MATHEMATICS (MATH)

Division of Mathematics and Sciences

Dean: Martin Stringer

Department Co-Chairs, Mathematics: Darlene Diaz, Alicia Frost, Randy Scott

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Associate in Science
Mathematics for Transfer (31040)

The Associate in Science in Mathematics for Transfer prepares students to transfer to a four-year institution leading to a baccalaureate degree. Employment opportunities are available as mathematicians in government, health, industry and education. Successful completion of the transfer degree in Mathematics guarantees the student acceptance to a California State University to pursue a baccalaureate degree in Mathematics or a related field.

Learning Outcome(s)
Upon successful completion of the major requirements for this degree, students will be able to

- Integrate into educational and professional conduct a calm, confident, and ethical approach to mathematical reasoning and problem solving while taking personal responsibility for mathematical success.
- Create mathematical models of real world phenomena, apply those models to make predictions about the behavior of the phenomena, apply appropriate problem solving techniques and critically evaluate the veracity of the obtained results.
- Clearly communicate mathematical reasoning and problem solving skills using a variety of formats, diverse technologies, and appropriate mathematical vocabulary and notation.

Major requirements*

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics 180/180H, Analytic Geometry and Calculus</td>
<td>4</td>
</tr>
<tr>
<td>Mathematics 185, Analytic Geometry and Calculus</td>
<td>4</td>
</tr>
<tr>
<td>Mathematics 280, Intermediate Calculus</td>
<td>4</td>
</tr>
<tr>
<td>Select one (1) course from the following (List A):</td>
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<tr>
<td>Mathematics 287, Introduction to Linear Algebra and Differential Equations (5)</td>
<td>4-5</td>
</tr>
<tr>
<td>Mathematics 290, Linear Algebra (4)</td>
<td></td>
</tr>
<tr>
<td>Mathematics 295, Beginning Differential Equations (4)</td>
<td></td>
</tr>
<tr>
<td>Select one (1) course from the following (List B):</td>
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<tr>
<td>Computer Science 112, Java Programming (3)</td>
<td>3-5</td>
</tr>
<tr>
<td>Computer Science 120, Introduction to Programming(3)</td>
<td></td>
</tr>
<tr>
<td>Computer Science 213, C# Programming (3)</td>
<td></td>
</tr>
<tr>
<td>Mathematics 219/219H, Statistics and Probability (4)</td>
<td></td>
</tr>
<tr>
<td>Social Science 219/219H, Statistics and Probability (4)</td>
<td></td>
</tr>
<tr>
<td>Physics 250A, Physics for Scientists and Engineers I (5)</td>
<td></td>
</tr>
</tbody>
</table>

TOTAL 19-22

Associate in Science
Mathematics (11931)

The associate degree in mathematics prepares students to transfer to a four-year institution leading to a baccalaureate degree. Employment opportunities are available as mathematicians in government, industry and education.

Learning Outcome(s)
Upon successful completion of the major requirements for this degree, students will be able to

- Create mathematical models of real world phenomena, apply those models to make predictions about the behavior of the phenomena, apply appropriate problem solving techniques, and critically evaluate the veracity of the obtained results.
- Clearly communicate mathematical reasoning and problem solving using a variety of formats, diverse technologies, and appropriate mathematical vocabulary and notation.
- Integrate into educational and professional conduct a calm, confident, and ethical approach to mathematical reasoning and problem solving while taking personal responsibility for mathematical successes.

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<td></td>
</tr>
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TOTAL 19-20

Courses

Mathematics N05
Basic Mathematics
Unit(s): 0.5-3.0
Class Hours: 9-64 Lecture total.
Reviews whole numbers, fractions, decimals, percents, geometric formulas and signed numbers using lectures, self-paced computer assisted instruction, and manipulative activities. Not applicable to associate degree. Grade: Pass/No Pass. Open Entry/Open Exit.

Mathematics N06
Essential Mathematics
Unit(s): 3.0
Class Hours: 64 Lecture total.
Reviews whole numbers, fractions, decimals, percents, geometric formulas and signed numbers. Not applicable to associate degree.

Mathematics N06L
Essential Mathematics Math Lab
Unit(s): 0.2
Class Hours: 9 Laboratory total.
Corequisite: Mathematics N06.
Students in Mathematics N06L will receive individual and/or group instruction. The course is designed to review, enhance and/or advance the students' mathematical knowledge based on their individual need in whole numbers, fractions, decimals, percents, geometric formulas and signed numbers. Not applicable to associate degree. Grade: Pass/No Pass. Open Entry/Open Exit.

*Major requirements for the associate degrees are in addition to the General Education requirements found on page 37.
Mathematics N48
Pre-Algebra/Algebra Basics
Unit(s): 4.0
Class Hours: 64 Lecture total.
Prerequisite: Mathematics N05, N06 or placement into Mathematics N48 on the Mathematics Level 1 placement exam and a course equivalent to Mathematics N05 or Mathematics N06.

For students who have little or no previous algebra experience. This course offers an introduction to basic algebra concepts, math vocabulary, algebraic operations. This course is intended to be a bridge from basic arithmetic to elementary algebra. Not applicable to associate degree.

Mathematics N48L
Pre-Algebra/Algebra Basics Math Lab
Unit(s): 0.2
Class Hours: 9 Laboratory total.
Corequisite: Mathematics N48.

Students in Mathematics N48L will receive individual and/or group instruction. The course is designed to review, enhance and/or advance the students' mathematical knowledge based on their individual need in pre-algebra/algebra basics. Grade: Pass/No Pass. Open Entry/Open Exit.

Mathematics N73L
Math Review
Unit(s): 0.2
Class Hours: 9 Laboratory total.

Students requiring specific math knowledge in courses outside the math department (such as water science, surveying, physics, accounting, etc.) will receive individual instruction of mathematical topics based on their individual need. Not applicable to associate degree. Grade: Pass/No Pass. Open Entry/Open Exit.

Mathematics N83L
Math Review
Unit(s): 0.2
Class Hours: 9 Laboratory total.

Corequisite: Enrollment in a mathematics course numbered lower than 100.

Students enrolled in a non-transferable math class will receive individual and/or group instruction of topics based on their current math course. The course is designed to review, enhance and/or advance students' knowledge of mathematics based on their individual need. Not applicable to associate degree. Grade: Pass/No Pass. Open Entry/Open Exit.

Mathematics N93L
Math Review
Unit(s): 0.2
Class Hours: 9 Laboratory total.

Corequisite: Enrollment in a mathematics course numbered 100 or greater.

Students enrolled in a transferable math class will receive individual and/or group instruction of topics based on their current math course. The course is designed to review, enhance and/or advance students' knowledge of mathematics based on their individual need. Grade: Pass/No Pass. Open Entry/Open Exit.

Mathematics 030
Coping with Math Anxiety
Unit(s): 1.0
Class Hours: 16 Lecture total.

Covers the concept of math anxiety, what causes it, and how to overcome it. Includes review and practice of basic math skills. Grade: Pass/No Pass.

Mathematics 060
Elementary Algebra
Unit(s): 4.0
Class Hours: 64 Lecture total.
Prerequisite: Mathematics N48 or placement into Mathematics 060 on the Mathematics Level 1 or 2 placement exam and a course equivalent to Mathematics N48.

A first course in algebra which includes solutions and applications of first and second degree equations, geometric concepts, graphs, inequalities, exponents, polynomials, and algebraic fractions. Credit by Exam.

Mathematics 060L
Beginning Algebra Math Lab
Unit(s): 0.2
Class Hours: 9 Laboratory total.
Corequisite: Mathematics 060.

Students in Mathematics 060L will receive individual and/or group instruction. The course is designed to review, enhance and/or advance students' knowledge of mathematics based on their individual need in elementary algebra. Grade: Pass/No Pass. Open Entry/Open Exit.

Mathematics 070
Geometry
Unit(s): 3.0
Class Hours: 64 Lecture total.
Prerequisite: Mathematics 060 or placement into Mathematics 070 on the Mathematics Level 2 placement exam and a course equivalent to Mathematics 060.

Basic Euclidean geometry including concepts of lines, planes, triangles, congruence, proofs, inequalities, parallel lines, similarity, areas and volumes. Credit by Exam.

Mathematics 070L
Geometry Math Lab
Unit(s): 0.2
Class Hours: 9 Laboratory total.
Corequisite: Mathematics 070.

Students in Mathematics 070L will receive individual and/or group instruction. The course is designed to review, enhance and/or advance the students' mathematical knowledge based on their individual need in geometry. Grade: Pass/No Pass. Open Entry/Open Exit.

Mathematics 080
Intermediate Algebra
Unit(s): 4.0
Class Hours: 80 Lecture total.
Prerequisite: Mathematics 060 or placement into Mathematics 080 on the Mathematics level 2 placement exam and a course equivalent to Mathematics 060.

A second course in algebra which includes systems of equations, inequalities, graphs and functions; radicals, quadratic polynomials, rational expressions; exponential and logarithmic functions, problem solving. Credit by Exam.

Mathematics 080L
Intermediate Algebra Math Lab
Unit(s): 0.2
Class Hours: 9 Laboratory total.
Corequisite: Mathematics 080.

Students in Mathematics 080L will receive individual and/or group instruction. The course is designed to review, enhance and/or advance the students' mathematical knowledge based on their individual need in intermediate algebra. Grade: Pass/No Pass. Open Entry/Open Exit.

*Major requirements for the associate degrees are in addition to the General Education requirements found on page 37.
Mathematics 105
Mathematics for Liberal Arts Students
Unit(s): 3.0
Class Hours: 64 Lecture total.
Prerequisite: Mathematics 080 or equivalent skills as measured by the Mathematics Level 3 Exam and a course equivalent to Mathematics 080.

An overview of mathematics for the liberal arts student. Topics will include problem solving, financial management, probability, statistics, and selected other topics such as set theory, geometry, logic, mathematical modeling, and the history of mathematics. CSU/UC

Mathematics 105L
Mathematics for Liberal Arts Students Math Lab
Unit(s): 0.2
Class Hours: 9 Laboratory total.
Corequisite: Mathematics 105.

Students in Mathematics 105L will receive individual and/or group instruction. The course is designed to review, enhance and/or advance the students’ mathematical knowledge based on their individual need in an overview of mathematics for the liberal arts. Grade: Pass/No Pass. Open Entry/Open Exit. CSU/UC

Mathematics 140
College Algebra
Unit(s): 4.0
Class Hours: 64 Lecture total.
Prerequisite: Mathematics 080 or equivalent skills as measured by the Mathematics Level 3 Exam and a course equivalent to Mathematics 080.

Survey of advanced topics in algebra: equations, inequalities and functions involving polynomials, rationals, exponentials, and logarithms with applications and graphing; sequences and series. Credit by Exam. CSU/UC

Mathematics 140L
College Algebra Math Lab
Unit(s): 0.2
Class Hours: 9 Laboratory total.
Corequisite: Mathematics 140.

Students in Mathematics 140L will receive individual and/or group instruction. The course is designed to review, enhance and/or advance the students’ mathematical knowledge based on their individual need in college algebra. Grade: Pass/No Pass. Open Entry/Open Exit. CSU/UC

Mathematics 150
Calculus for Biological, Management and Social Sciences
Unit(s): 4.0
Class Hours: 80 Lecture total.
Prerequisite: Mathematics 140 or placement into Mathematics 150 on the Mathematics Level 3 placement exam and a course equivalent to Mathematics 140.

Single and multi-variable calculus including limits, derivatives, integrals, exponentials and logarithmic functions and partial derivatives. Applications are drawn from Biology, Social Science and Business. CSU/UC

Mathematics 150L
Calculus for Biological, Management and Social Sciences Math Lab
Unit(s): 0.2
Class Hours: 9 Laboratory total.
Corequisite: Mathematics 150.

Students in Mathematics 150L will receive individual and/or group instruction. The course is designed to review, enhance and/or advance the students’ mathematical knowledge based on their individual need in calculus for biological, management and social sciences. Grade: Pass/No Pass. Open Entry/Open Exit. CSU

Mathematics 160
Trigonometry
Unit(s): 4.0
Class Hours: 64 Lecture total.
Prerequisite: Mathematics 070 and 080 or placement in Mathematics 160 with the Mathematics Level 3 exam and courses equivalent to Mathematics 070 and 080.

Angles and their measurement, trigonometric functions and their applications, including vector problems. Use of trigonometric identities. Graphing the basic functions and variations, solving trigonometric equations. Graphing using polar coordinates, and use of complex numbers. Credit by Exam. CSU/UC

Mathematics 160L
Trigonometry Math Lab
Unit(s): 0.2
Class Hours: 9 Laboratory total.
Corequisite: Mathematics 160.

Students in Mathematics 160L will receive individual and/or group instruction. The course is designed to review, enhance and/or advance the students’ mathematical knowledge based on their individual need in trigonometry. Grade: Pass/No Pass. Open Entry/Open Exit. CSU/UC

Mathematics 170
Pre-Calculus Mathematics
Unit(s): 4.0
Class Hours: 80 Lecture total.
Prerequisite: Mathematics 160 or equivalent skills as measured by the Mathematics Level 4 Exam and a course equivalent to Mathematics 160.

Advanced algebraic topics. Study of rational, trigonometric, exponential and logarithmic functions, polar coordinates, and analytic geometry. Preparation for Mathematics 180. Credit by Exam. CSU/UC

Mathematics 170L
Pre-Calculus Mathematics Math Lab
Unit(s): 0.2
Class Hours: 9 Laboratory total.
Corequisite: Mathematics 170.

Students in Mathematics 170L will receive individual and/or group instruction. The course is designed to review, enhance and/or advance the students’ mathematical knowledge based on their individual need in pre-calculus mathematics. Grade: Pass/No Pass. Open Entry/Open Exit. CSU/UC

Mathematics 180
Analytic Geometry and Calculus
Unit(s): 4.0
Class Hours: 80 Lecture total.
Prerequisite: Mathematics 170 or equivalent skills as measured by Mathematics Level 4 Exam and a course equivalent to Mathematics 170.

Limits and continuity, derivatives and integrals of algebraic, trigonometric, and other transcendental functions. Applications including extrema tests, related rates and areas. Credit by Exam. CSU/UC (C-ID)

Mathematics 180H
Honors Analytic Geometry and Calculus
Unit(s): 4.0
Class Hours: 80 Lecture total.
Prerequisite: Mathematics 170 or equivalent skills as measured by Mathematics Level 4 Exam and a course equivalent to Mathematics 170 and a high school or college GPA of 3.0 or above.

An in-depth honors level study of limits and continuity, derivatives and integrals of algebraic, trigonometric, and transcendental functions with the emphasis on theory and challenging problems. Applications include extrema tests, related rates and areas. CSU/UC

*Major requirements for the associate degrees are in addition to the General Education requirements found on page 37.
Mathematics 180L
Analytic Geometry and Calculus Math Lab
Unit(s): 0.2
Class Hours: 9 Laboratory total.
Corequisite: Mathematics 180/180H.
Students in Mathematics 180L will receive individual and/or group instruction. The course is designed to review, enhance and/or advance the students' mathematical knowledge based on their individual need in analytic geometry and calculus. Grade: Pass/No Pass. Open Entry/Open Exit. CSU

Mathematics 185
Analytic Geometry and Calculus
Unit(s): 4.0
Class Hours: 80 Lecture total.
Prerequisite: Mathematics 180/180H.
Applications of integrals, including volumes, work, arc length, and surface area. Integration techniques, differential equations, conics, parametric equations, polar coordinates, improper integrals, sequences and infinite series. CSU/UC (C-ID)

Mathematics 185L
Analytic Geometry and Calculus Math Lab
Unit(s): 0.2
Class Hours: 9 Laboratory total.
Corequisite: Mathematics 185.
Students in Mathematics 185L will receive individual and/or group instruction. The course is designed to review, enhance and/or advance the students' mathematical knowledge based on their individual need in analytic geometry and calculus, beyond the level of Mathematics 180. Grade: Pass/No Pass. Open Entry/Open Exit. CSU

Mathematics 203
Fundamental Concepts of Elementary Mathematics
Unit(s): 4.0
Class Hours: 64 Lecture total.
Prerequisite: Mathematics 105, 140, 170, 219/219H or Social Science 219/219H.
This course emphasizes problem solving techniques and mathematical structure associated with numeration, set theory, elementary number theory, the real number system, ratio, proportion and patterns. Designed for prospective elementary teachers, this course includes activity-based explorations implementing the common core state curriculum standards. CSU/UC

Mathematics Course Sequences

Math N06
Essential Math

Math N48
Pre-Algebra/Algebra Basics

Math 060
Elementary Algebra

Math 070
Geometry

Math 080
Intermediate Algebra
This course meets the minimum requirements for an A.A.

Math/Science/Engineering
Math 160*
Trigonometry

Math 170
Pre-Calculus

Calculus Sequence
Math 180
Math 185
Math 290

Calculus Sequence
Math 267 OR Math 290/295

Math 140
College Algebra
OR
Math 140
College Algebra

Business/Social Sciences
Math 150
Business Calculus

Liberal Arts
Math 105
Liberal Arts Math
OR
Math 219 or 219H
Statistics/Probability

Math 203
For Elementary Teachers

Note: Where a student places in the sequence will depend upon previous background and test scores.
Check prerequisites for all courses.

Note: Students planning to transfer to a four-year school should work carefully with a counselor and the catalog of the school of transfer.

* Geometry prerequisite.

*Major requirements for the associate degrees are in addition to the General Education requirements found on page 37.
Mathematics 203L
Fundamental Concepts of Elementary Mathematics Math Lab
Unit(s): 0.2
Class Hours: 9 Laboratory total.
Corequisite: Mathematics 203.
Students in Mathematics 203L will receive individual and/or group instruction. The course is designed to review, enhance and/or advance the students’ mathematical knowledge based on their individual need in the fundamental concepts of elementary mathematics. Grade: Pass/No Pass. Open Entry/Open Exit. CSU

Mathematics 219
Statistics and Probability
Unit(s): 4.0
Class Hours: 80 Lecture total.
Prerequisite: Mathematics 080 or placement into Mathematics 219 on the Mathematics Level 3 placement exam and a course equivalent to Mathematics 080.
First course in statistical reasoning. Includes descriptive statistics, graphical displays of data, probability, confidence intervals, hypothesis testing, regression, contingency tables, ANOVA, and non-parametric statistics. Includes use of technology. (Same as Social Science 219.) Credit by Exam. CSU/UC

Mathematics 219H
Honors Statistics and Probability
Unit(s): 4.0
Class Hours: 80 Lecture total.
Prerequisite: Mathematics 080 or placement into Mathematics 219 on the Mathematics Level 3 placement exam and a course equivalent to Mathematics 080 and a high school or college GPA of 3.0 or above.
This course is an enhanced format for the first course in statistics and probability by using a seminar approach, applying statistical software and presenting individual research. This course includes descriptive statistics, graphical displays of data, probability, confidence intervals, hypothesis testing, regression, contingency tables, ANOVA and non-parametric statistics, with applications designed around the individual interests of students. (Same as Social Science 219H.) CSU/UC

Mathematics 219L
Statistics and Probability Math Lab
Unit(s): 0.2
Class Hours: 9 Laboratory total.
Corequisite: Mathematics 219/219H.
Students in Mathematics 219L will receive individual and/or group instruction. The course is designed to review, enhance and/or advance the students’ mathematical knowledge based on their individual need in statistics and probability. Grade: Pass/No Pass. Open Entry/Open Exit. CSU

Mathematics 280
Intermediate Calculus
Unit(s): 4.0
Class Hours: 64 Lecture total.
Prerequisite: Mathematics 185.
Vectors and three-dimensional space, functions of several variables, partial derivatives and multiple integrals. Vector calculus, Green’s Theorem, Stoke’s Theorem, and the Divergence Theorem. CSU/UC

Mathematics 280L
Intermediate Calculus Math Lab
Unit(s): 0.2
Class Hours: 9 Laboratory total.
Corequisite: Mathematics 280.
Students in Mathematics 280L will receive individual and/or group instruction. The course is designed to review, enhance and/or advance the students’ mathematical knowledge based on their individual need in intermediate calculus. Grade: Pass/No Pass. Open Entry/Open Exit. CSU

Mathematics 287
Introduction to Linear Algebra and Differential Equations
Unit(s): 5.0
Class Hours: 80 Lecture total.
Prerequisite: Mathematics 280.
Topics include matrices, determinants, vector spaces, linear systems of equations, linear product spaces, first and second order differential equations, systems of differential equations, and the Laplace transform. CSU/UC

Mathematics 287L
Introduction to Linear Algebra and Differential Equations Math Lab
Unit(s): 0.2
Class Hours: 9 Laboratory total.
Corequisite: Mathematics 287.
Students in Mathematics 287L will receive individual and/or group instruction. The course is designed to review, enhance and/or advance the students’ mathematical knowledge based on their individual need in the introduction to linear algebra and differential equations. Grade: Pass/No Pass. Open Entry/Open Exit. CSU

Mathematics 290
Linear Algebra
Unit(s): 4.0
Class Hours: 64 Lecture total.
Prerequisite: Mathematics 280.
Systems of linear equations, matrices, determinants, Euclidean and abstract vector spaces, linear transformations, eigenvalues and eigenvectors, applications of linear algebra, proofs of course concepts. CSU/UC (C-ID)

Mathematics 295
Beginning Differential Equations
Unit(s): 4.0
Class Hours: 64 Lecture total.
Prerequisite: Mathematics 280
Recommended Preparation: Completion of or concurrent enrollment in Mathematics 290.
Introduction to the theory, techniques and applications of ordinary differential equations, first and second order ODEs, linear systems of ODEs, infinite series, Laplace transforms; matrix solutions and eigenvalues; linear independence, and numerical methods. CSU/UC (C-ID)

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