

## MATHEMATICS MAJOR, MINOR, AND CERTIFICATES

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*Note: Courses designated by an underscore are offered on the Imperial Valley Campus. All courses are available at the San Diego campus.*

### Faculty

Assistant Professors: Ponce, Verzi

### Mathematics Major

#### **In preparation for the Single Subject Teaching Credential With the B.A. Degree in Liberal Arts and Sciences (Major Code: 17011)**

All candidates for a teaching credential must complete all requirements as outlined in this section of the bulletin under Teacher Education. For students completing the single subject teaching credential program, no more than 48 units in mathematics courses can apply to the degree.

This major may be used by students preparing to be high school teachers as an undergraduate major for the B.A. degree in liberal arts and sciences.

**Preparation for the Major.** Mathematics 150, 151, 241, 245, 252, 254, Statistics 250. (22 units)

Recommended: Computer Science 107, Physics 195, 195L, 196, 196L, 197, 197L.

**Language Requirement.** Competency (successfully completing the third college semester or fifth college quarter) is required in one foreign language to fulfill the graduation requirement. Refer to the section of the catalog on "Graduation Requirements."

**Graduation Writing Assessment Requirement.** Passing the Writing Proficiency Assessment with a score of 10 or above or completing one of the approved upper division writing courses (W) with a grade of C (2.0) or better. See page 26 in "Graduation Requirements" section for a complete listing of requirements.

**Major.** A minimum of 24 upper division units in mathematics to include Mathematics 302, 303, 414, 521A, 534A, Statistics 550; an upper division course in geometry; and three units of electives in mathematics approved by the credential adviser.

**Master Plan.** A master plan of the courses taken to fulfill the major must be approved by the adviser and filed with the Office of the Registrar.

### Mathematics Minor

The minor in mathematics consists of a minimum of 20-22 units in mathematics to include 12 upper division units, at least six of which have as prerequisite Mathematics 151; or Mathematics 252 and nine upper division units in mathematics, at

least six of which have as prerequisite Mathematics 151. The courses selected will be subject to the approval of the minor adviser.

Courses in the minor may not be counted toward the major, but may be used to satisfy preparation for the major and general education requirements, if applicable. A minimum of six upper division units must be completed in residence at San Diego State University.

### Single Subject Mathematics Certificate

The purpose of the Single Subject Mathematics Certificate program is to provide individuals appropriate mathematics coursework to establish their subject matter competency in accordance with California State requirements for high school mathematics teachers. Admission is open to individuals who are majoring or have majored in an area other than mathematics and who have the equivalent of two years of high school mathematics and satisfy the Entry-Level Mathematics Examination. In order to enroll in the program, individuals should contact the single subject mathematics credential adviser in the Department of Mathematics and Statistics.

The program consists of 46 units to include Mathematics 150, 151; and 241, 245, 252, 254, 302, 303, 414, 510 (or 511 or 512), 521A, 534A, Statistics 250, 550, and three units of upper division electives selected from mathematical or physical sciences.

Individuals must complete at least nine upper division units at San Diego State University and have a cumulative grade point average of 2.5 in the required courses to qualify for the certificate.

### Mathematics Departmental Placement Examination

All students who expect to enroll in Computer Science 106, 107, 108, Mathematics 118, 120, 121, 141, 150, 210, 211, 312, Statistics 119, 250 must satisfy the Entry-Level Mathematics Examination requirement and pass the required part of the Mathematics Departmental Placement Examination. For Mathematics 150, certain prerequisite courses taken at San Diego State University may be used to satisfy the Mathematics Departmental Placement Examination requirement.

## Courses (MATH)

Refer to Curricula and Courses and University Policies sections of this bulletin for explanation of the course numbering system, unit or credit hour, prerequisites, and related information.

### LOWER DIVISION COURSES

**NOTE:** Proof of completion of Entry-Level Mathematics requirement required for Mathematics 118, 120, 121, 122, 141, 150, 210, 211: Copy of ELM score or verification of exemption.

#### **MATH 210. Number Systems in Elementary Mathematics (3) [GE]**

This course or its equivalent is required for students working toward a multiple subject credential in elementary education.

Prerequisite: Satisfaction of the Entry-Level Mathematics requirement.

Number sense, operation concepts, estimation, mental arithmetic, algorithms, problem solving, whole, rational, real numbers, ratio, and number theory.

#### **MATH 211. Geometry in Elementary Mathematics (3) [GE]**

Prerequisites: Satisfaction of the Entry-Level Mathematics requirement and Mathematics 210.

Two and three dimensional shapes and interrelationships, congruence, similarity and proportional reasoning, measurement of length, angle size, area, volume, metric system, and problem solving.

#### **MATH 215. Mathematics Placement Examination: Part LS Review (1) (Cr/NC)**

Prerequisite: Score of 12 or lower on either section of Mathematics Placement Examination: Part LS.

Required review for students who have failed Mathematics Placement Examination: Part LS. Basic numbers (quantities, number systems, basic computations with integers and fractions), measurement and geometry (two- and three-dimensional objects, measurements, and measure systems).

#### **MATH 241. Mathematics Software Workshop (1)**

(Selected sections offered as distance education.)

Prerequisite: Mathematics 151.

Introduction to mathematical software environment such as MATLAB, MAPLE, MATHEMATICA or the Geometers Sketchpad. May be repeated for credit with different software. See *Class Schedule* for specific content. Maximum credit two units.

#### **MATH 245. Discrete Mathematics (3) [GE]**

Prerequisite: Mathematics 121 or 150.

Logic, methods of proof, set theory, number theory, equivalence and order relations, counting (combinations and permutations), solving recurrence relations.

#### **MATH 252. Calculus III (4) [GE]**

Prerequisite: Mathematics 151 with minimum grade of C.

Functions of several variables. Vectors. Partial derivatives and multiple integrals. Line integrals and Green's Theorem.

### UPPER DIVISION COURSES (Intended for Undergraduates)

**NOTE:** Proof of completion of prerequisites required for all upper division courses: Copy of transcript.

#### **MATH 302. Transition to Higher Mathematics (3)**

Prerequisite: Mathematics 150.

Selected topics in mathematics to emphasize proof writing and problem solving. Intended for those planning to teach secondary school mathematics.

#### **MATH 303. History of Mathematics (3) [GE]**

Prerequisites: Mathematics 141 (precalculus), or students using course to satisfy General Education must complete the General Education requirement in Foundations IIA., Natural Sciences and Quantitative Reasoning.

Major currents in the development of mathematics from ancient Egypt and Babylon to late nineteenth century Europe.

#### **MATH 311. Statistics and Probability in Elementary Mathematics (2)**

Prerequisites: Mathematics 211 and satisfactory performance on Mathematics Departmental Placement Examination, Part LS.

Topics from statistics and probability. Enrollment limited to liberal studies majors. Not open to students with credit in Mathematics 312.

#### **MATH 312. Topics from Elementary Mathematics I (3)**

Prerequisites: Mathematics 211 and satisfactory performance on Mathematics Departmental Placement Examination, Part LS.

Topics from statistics and probability. Enrollment limited to future teachers in grades K-8. Not open to students with credit in Mathematics 311.

#### **MATH 313. Selected Topics in Elementary Mathematics (3)**

Prerequisite: Mathematics 311 or 312.

Capstone course for prospective K-8 teachers. Advanced topics in mathematics selected from algebra, number systems, transformation geometry, and problem solving. Enrollment limited to future teachers in grades K-8.

#### **MATH 336. Introduction to Mathematical Modeling (3)**

Prerequisite: Mathematics 254.

Models from the physical, natural, and social sciences including population models and arms race models. Emphasis on classes of models such as equilibrium models and compartment models.

#### **MATH 337. Elementary Differential Equations (3)**

Prerequisite: Mathematics 254 or 342A.

Integration of first-order differential equations, initial and boundary value problems for second-order equations, series solutions and transform methods, regular singularities.

**MATH 413. Mathematics for the Middle Grades (3)**

Prerequisites: Senior standing and Mathematics 312.

Teacher-level look at mathematics taught in middle grades, to include proportional reasoning, rational and real numbers, probability, and algebra. Intended for those planning to teach mathematics in middle grades; cannot be used as part of major or minor in mathematical sciences with exception of major for single subject teaching credential. Students in the SSTC major must receive instructor permission.

**MATH 414. Mathematics Curriculum and Instruction (3)**

Prerequisites: Senior standing and 12 upper division units in mathematics.

Historical development of mathematics and mathematics curriculum. Principles and procedures of mathematics instruction in secondary schools. For secondary and postsecondary teachers and teacher candidates. Course cannot be used as part of the major or minor in mathematical sciences with exception of major for the single subject teaching credential.

**MATH 496. Experimental Topics (1-4)**

Selected topics. May be repeated with new content. See *Class Schedule* for specific content. Limit of nine units of any combination of 296, 496, 596 courses applicable to a bachelor's degree.

**MATH 499. Special Study (1-3)**

Prerequisite: Consent of instructor.

Individual study. Maximum credit six units.

**UPPER DIVISION COURSES**

**(Acceptable for a graduate degree only with PRIOR approval of the graduate adviser.)**

**NOTE:** *Proof of completion of prerequisites required for all upper division courses: Copy of transcript.*

**MATH 509. Computers in Teaching Mathematics (3)**

Two lectures and three hours of laboratory.

Prerequisite: Mathematics 252.

Solving mathematical tasks using an appropriate computer interface, and problem-based curricula. Intended for those interested in mathematics teaching.

**MATH 510. Introduction to the Foundations of Geometry (3)**

Prerequisite: Mathematics 122 or 151.

The foundations of Euclidean and hyperbolic geometries. Highly recommended for all prospective teachers of high school geometry.

**MATH 512. Non-Euclidean Geometry (3)**

Prerequisite: Mathematics 122 or 151.

History of attempts to prove the fifth postulate; emphasis on plane synthetic hyperbolic geometry; brief treatment of other types of non-Euclidean geometry.

**MATH 521A. Abstract Algebra (3)**

Prerequisites: Mathematics 245 and 252.

Abstract algebra, including elementary number theory, groups, and rings.

**MATH 524. Linear Algebra (3)**

Prerequisites: Mathematics 245 and 254; or 342A.

Vector spaces, linear transformations, orthogonality, eigenvalues and eigenvectors, normal forms for complex matrices, positive definite matrices and congruence.

**MATH 534A. Advanced Calculus I (3)**

Prerequisites: Mathematics 245 and 254; or 342A.

Completeness of the real numbers and its consequences, sequences of real numbers, continuity, differentiability and integrability of functions of one real variable.

**MATH 534B. Advanced Calculus II (3) II**

Prerequisite: Mathematics 534A.

Series and sequences of functions and their applications, functions of several variables and their continuity, differentiability and integrability properties.

**MATH 537. Ordinary Differential Equations (3)**

Prerequisite: Mathematics 337.

Theory of ordinary differential equations: existence and uniqueness, dependence on initial conditions and parameters, linear systems, stability and asymptotic behavior, plane autonomous systems, series solutions at regular singular points.

**MATH 541. Introduction to Numerical Analysis and Computing (3)**

Prerequisites: Mathematics 254 or 342A; and Computer Science 106 or 107 or 205.

Solution of equations of one variable, direct methods in numerical linear algebra, least squares approximation, interpolation and uniform approximation, quadrature.

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