

# Mathematics - CPS (MTH)

**MTH 1100. College Algebra. 3 Hours.**

Covers laws of exponents, factoring, inequalities, polynomials, roots, linear and quadratic equations, complex numbers, rational functions, systems of equations, exponential and logarithmic functions, and inverse functions. Requires students to communicate mathematical ideas using symbolic and written forms and to apply algebraic concepts to real-life applications. Seeks to provide students with a solid foundation of concepts and skills necessary to advance to statistics or precalculus. Requires prior knowledge of the manipulation and simplification of basic algebraic expressions.

**MTH 1105. Quantitative Skills and Reasoning: Practical Math. 3 Hours.**

Uses basic mathematics and statistics concepts to analyze, synthesize, and interpret quantitative data in the context of various disciplines and everyday applications. This is an introductory mathematics course.

**MTH 1200. Precalculus. 3 Hours.**

Combines algebraic, geometric, and trigonometric concepts and techniques to model real-world situations (that is, exponential growth and decay, periodic phenomena). Successful completion of this course should strengthen the student's conceptual understanding of mathematics and critical reasoning. Focuses on linear, polynomial, exponential, logarithmic, trigonometric functions and conic sections. Emphasizes understanding, manipulating, and graphing these basic functions, their inverses and compositions, and using them to solve applications drawn from the physical and natural sciences.

**MTH 1990. Elective. 1-4 Hours.**

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

**MTH 2100. Calculus 1. 3 Hours.**

Focuses primarily on differential calculus. Using mathematical models, offers students an opportunity to make predictions and inferences in a variety of applications that relate to the fields of engineering, economics, biology, etc. For example, students can use differential calculus to determine what is the most cost-effective speed to drive a car, using the least amount of fuel. These types of problems, called optimization problems, require an understanding of the derivative as a rate of change. The course focuses on how to apply rules and properties of derivatives to model and solve application problems in science, engineering, and technology. As a prelude to MTH 2105, at the end of the semester, the concept of the integral is introduced as a limit of sums and antidifferentiation.

**MTH 2105. Calculus 2. 3 Hours.**

Continues MTH 2100. Uses mathematical models to make predictions and inferences in a variety of applications that relate to the fields of engineering, economics, biology, etc. Focuses primarily on integral calculus and infinite sequences and series. Topics include definite and indefinite integration, the fundamental theorem of calculus, and the use of integration methods in the calculation of areas and volumes and other applications. Introduces improper integrals as well as the study of infinite sequences and series, power series, Taylor series, and techniques for determining convergence or divergence of sequences series. This course offers an in-depth overview of the above concepts and applies them to solve problems in science, engineering, and technology.

**MTH 2110. Calculus 3. 3 Hours.**

Extends concepts and problem-solving techniques of single-variable calculus to multivariate calculus. Employs techniques to evaluate higher-order differentiation and integration, including vector fields and vector calculus in 2D and 3D. Topics include lines and planes; 3D graphing; partial derivatives; the gradient, tangent planes, and local linearization; optimization; multiple integrals; line and surface integrals; the divergence theorem; and theorems of Green and Stokes with applications to science, engineering, and technology.

**MTH 2120. Technical Math 1. 3 Hours.**

Reviews topics of trigonometry, differential and integral calculus. Emphasis is placed on limits, continuity, derivatives and integrals of algebraic and transcendental functions of one variable. Upon completion, students should be able to select and use appropriate models and techniques for finding solutions to derivative-related problems with and without technology. This is an accelerated course for designed for Advanced Manufacturing Systems and Engineering Technology students.

**MTH 2220. Technical Math 2. 3 Hours.**

Continuation of MTH 2120. Focuses primarily on integral calculus and differential equations. Topics include definite and indefinite integration, the fundamental theorem of calculus, and the use of integration methods in the calculation of areas and volumes, ordinary differential equations, and Laplace transforms.

**MTH 2300. Business Statistics. 3 Hours.**

Offers students an opportunity to obtain the necessary skills to collect, summarize, analyze, and interpret business-related data. Covers descriptive statistics, sampling and sampling distributions, statistical inference, relationships between variables, formulating and testing hypotheses, and regression analysis in the context of business decision making.

**MTH 2310. Statistics for the Behavioral and Social Sciences. 3 Hours.**

Offers students an opportunity to obtain the necessary skills to collect, summarize, analyze, and interpret social and behavioral science data. Covers descriptive statistics, sampling and sampling distributions, statistical inference, relationships between variables, formulating and testing hypotheses, and regression analysis in the context of the social and behavioral sciences.

**MTH 2400. Technology and Applications of Discrete Mathematics. 3 Hours.**

Offers students experience with and exposure to ideas and techniques from discrete mathematics, which is at the foundation of the technological disciplines. Focuses on applications and practical use of discrete mathematics as it is applied to the computing sciences and engineering disciplines. Topics covered include sets; logic; Boolean algebra; machine representations of numbers (decimal, binary, octal, hexadecimal) and arithmetic; counting methods; graphs; and trees. Specific applications include algorithms and complexity, circuits and circuit diagrams, searching and sorting, networks, probability, and finite-state machines. Requires students to select and apply appropriate techniques from discrete math to address common problems found in modern technological systems, especially software and computing hardware design.

**MTH 2500. Statistical Quality Control. 3 Hours.**

Introduces statistical analysis and concepts related to engineering manufacturing quality control, including process capability, control charts, acceptance sampling, and process improvement. Other topics include Six Sigma, statistical and graphical data summaries, quality engineering, and quality design.

**MTH 2990. Elective. 1-4 Hours.**

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

**MTH 3200. Differential Equations. 3 Hours.**

Studies equations involving a single independent variable, also referred to as ordinary differential equations. Mathematics models are created and used by engineers and scientists to express the laws of nature and other physical phenomena. The use of differential equations is pivotal in constructing such models. Reviews techniques to formulate, solve, and interpret ordinary differentials and their application in science, engineering, and technology. Topics include numerical methods, Laplace transforms, linear algebra, matrix algebra, systems of algebraic equations, eigenvalues, and eigenvectors.

**MTH 3300. Applied Probability and Statistics. 3 Hours.**

Covers randomness, finite probability space, probability measure, events; conditional probability, independence, Bayes' theorem; discrete random variables; binomial and Poisson distributions; concepts of mean and variance; continuous random variables; exponential and normal distribution, probability density functions, calculation of mean and variance; central limit theorem and implications for normal distribution; purpose and the nature of sampling; nature of estimates, point estimates, interval estimates; maximum likelihood, least-squares approach; confidence intervals; estimates for one or two samples; development of models and associated hypotheses; nature of hypothesis formulation, null and alternate hypotheses, testing hypotheses; test statistics: t-test, chi-squared test; correlation and regression; Markov processes, discrete time systems, and continuous time systems; queuing theory, including system simulation and modeling, queuing methods.

**MTH 3990. Elective. 1-4 Hours.**

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

**MTH 4955. Project. 1-4 Hours.**

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

**MTH 4990. Elective. 1-4 Hours.**

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

**MTH 6505. Classroom Technologies for the Middle and High School. 4 Hours.**

Seeks to improve teachers' skills in bringing together curriculum and technology to support student learning. Technology is an integral part of the modern mathematics classroom, including the almost universal use of the graphing calculator. Two computer programs, Excel and the Geometer's Sketchpad, have also been extensively used. These technologies are meant to illuminate and enhance concepts and techniques in the math curriculum. The NCTM emphasizes multiple representations of problems and methods, and these programs and calculators are designed for that exact purpose. Because there is little curriculum designed for the classroom use of technology, teachers must acquire and apply their own skills in adapting the technology into their teaching. Participants have the opportunity to practice presenting lessons with particular emphasis on the graphing calculator.

**MTH 6515. Introduction to Quantitative Reasoning for Middle School and High School Mathematics. 4 Hours.**

Offers participants an opportunity to understand quantitative reasoning (QR) and to integrate a QR approach and concepts into existing or newly developed middle school and high school curriculum. Focuses on learning and doing mathematical reasoning in a variety of contexts, such as personal finance and demographics. Topics include number sense, real-life probability and statistics, critical thinking and problem solving, interpreting graphs and tables, and modeling. Activities include mathematical problem solving, skill development, using a spreadsheet, reflecting on pedagogical practices, and examining connections to the Common Core Standards. Offers participants an opportunity to design and share problems, lesson plans, and projects to suit the interests and needs of their students and curriculum, working toward preparing students for future success in college, career, and life experiences.

**MTH 6520. Mathematical Thinking in the Middle School. 4 Hours.**

Aimed at middle school teachers. Focuses on developing key mathematical thinking in the formative pre-high school years. Explores, at the base level, content in numbers, number sense, and beginning algebra, with connections to geometry, with the goal of transforming procedural practice into clear and effective conceptual understanding. Offers participants an opportunity to reinforce their own personal understanding of mathematics as well as the tools to translate personal mathematical accomplishment into effective teaching strategy. Examines devices to enliven the classroom experience for students. Uses the tools and techniques of arithmetic to motivate and help develop clear understanding of the principles of algebra. Explores visual connections.

**MTH 6610. Precalculus for the Secondary Teacher. 4 Hours.**

Explores the behavior and the applications of polynomial, exponential, logarithmic, and trigonometric functions. Examines the wide array of mathematics curves that serve as the foundational examples on which the calculus is then performed. Considers other curves, such as the circle, ellipse, and hyperbola, as well as disparate topics, such as vectors, sequences, and series. Offers students an opportunity to use technology extensively, mostly the graphing calculator, to facilitate the explorations and to complete the skills necessary for a rigorous calculus course. Uses real-world examples to illuminate each of the elements of the course.

**MTH 6962. Elective. 1-4 Hours.**

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

**MTH 7962. Elective. 1-4 Hours.**

Offers elective credit for courses taken at other academic institutions.