

# MTH - MATHEMATICS

## MTH 0099 Elementary Algebra (3 Units)

An introduction to algebra, including a study of the real number system, solutions of linear and quadratic equations, polynomials, factoring, systems of equations, graphing, inequalities, and radicals.

This course does not count toward the minimum 128 units required for graduation.

## MTH 1013 College Algebra (3 Units)

A review and extension of elementary algebra, solutions of linear and quadratic equations, radicals, inequalities, linear and quadratic functions, polynomial functions, exponential and logarithmic functions, conic sections, sequences and series and graphing.

**Prerequisite(s):** MTH 0099 or equivalent.

## MTH 1021 Calculus and Modeling (1 Unit)

An introduction to mathematical modeling using mathematical concepts from Calculus I.

Credit/No Credit.

**Prerequisite(s):** A score of 3 or more on AP 114 or AP 115 or credit for a calculus course from another institution.

## MTH 1031 Computer Aided Calculus (1 Unit)

Introduction to the use of a computer algebra system to complement the knowledge of calculus.

**Prerequisite(s):** MTH 1044 or a score of 3 or higher on AP 114 or AP 115.

## MTH 1033 Pre-Calculus (3 Units)

An introduction to the functions necessary for the study of calculus with an emphasis on numericals and graphical notions of continuity, limits and derivatives. The following function types are used as examples for the study of the concepts: polynomial, rational, exponential, logarithmic, and trigonometric functions.

**Prerequisite(s):** MTH 1013 or equivalent.

## MTH 1044 Calculus with Applications (FE) (4 Units)

Differential and integral calculus of the elementary functions of one variable. Limits, continuity, derivatives, integrals, and applications.

**Prerequisite(s):** MTH 1033 or equivalent.

## MTH 1053 Mathematical Analysis for Business and Economics (3 Units)

This course focuses on learning and using basic mathematical tools that are fundamental to business applications. Applications of these tools include: supply and demand, optimization, cost-benefit analysis, equilibrium (systems of equations), interest, and loan amortization.

**Prerequisite(s):** MTH 1013 or equivalent.

## MTH 1064 Calculus I (FE) (3 Units)

Calculus of the elementary functions of one variable. Limits, continuity, derivatives, methods of integration and applications.

**Prerequisite(s):** MTH 1033 or equivalent.

**Corequisite(s):** MTH 1064L

## MTH 1064L Calculus I Lab (FE) (1 Unit)

An introduction to mathematical modeling using mathematical concepts from Calculus I.

**Corequisite(s):** MTH 1064

## MTH 1073 Business Calculus (FE) (3 Units)

A calculus course intended for those studying business economics, or other related business majors. This course covers differential and integral calculus of elementary functions with an emphasis on business applications. This is a brief calculus course and not appropriate for students majoring in science, computer science or mathematics.

**Prerequisite(s):** MTH 1013 or equivalent.

## MTH 1074 Calculus II (3 Units)

A continuation of Calculus I supported by the use of computer graphics and a symbolic computer algebra system. Methods of integration, sequences, series, elementary differential equations, polar coordinates and parametric equations.

**Prerequisite(s):** MTH 1044 with a grade of C- or higher or MTH 1064 with a grade of C- or higher.

**Corequisite(s):** MTH 1074L

## MTH 1074L Calculus II Lab (1 Unit)

Introduction to the use of a computer algebra system to complement the knowledge of calculus.

**Corequisite(s):** MTH 1074

## MTH 2003 Introduction to Statistics (3 Units)

A first course in statistics for the general student. Description of sample data, probability theory, theoretical frequency distributions, sampling, estimation, and hypothesis testing.

Not applicable toward a major in Mathematics.

**Prerequisite(s):** MTH 0099 or equivalent.

## MTH 2013 Fundamentals of Elementary Mathematics I (3 Units)

A comprehensive approach to the mathematical knowledge necessary for a California multiple subject teaching credential (K-8). Topics covered in this course include whole numbers, numeration systems, fractions, decimals, ratios, proportions and an introduction to number theory.

The integers, rational numbers, irrational numbers and real numbers are studied along with algebraic expressions, inequalities, graphs and polynomials. This class is highly interactive and emphasizes group work and cooperative learning.

Not applicable toward a major in Mathematics. Passing an 8th grade mathematics proficiency test is a requirement for the completion of this course.

**Prerequisite(s):** MTH 1013 or equivalent.

## MTH 2023 Fundamentals of Elementary Mathematics II (3 Units)

A continuation of Mathematics 213 focusing on additional knowledge necessary for a California multiple-subject teaching credential (K-8).

Topics covered in this course include data analysis and statistics, probability, combinations and permutations, simulations as well as standard and non-standard measurement. Planar and three dimensional geometry and geometric constructions are studied, including an algebraic approach to geometry. This class is highly interactive and emphasizes group work and cooperative learning.

**Prerequisite(s):** MTH 2013

## MTH 2033 Linear Algebra (3 Units)

A computational introduction to linear algebra with applications. A study of linear equations, matrix algebra, Euclidean spaces and subspaces, vector spaces, linear transformations, eigenvalues, eigenvectors, and inner products.

**Prerequisite(s):** MTH 1044 with a grade of C- or higher or MTH 1064 with a grade of C- or higher.

**MTH 2074 Calculus III (4 Units)**

Conceptual development of the calculus of functions of more than one variable supported by the use of a symbolic computer algebra system. Limits and continuity, partial derivatives, chain rule, extreme values, Taylor's theorem, multiple integrals, line and surface integrals, Green's Theorem and Stokes' Theorem.

**Prerequisite(s):** MTH 1074 with a grade of C- or higher.

**MTH 2092 Applied Project for Data Science (2 Units)**

This course introduces students to the complete data science process. Students will work in teams to scope a real-world problem, gather data to answer the question, wrangle the data, model it, validate the models, draw conclusions and communicate results. The course includes study of the principles of data science and technical communication. This course will integrate prior cross-disciplinary coursework and introduce students to the basics of scripting and integrating tools into full-stack solutions.

**Prerequisite(s):** MTH 2074 with a grade of C- or higher.

**MTH 3003 Problem Solving (FE) (3 Units)**

A Foundational Explorations course whose major goal is to develop the ability to solve non-routine problems through dynamic processes of inquiry and exploration, logical reasoning, making and testing conjectures and investigating implications of conclusions. A study of quantitative reasoning with emphasis on active problem solving and developing connections with other disciplines.

Not applicable toward a major in Mathematics.

**Prerequisite(s):** MTH 0099 or equivalent and Junior or Senior standing.

**MTH 3012 Number Theory with Proofs (2 Units)**

An introduction to proofs using the study of natural numbers, integers, prime factorization, divisibility, congruences, multiplicative functions, continued fractions, quadratic residues. Methods used include investigation, conjecture, inductive and deductive proofs.

**Prerequisite(s):** MTH 1074 with a grade of C- or higher.

**MTH 3033 Differential Equations (3 Units)**

Ordinary differential equations, solutions by analytical and numerical methods in the context of real world applications. A brief introduction to partial differential equations and Fourier series.

**Prerequisite(s):** MTH 2074 with a grade of C- or higher.

**MTH 3043 Discrete Mathematics (3 Units)**

Sets, functions, propositional logic and switching theory, graphs including trees, matrices, induction and proof by contradiction, combinatorics, and probability. Selected applications from computer science included.

**Prerequisite(s):** MTH 1044 with a grade of C- or higher or MTH 1064 with a grade of C- or higher.

**MTH 3052 History of Mathematics (2 Units)**

Development of mathematics from pre-Greek to recent times.

Perspectives and contributions of persons from diverse cultural, ethnic, and gender groups. Impact of culture on mathematical progress.

**Prerequisite(s):** MTH 1044 with a grade of C- or higher or MTH 1064 with a grade of C- or higher.

**MTH 3063 Calculus Based Statistics with R (3 Units)**

A first course in descriptive and inferential statistics for general students who have taken calculus. Topics include experimental design, sampling and sampling distributions, estimation and hypothesis testing. This course also provides a basic introduction to statistical analysis in the statistical software package R.

Not applicable toward a major in Mathematics.

**Prerequisite(s):** MTH 1044 with a grade of C- or higher or MTH 1064 with a grade of C- or higher or equivalent.

**MTH 3073 Mathematical Modeling (3 Units)**

A problem based course that explores mathematical modeling techniques using a variety of computational methods. Also examines how mathematics can be applied to answer specific questions. Includes problems from biology, chemistry, physics, business and other non-mathematical disciplines. Written report and oral presentation are required.

**Prerequisite(s):** MTH 2074 and MTH 3083

**MTH 3083 Mathematical Probability and Statistics (3 Units)**

A first course in probability and statistics for students with sophisticated mathematics exposure. Topics include axioms of probability, random variables, discrete and continuous distributions, mathematical expectation, and limit theorems. Introduction into descriptive and inferential statistics, including the topics of sampling distributions, point estimation and hypothesis testing. Topics are supported by the use of statistical software.

**Prerequisite(s):** MTH 2074 with a grade of C- or higher.

**MTH 4002 Topics in Geometry (2 Units)**

A study of the foundations of geometry, Affine, non-Euclidean and projective geometries. A synthetic development of advanced Euclidean geometry including geometric transformations, convexity, and constructions.

**Prerequisite(s):** MTH 1044 or MTH 1064

**MTH 4013 Complex Analysis (3 Units)**

Complex numbers, analytic functions, integration, series, contour integration, residues and conformal maps.

**Corequisite(s):** MTH 2074

**MTH 4024 Real Analysis (4 Units)**

Real numbers, topology of Euclidean n-space, continuity, differentiation and integration theory.

**Corequisite(s):** MTH 2033 and MTH 3012 and Junior standing.

**MTH 4044 Abstract Algebra (4 Units)**

A study of groups, rings, fields and related structures with selected applications.

**Corequisite(s):** MTH 2033 and MTH 3012 and Junior standing.

**MTH 4053 Advanced Applied Statistics (3 Units)**

This course is a continuation of MTH 3083 including the topics of random sampling and experimental design, sampling distributions, methods of estimation and the properties of estimators, least square estimates of parameter, linear regression, hypothesis testing, and confidence intervals, testing of models, data analysis and appropriateness of models. Topics are supported by the use of statistical software.

**Prerequisite(s):** MTH 3083

**MTH 4062 Research in Data Science (2 Units)**

Independent research conducted under the guidance of a faculty mentor. The instructor and student propose the research topic.

Credit/No Credit.

**Prerequisite(s):** MTH 2092, MTH 3083, approval of the department chair, consent of instructor, and Junior standing.

**MTH 4071 History of Mathematics Study Tour (1 Unit)**

This course is conducted as a European trip (countries vary). The course uses specific museums, library collections and historic sites to investigate the development of mathematics in relation to specific problems.

Lectures and meeting are held during the semester and a series of lectures by the professor and others are presented on location.

**Prerequisite(s):** Consent of instructor.

**MTH 4072 Internship in Data Science (2 Units)**

A supervised experience in which the student works with industry professionals to gain experience in data science.

May be repeated up to a total of four (4) units. Credit/No Credit.

**Prerequisite(s):** MTH 2092, MTH 3083, and consent of instructor.

"C" Designation is for California Internships. "E" Designation is for Out of State Internships.

**MTH 4081 Senior Seminar in Computer Science (1 Unit)**

This one-unit capstone course is a seminar in which students give lectures on topics of general interest in mathematics. Issues related to vocation and calling are also discussed.

Credit/No Credit.

**Prerequisite(s):** One of CSC 4102, CSC 4133, HON 4098, ISS 4072, ISS 4102, ISS 4133, MTH 4102, or MTH 4133 and Senior standing (or Junior standing if a December graduate).

**MTH 4091 Independent Study in Mathematics (1-4 Units)**

Study of a selected problem or topic under the direction of an instructor.

The instructor and student propose the course of study. Approval by the department chair is required.

May be repeated up to a total of six (6) units.

**Prerequisite(s):** Consent of instructor.

**MTH 4092 Special Topics in Mathematics (2 Units)**

Study of an area of mathematics not otherwise included in the curriculum. The needs and interests of students and faculty involved determine the topics.

May be repeated up to a total of six (6) units.

**Prerequisite(s):** Consent of instructor.

**MTH 4102 Independent Research in Mathematics I (2 Units)**

Independent research conducted under the guidance of a faculty mentor.

The instructor and student propose the research topic.

Credit/No Credit.

**Prerequisite(s):** Approval of the department chair, consent of instructor, and Junior standing.

**MTH 4121 Independent Research in Mathematics II (1 Unit)**

The continuation of independent research conducted under the guidance of a faculty mentor. The instructor and student propose the research topic.

Credit/No Credit.

**Prerequisite(s):** MTH 4102, approval of the department chair, and consent of instructor.

**MTH 4133 Service Learning in Mathematics (3 Units)**

Students working in teams design and implement a project using a broad spectrum of mathematical knowledge to meet the needs of a community organization or the university.

**Prerequisite(s):** Consent of instructor and Junior standing.