provides an introduction to methods for solving ordinary differential equations. Course material will include modeling and methods of solution for linear and nonlinear first order equations, modeling and methods of solution for second and higher order linear equations and series solutions around ordinary points. Further topics (e.g. series solutions around regular singular points, Laplace transform methods and introductory methods for solving systems of ordinary differential equations) may be added at the instructor's discretion.

**Prerequisites:** MATH 2502 and MATH 2140 (may be taken concurrently)

**MATH 3520. Introduction to Analysis (3)**

This is a rigorous introduction to analysis functions on Euclidean space. Topics include limits, continuity, sequences, series, differentiation, integration, and sequences and series of functions.

**Prerequisites:** MATH 2503 or MATH 252 and MATH 3005

**MATH 4010. Mathematical Problem Solving (3)**

A study of extended and refined methods of mathematical problem solving. These methods will allow the use of problem-solving approaches to investigate and understand mathematical content, to apply integrated mathematical problem solving strategies to solve problems from within and without mathematics, and to apply the processes of mathematical modeling to real-world problem situations. Problems to be solved will arise from a variety of areas including the course content of MATH 2010, MATH 3020, and MATH 3030.

**Prerequisites:** MATH 2010 (may be taken concurrently) and MATH 3020 and MATH 3030

**MATH 4020. Concepts of Discrete Math. (3)**

A study of mathematical topics characterized by discrete processes. The study focuses on combinatorics, the theory of graphs and trees, matrix representations, and iterative algorithms. Recursive thinking and inductive processes are emphasized through a variety of applications involving discrete mathematical models. Deductive proof is introduced through topics from logic, set theory, and graph theory, and some relevant topics from the history of mathematics are explored.

**Prerequisites:** MATH 2010 (may be taken concurrently) and MATH 3020 and MATH 3030

**MATH 4050. Methods of Teaching Sec. Math (3)**

In this course, students will explore theory and pedagogy of mathematics instruction with a focus on teaching methods across a variety of mathematical topics. The emphasis will be on learning and communicating mathematics. Topics will be taken from Number & Operations, Geometry, Algebra, Data Analysis, Calculus, and Discrete Mathematics. Appropriate integration of technology for mathematics teaching and learning will be emphasized.

**Restrictions:** Mathematics with Teacher Cert

**MATH 4110. Survey of Algebra (3)**

This course is a survey of group, ring, and field theory. Topics include algebraic structures on the integers, the real numbers, and the complex numbers; modular arithmetic; the Euclidean Algorithm; group and ring homomorphisms and isomorphisms; and field extensions with applications to constructions.

**Prerequisites:** MATH 3005

**MATH 4130. Applied Algebra (3)**

This course begins an investigation of how the theory of abstract algebra is applied to solve non-theoretical problems. Topics are selected from applications in exact computing, error correcting codes, block designs, crystallography, integer programming, cryptography and combinatorics. Students will work both singly and in groups on projects from the chosen topics.

**Prerequisites:** MATH 3110

**MATH 4231. Modern Geometry (3)**

This course begins a study of Euclidean and non-Euclidean geometries. Topics will be explored through historical perspectives, formal geometric proofs, technology-based investigations, and modern applications.

**Prerequisites:** MATH 3005

**MATH 4250. Elementary Number Theory (3)**

An introduction to the mathematical treatment of concepts to integers. Topics include divisibility, prime numbers, numerical functions, congruence classes and Diophantine equations. Other topics such as rational and irrational numbers may be addressed.

**Prerequisites:** MATH 3005

**MATH 4261. Introduction to Probability (3)**

This is a beginning course in Mathematical Probability. It provides an introduction to probability, random variables and their distributions, mathematical expectation, moment generating functions and sampling distributions.

**Prerequisites:** MATH 2503 (may be taken concurrently)

**MATH 4303. Partial Differential Equations (3)**

This course investigates classical methods used in partial differential equations. Topics include data propagating along characteristics, classification of systems of the first order equation, the method of transforms and separation of variables, and typical applications of the wave and heat equations.

**Prerequisites:** MATH 2503 and MATH 3303

**MATH 4320. Numerical Methods (3)**

This course is an introduction to numerical techniques used in applied mathematics. Main topics will be chosen from various modules, including, but not limited to: direct and iterative methods for solutions of linear systems; numerical differentiation and integration; interpolation and splines; initial value and boundary value problems for ordinary differential equations; least squares problems; Monte Carlo methods; initial and boundary value problems for partial differential equations.

**Prerequisites:** MATH 3005 and MATH 3303 and CSCI 1301

**MATH 4350. Graph Theory (3)**

This course is a study of the fundamental concepts of graphs trees, connectivity, Eulerian and Hamiltonian graphs, planar graphs, graph colorings, network flows, matching theory and applications.

**Prerequisites:** MATH 3005 or (MATH 2020 and MATH 2140)

**MATH 4360. Combinatorics (3)**

This course is a study of combinatorial problem solving techniques. Topics are selected from counting principles, generating functions, recurrence relations, principle of inclusion and exclusion, pigeon-hole principle, Polya theory, combinatorial designs, matroids, and latin squares.

**Prerequisites:** MATH 3005 or (MATH 2020 and MATH 2140)

**MATH 4800. Selected Topics in Mathematics (3)**

Topics of interest in mathematics not covered in listed courses. Course may be repeated when topics vary.

**Prerequisites:** MATH 3005

**MATH 4801. Selected Topics in Mathematics (3)**

Topics of interest in mathematics not covered in listed courses.

**Prerequisites:** MATH 3005

**MATH 4802. Selected Topics in Mathematics (3)**

Topics of interest in mathematics not covered in listed courses.

**Prerequisites:** MATH 3005

**MATH 4803. Selected Topics in Mathematics (3)**

Topics of interest in mathematics not covered in listed courses.

**Prerequisites:** MATH 3005

**MATH 4804. Selected Topics in Mathematics (3)**

Topics of interest in mathematics not covered in listed courses.

**Prerequisites:** MATH 3005

**MATH 4986. Internship in Mathematics (2)**

This is a course for students who have an applied internship at an approved organization to integrate disciplinary and/or interdisciplinary knowledge with experiences in various work settings. Academic credit will be awarded for satisfactory completion of the academic assignments (as determined by the faculty coordinator) and satisfactory completion of onsite work (minimum of 80 onsite hours per semester). Sample internships include Education Intern, Banking Intern, Research Intern, Data Analyst Intern, Computational and Mathematics Modeling Intern.

**MATH 4987. Directed Undergrad Research I (1)**

This is the first of two directed research courses where students conduct individual research in preparation for the senior capstone project in the BS in Mathematics degree program. Research will be closely supervised by one or more faculty members.

**Prerequisites:** MATH 3006

**MATH 4988. Directed Undergrad Research II (1)**

This is the second of two directed research courses where students continue their individual research work in preparation for the senior capstone project in the BS in Mathematics degree program. Research will be closely supervised by one or more faculty members.

**Prerequisites:** MATH 4987

**MATH 4989. Senior Capstone Project (0)**

Students will summarize their directed, individualized research. A paper, written with the tools professional mathematicians use in the preparation of their research for publication, and public presentation are the required output of the course.

**Prerequisites:** MATH 3006