

# MATHEMATICS (CMAT)

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## CMAT 103 Algebra I 3 Credits

Basic concepts of arithmetic and algebra, the real numbers, first degree equations of one variable, inequalities, exponents, polynomials, factoring, algebraic fractions, coordinate geometry and linear systems, rational exponents and radicals, quadratic equations.

## CMAT 104 Finite Mathematics 3 Credits

Linear models, polynomial and rational models, exponential and logarithmic models, mathematics of finance, systems of linear equations and matrices, linear programming.

## CMAT 105 Pre-Calculus I 3 Credits

Fundamentals of algebra for study in analytic geometry and calculus. Concepts include the real numbers system, basic algebra, equations and inequalities of first and second degree, and functions and their graphs. Prerequisites: Institutional placement or CMAT 103.

## CMAT 106 Pre-Calculus II 3 Credits

Fundamentals of trigonometry for study in analytic geometry and calculus. Concepts include trigonometry, systems of equations and inequalities, conic sections, and sequences and series. Prerequisites: CMAT 105, or placement based on entrance exams.

## CMAT 107 Precalculus (Accelerated) 4 Credits

This course is designed for STEM majors who require a review of algebra and trigonometry before beginning the calculus sequence. Topics include the real number system, algebraic equations and inequalities; systems of equations, exponential and logarithmic equations; functions and graphs; and trigonometry.

## CMAT 108 Combined Pre-calculus 6 Credits

This course emphasizes problem solving in mathematics. It will focus on concepts necessary to solve a variety of problems in algebra and trigonometry and enable the student to undertake a successful study of calculus, statistics or other intermediate level courses in mathematics. Prerequisites: Departmental approval

## CMAT 109 College Algebra for Bus & Econ 3 Credits

This course includes the real number system, algebraic techniques, equations, linear models, polynomials and rational models, exponential and logarithmic models, and applications of these topics to business and economics areas.

## CMAT 110 Calculus for Bus & Econ 3 Credits

This course in applied calculus is designed for students majoring in business and economics. Topics include differentiation and integration of functions, multivariate calculus, and application of these topics to business and economics. Prerequisite: CMAT 109

## CMAT 111 Calculus I 4 Credits

Real numbers, functions, limits, derivatives, definite integrals and the applications of these topics. Prerequisites: Institutional placement or CMAT 106 or CMAT 108.

## CMAT 112 Calculus II 4 Credits

Topics covered include techniques of integration with applications to volume and surface area of solids of revolution and centers of mass, parametric equations, polar coordinates, improper integrals, and infinite series. Prerequisites: CMAT 111.

## CMAT 113 Calculus for Biological Scienc 4 Credits

This is a one semester applied calculus course that covers differential and integral calculus and its applications to the Biological Sciences. Prerequisites: CMAT 107 or CMAT 105 and CMAT 106; This course is required for Biology and Psychology majors pursuing the Bachelor of Science Degree. Approval is required for other majors.

## CMAT 204 Introduction to Statistics 3 Credits

This is an introductory statistics course intended for students in various disciplines. Topics include descriptive statistics, inferential statistics, probability distribution, hypothesis testing, correlation and linear regression.

## CMAT 209 Calculus with Anal Geometry I 3 Credits

An integrated course in analytic geometry and calculus designed for students in economics, business administration, and biology. The course provides students with the skills needed to study mathematics of finance, limits, functions, and differentiation. Prerequisites: CMAT 105 or Institutional placement. This course is for students majoring in business.

## CMAT 210 Calculus w/Analy Geometry II 3 Credits

Differentiation and integration of transcendental functions, definite integral, indefinite integral, area under curves, area between two curves, and differentiation of multivariable functions. Prerequisites: CMAT 209. This course is for students majoring in business.

## CMAT 211 Calculus III 4 Credits

Topics include multidimensional calculus, namely partial geometry, multiple integrals, vector calculus and their applications. Prerequisites: CMAT 112.

## CMAT 212 Differential Equations 3 Credits

This course focuses on the definition and classification of differential equations. Techniques for first order nonlinear equations, linear equations with constant and variable coefficients, methods of undetermined coefficients, variation of parameters, Cauchy-Euler equations, and other methods for solving nonlinear equations, series solutions. Prerequisites: CMAT 112.

## CMAT 214 Linear Algebra 3 Credits

This course is an introduction to linear algebra. Topics include vectors, matrices, linear equations, determinants, vector spaces, linear transformations, and vector spaces with an inner product. Prerequisites: CMAT 106 or equivalent.

## CMAT 311 Mathematical Logic 3 Credits

This course is a study of sets and equivalence classes, Boolean algebra, the role of axiomatic in the structure of mathematics, basic principles of logic involving rules of modus ponens, reduction absurdum, propositional calculus, first order logic, and the nature of mathematical proof. Prerequisites: CMAT 111 or departmental approval.

## CMAT 321 Mathematical Prob & Stat I 3 Credits

This course is an introduction to probability; distribution functions and moment generating functions; correlation and regression; development and applications of the binomial, normal, Student's t, chi square, and F distributions; Poisson's and Cauchy's distributions. Prerequisites: CMAT 112 or departmental approval

## CMAT 322 Mathematical Prob & Stat II 3 Credits

This course is a continuation of CMAT 321; distribution functions and moment generating functions; correlation and regression; development and applications of the binomial, normal, Student's t, chi square, and F distributions; Poisson's and Cauchy's distributions. Prerequisites: CMAT 321

**CMAT 325 Modern Algebra 3 Credits**

This course includes a study of the number system, groups, rings, fields, matrices and linear transformations, linear algebra, and other algebraic systems, vector spaces, systems of equations, reducible polynomials, and algebraic and transcendental numbers. Prerequisites: CMAT 311 or Departmental Approval

**CMAT 326 Modern Algebra II 3 Credits**

This course is a continuation of CMAT 325. This course includes a study of the number system, groups, rings, fields, matrices and linear transformations, linear algebra, and other algebraic systems, vector spaces, systems of equations, reducible polynomials, and algebraic and transcendental numbers. Prerequisites: CMAT 325.

**CMAT 421 Advanced Calculus I 3 Credits**

This course includes a study of sets, relations and functions, mathematical induction, equivalent and countable sets, real numbers, order and completeness, sequences, series, limits of functions, and community, the Riemann integral, improper integral. Metric spaces, completeness, compactness, sequences and series of functions, uniform continuity and convergence, integral of sequences and series of functions. Prerequisites: CMAT 211 and CMAT 311.

**CMAT 422 Advanced Calculus II 3 Credits**

This course includes a study of sets, relations and functions, mathematical induction, equivalent and countable sets, real numbers, order and completeness, sequences, series, limits of functions, and community, the Riemann integral, improper integral. Metric spaces, completeness, compactness, sequences and series of functions, uniform continuity and convergence, integral of sequences and series of functions. Prerequisites: CMAT 421.

**CMAT 423 Intro to Complex Variables I 3 Credits**

This is an introductory course in complex variables, including the complex numbers, analytic functions, elementary functions, complex integrals, series, residues, poles, and mapping by elementary functions. Prerequisites: CMAT 211

**CMAT 424 Intro to Complex Variables II 3 Credits**

This course is a continuation of CMAT 423. This is an introductory course in complex variables, including the complex numbers, analytic functions, elementary functions, complex integrals, series, residues, poles, and mapping by elementary functions. Prerequisites: CMAT 423.

**CMAT 427 Intro to Topology I 3 Credits**

This course includes the study of limits and metric spaces, continuous functions on metric spaces and general topological spaces, completeness, product spaces. Prerequisites: CMAT 211 and CMAT 311 or departmental approval

**CMAT 428 Intro to Topology II 3 Credits**

This course is a continuation of CMAT 427. This course includes the study of limits and metric spaces, continuous functions on metric spaces and general topological spaces, completeness, product spaces. Prerequisites: CMAT 427.

**CMAT 440 Numerical Analysis 3 Credits**

This course is an introductory study of numerical algorithms for the solution of algebraic, differential and partial differential equations, error analysis. Prerequisites: CMAT 212 and CMAT 214.

**CMAT 443 Intro to Operations Research 3 Credits**

This course includes linear programming, duality, sensitivity analysis, integer programming and applications to various decision and management problems. Prerequisites: CMAT 211 and CMAT 214.

**CMAT 461 Intro to the Theory of Numbers 3 Credits****CMAT 471 Discrete Mathematical Structure 3 Credits**

This course is an introduction to finite mathematical structures and their application to computational and computer sciences. Prerequisites: CMAT 111 or departmental approval.

**CMAT 475 Seminar I 3 Credits**

This course includes selected topics, papers, projects, and research in mathematics. Prerequisites: Departmental approval

**CMAT 476 Seminar II 3 Credits**

This course includes selected topics, papers, projects, and research in mathematics. Prerequisites: Departmental approval

**CMAT 480 Independent Study 1-3 Credits**

This course includes selected topics, papers and projects. Prerequisites: Departmental approval.

**CMAT 483 Mathematics in Community Ser. 3 Credits**

This course is an expansion of the departmental tutorial program offered especially to those students of Clark Atlanta University studying mathematics in the services courses CMAT 103, CMAT 104, CMAT 105 and CMAT 106. This expansion is a community course in service to local school students. Prerequisites: Departmental approval

**CMAT 501 Calculus & Linear Algebra 3 Credits**

This is a course for non-mathematics majors who are deficient in the tools of calculus and linear algebra.

**CMAT 521 Real Analysis I 3 Credits**

The course discusses limits of functions, sequences, continuity, differentiation, The Riemann Integral, sequences and series of functions, Theory of Lebesgue measure and integration.

**CMAT 522 Real Analysis II 3 Credits**

The course discusses limits of functions, sequences, continuity, differentiation, The Riemann Integral, sequences and series of functions, Theory of Lebesgue measure and integration.

**CMAT 523 Complex Variables I 3 Credits**

The course focuses on the theory and applications of functions of a complex variable; topics include analytic functions, contour integration, harmonic functions, conformal mapping and analytic continuation.

**CMAT 524 Complex Variables II 3 Credits**

The course focuses on the theory and applications of functions of a complex variable; topics include analytic functions, contour integration, harmonic functions, conformal mapping and analytic continuation.

**CMAT 525 Algebra I 3 Credits**

Using abstract algebra, the course covers the basic theory of groups, Sylow theorems, rings, integral domains, fields and modules; advanced topics include Galois theory and category theory.

**CMAT 526 Algebra II 3 Credits**

Using abstract algebra, the course covers the basic theory of groups, Sylow theorems, rings, integral domains, fields and modules; advanced topics include Galois theory and category theory.

**CMAT 527 Topology I 3 Credits**

The course includes the study of topological concepts including metric and topological spaces, continuity, connectedness, completeness, compactness and product spaces.

**CMAT 528 Topology II 3 Credits**

The course includes the study of topological concepts including metric and topological spaces, continuity, connectedness, completeness, compactness and product spaces.

**CMAT 541 Principles of Applied Math I 3 Credits**

The course includes the study of various techniques of applied mathematics including Green's functions, string vibration, integral and differential operators in Hilbert spaces, spectral analysis and Laplace transform.

**CMAT 542 Principles of Applied Math II 3 Credits**

The course includes the study of various techniques of applied mathematics including Green's functions, string vibration, integral and differential operators in Hilbert spaces, spectral analysis and Laplace transform.

**CMAT 551 Biostatistics 3 Credits**

This course emphasizes methods of descriptive and inferential statistics through hands-on work with real data using standard statistical computer package STATA and EXCEL. Topics range from descriptive statistics that include frequency tables, graphs and summary central and spread measures; and inferential statistics that include standard estimation and hypothesis testing methods of one and several parameters modeling. In the model, special emphasis is placed on linear correlation and regression and methods in clinical tests and epidemiological studies. Examples are mostly drawn from the biological literature.

**CMAT 601 Prob. Theory & Stochastic I 3 Credits**

The course focuses on probability theory including central limit theorem and ergodic theory. Also included is study of stationary processes, independent increment processes and Gaussian processes.

**CMAT 607 Intro to Numerical Methods 3 Credits**

The course includes a study of numerical algorithms for the solution of algebraic, differential and integral equations including error analysis.

**CMAT 610 Foundations of Mathematics 3 Credits**

Students study basic concepts and ideas in the philosophy and foundations of mathematical sciences, topics varying with the needs of students.

**CMAT 612 Theory of Sets 3 Credits**

The course topics include the descriptive theory of sets and functions, the cartesian product, relations, counting, transfinite arithmetic, well ordered sets and cardinal numbers, and the equivalence of the axiom of choice, the well-ordering theorem and Zorn's Lemma

**CMAT 643 Operations Research I 3 Credits****CMAT 644 Operations Research II 3 Credits****CMAT 651 Topics in Mathematics 3 Credits**

Study of topics of current interest in the Department of Mathematical Sciences

**CMAT 675 Thesis Seminar I 3 Credits**

Students develop a research topic leading to the completion of a graduate thesis.

**CMAT 676 Thesis Seminar II 3 Credits**

Students develop a research topic leading to the completion of a graduate thesis.