

# MATHEMATICS

## Contact Information

### Division

Sciences and Mathematics

### Dean

Randy Lehr

### Associate Dean

Karen Warburton

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Department Website (<http://math.sierracollege.edu>)

## Overview

Mathematics is a dynamic and developing field of study. It is the foundation and language of all scientific endeavor. Mathematics contributes in direct and important ways to business, finance, engineering, health and public policy.

A degree in Mathematics or Statistics provides many challenging and rewarding career opportunities. These include teaching, research in engineering fields, molecular structures, genetics and medicine, robotics, digital imagery, computer-aided design, economic forecasting and environmental design and modeling.

TRANSFER AND MAJOR REQUIREMENTS in Mathematics are available in the Counseling Center. In all cases, students should consult with a counselor for specific transfer requirements. Assessment testing is available at the Assessment Center in the Counseling Center.

## Alternatives to Traditional Lecture Format for Algebra

Some instructors teach algebra using a traditional lecture format while others use platforms that require the use of a computer and/or the Internet. Check the Mathematics Department Web Page at <http://math.sierracollege.edu/> to determine the appropriate platform for your learning style.

## Preparation for Mathematics Courses

- All prerequisite courses must be completed with grades of "C" or better.
- Two years of high school algebra means "Algebra I and Algebra II."
- It is strongly recommended that students without recent math coursework complete the assessment process. Contact the Assessment-Placement Center for further information.

## Faculty

### Charles Albright

#### Assistant Professor, Mathematics

B.A., California State University, Sacramento

B.A., California State University, Sacramento

M.A., California State University, Sacramento

### Jacqueline M. Anderson

#### Professor, Mathematics

B.A., Westmont College

M.S., University of Nevada, Reno

### Daniel J. Balaguy

#### Professor, Mathematics

B.A., California State University, Sacramento

M.S., University of Montana

### Andreas Bazos

#### Professor, Mathematics

BA California State U-Sacramento

MA University of California-Davis

### Charles T. Buchwald

#### Professor, Mathematics/Coordinator, Mathematics Center

A.S., Palomar College

B.S., California State University, San Marcos

M.S., California State University, San Marcos

### Vicki L. Day

#### Professor, Mathematics

B.S., Washington State University

M.A.T., University of California, Davis

### Barbara Eryisian

#### Professor, Mathematics

B.S., California State University, Chico

M.S., University of Oregon

### Rene I. Gottwig

#### Professor, Mathematics

B.A., Pacific Lutheran University

M.S., California State University, Sacramento

### Lynn Harrison Benavidez

#### Professor, Mathematics

B.A., University of California, San Diego

M.S., Washington State University

### Debra J. Hill

#### Professor, Mathematics

B.S., University of California, Davis

M.A., University of California, Davis

### Kenneth G. Johnson

#### Professor, Mathematics

B.A., University of California, Santa Barbara

M.A., University of California, Davis

### Jay G. Kesler

#### Professor, Mathematics

B.A., University of California, San Diego

M.A., California State University, Sacramento

### Rebecca J. Kyler

#### Professor, Mathematics

B.A., State University of New York at Plattsburgh

B.S., University of North Dakota

M.Ed., University of North Dakota

### Katherine P. Lucero

#### Professor, Mathematics

B.S., California Polytechnic State University, San Luis Obispo

M.S., California Polytechnic State University, San Luis Obispo

### Michele L. Morgan

#### Professor, Mathematics

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M.A., San Francisco State University

**Sabrina L. Newsome**

**Professor, Mathematics**

A.A., Napa Valley College

B.S., University of California, Davis

M.A.T., University of California, Davis

**Sudha Parambil**

**Assistant Professor, Mathematics**

B.S., University of Calicut

M.S., University of Calicut

**Mary Beth E. Pattengale**

**Professor, Mathematics**

B.S., California Polytechnic State University, San Luis Obispo

M.S., California Polytechnic State University, San Luis Obispo

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**Professor, Mathematics**

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M.S., University of Calgary

**Patricia A. Ritchie-Reese**

**Assistant Professor, Mathematics**

B.A., California State University, Sacramento

M.A., California State University, Sacramento

**Lyudmila Shved**

**Assistant Professor, Mathematics**

B.A., California State University, San Bernardino

M.A., California State University, San Bernardino

**Donna M. Smith**

**Professor, Mathematics**

B.A., Pomona College

M.A., University of California, Berkeley

**James M. Sullivan**

**Professor, Mathematics**

B.S., University of California, Davis

M.S., University of California, Davis

**Pitt Turner**

**Professor, Mathematics**

B.A., University of California, Santa Cruz

M.A., University of Hawaii, Manoa

**Kiet Vo**

**Assistant Professor, Mathematics**

A.A., San Joaquin Delta College

B.A., University of California, Berkeley

M.A., California State University, Sacramento

**Michael Waterson**

**Assistant Professor, Mathematics**

B.S., University of California, San Diego

M.S., Salem State University

**Ian Wu**

**Professor, Mathematics**

B.S., California State University, Chico

M.A., California State University, Sacramento

## Degrees/Certificates

### Associate Degree for Transfer

- Mathematics for Transfer (p. 2)

### Associate Degree

- Mathematics (p. 3)

## Mathematics for Transfer

### AS-T Degree

The Associate in Science in Mathematics for Transfer (AS-T) degree includes curriculum focusing on the mastery of calculus, linear algebra and differential equations. Students will master these concepts using algebraic and visual models in pure and applied contexts and be able to communicate mathematically.

The Associate in Science in Mathematics for Transfer degree prepares students to transfer into the CSU system to complete a bachelor's degree in Mathematics or a major deemed similar by a CSU campus. Students earning an associate degree for transfer and meeting the CSU minimum transfer admission requirements are guaranteed admission with junior standing to the CSU system, but not to a particular campus or major. Upon transfer, students will be required to complete no more than 60 additional prescribed units to earn a bachelor's degree.

To earn the Associate in Science in Mathematics for Transfer degree, students must complete 60 CSU-transferable semester units with a minimum grade point average of 2.0, including both of the following:

- completion of all courses required for the major with grades of "C" or better; and
- completion of the California State University General Education Breadth (CSU GE) (<http://catalog.sierracollege.edu/archive/2018-2019/student-resources/general-education/california-state-university-general-education-breadth-requirements>) pattern or the Intersegmental General Education Transfer Curriculum (IGETC) (<http://catalog.sierracollege.edu/archive/2018-2019/student-resources/general-education/intersegmental-general-education-transfer-curriculum-igetc>) pattern. (Students transferring to a CSU campus using IGETC must complete Area 1C Oral Communication to be eligible for admission.)

The exact wording of the law pertaining to associate degrees for transfer may be found in Education Code Section 66746.

It is highly recommended that, prior to transferring, students complete courses that satisfy the CSU United States History, Constitution and American Ideals graduation requirement. In all cases, students should consult with a counselor for more information on university admission and transfer requirements.

**RESTRICTION:** International coursework from non-United States regionally accredited institutions cannot be applied to associate degrees for transfer.

### Required Courses

Code	Title	Units
MATH 0030	Analytical Geometry and Calculus I	4
MATH 0031	Analytical Geometry and Calculus II	4
MATH 0032	Analytical Geometry and Calculus III	4

MATH 0033	Differential Equations and Linear Algebra	6
Total Units		18

Understanding course descriptions (<http://catalog.sierracollege.edu/archive/2018-2019/student-resources/course-information/understanding-course-descriptions>)

## Mathematics

### AA or AS Degree

The Mathematics major recognizes a concentration in the field of Mathematics. Successful completion of the curriculum in Mathematics and the associated electives prepare Mathematics students for transfer to four-year colleges or universities. The program in Mathematics outlined below is typical of lower-division requirements for four-year colleges and universities: some requirements vary from college to college. In all cases, students should consult with a counselor for more information on university admission and transfer requirements. Students must fulfill the following major requirements with grades of "C" or better, complete a minimum of 60 degree-applicable semester units (12 of which must be completed at Sierra College) with a grade point average of at least 2.0 and complete one of the following three general education patterns:

- Sierra College Associate Degree Requirements (<http://catalog.sierracollege.edu/archive/2018-2019/student-resources/general-education/associate-degree-requirements>);
- California State University General Education Breadth (<http://catalog.sierracollege.edu/archive/2018-2019/student-resources/general-education/california-state-university-general-education-breadth-requirements>) pattern;
- Intersegmental General Education Transfer Curriculum (IGETC) (<http://catalog.sierracollege.edu/archive/2018-2019/student-resources/general-education/intersegmental-general-education-transfer-curriculum-igetc>).

### Required Courses

Code	Title	Units
MATH 0030	Analytical Geometry and Calculus I	4
MATH 0031	Analytical Geometry and Calculus II	4
MATH 0032	Analytical Geometry and Calculus III	4
MATH 0033	Differential Equations and Linear Algebra	6
<b>Select 3-5 units from the following:</b>		3-5
CSCI 0012	Programming Concepts and Methodology I	
CSCI 0027	Visual Basic .NET Programming I	
CSCI 0046	System Programming with C	
MATH 0010	Problem Solving	
MATH 0013	Elementary Statistics	
MATH 0015	Discrete Mathematics	
MATH 0017	Concepts of Mathematics	
MATH 0018	The Nature of Mathematics	
PHYS 0205 & 0205L	Principles of Physics: Mechanics and Principles of Physics Laboratory: Mechanics	
Total Units		21-23

### MATH 0000A. Elementary Algebra

Units: 4-5

Hours: 72 lecture (4 units); 90 lecture (5 units)

Real numbers and their properties, first degree equations and inequalities, graphs of linear equations in two variables, systems of linear equations in two variables, properties of integer exponents, polynomial operations, basic factoring, rational expressions, radical expressions, quadratic equations, and applied problems and problem solving. (not transferable)

### MATH 0000B. Plane Geometry

Units: 4

Prerequisite: Completion of MATH A with grade of "C" or better or placement by matriculation assessment process

Hours: 72 lecture

Study of points, lines, angles, polygons, triangles, similarity, congruence, geometric proofs, area, volume, perimeter, the circle, right triangle trigonometry. (not transferable)

### MATH 0000D. Intermediate Algebra

Units: 4-5

Prerequisite: Completion of MATH A with grade of "C" or better or placement by matriculation assessment process

Hours: 72 lecture (4 units); 90 lecture (5 units)

Exponents, radicals, complex numbers, factoring, linear and quadratic equations and inequalities; linear, quadratic, exponential and logarithmic functions; graphing, and systems of equations. (not transferable)

### MATH 0000E. Practical Mathematics

Units: 6

Hours: 108 lecture

Practical Mathematics is a one semester course for non-math, non-science majors covering the topics of numeracy, proportional reasoning, algebraic reasoning, trigonometric reasoning, data analysis and critical thinking through real world applications. Students will develop the marketable skills needed to apply mathematics and technology to analyze and interpret data. Algebraic, geometric and trigonometric topics covered include: real numbers and their properties; proportions; measurement of lengths, areas and volumes; first degree equations and inequalities; graphs of linear, quadratic, power, exponential and logarithmic equations; quadratic, exponential, and logarithmic equations; and basic right triangle trigonometry. Not intended for students on the Calculus track. (not transferable)

### MATH 0000G. B-STEM Intermediate Algebra

Units: 5

Hours: 90 lecture

B-STEM Intermediate Algebra is a one semester course for business, science, technology, engineering and math majors covering the topics of linear equations and applications, absolute value equations and inequalities, factoring, operations on rational and radical expressions, functions including composition and inverses, quadratic functions and graphs, exponential and logarithmic expressions and equations, and systems of equations. Computational techniques developed in beginning algebra are prerequisite skills for this course. This course is appropriate for students on a business or STEM pathway and have some knowledge of beginning algebra or who have had at least two years of high school algebra but have not used it for several years. (not transferable)

## Courses

View the course progression for Mathematics (PDF) (<http://math.sierracollege.edu/mathtree/mathtree.asp>)

**MATH 0000S. Just in Time Support for B-STEM Intermediate Algebra***Units: 3*

Corequisite: Concurrent enrollment in Math G

Hours: 54 lecture

Just in time support option covering the core prerequisite skills, competencies, and concepts for Intermediate Algebra. Intended for students who are concurrently enrolled in MATH G - B-STEM Intermediate Algebra. Topics include: numeracy, computational skills, the vocabulary of algebra, evaluation of expressions and functions, solving and graphing linear equations and inequalities in one and two variables, solving and graphing systems of equations in two variables, factoring, algebraic operations on polynomial and rational expressions. Recommended for students taking Math G – B-STEM Intermediate Algebra with little or no recent algebra knowledge. (not transferable) (not degree applicable) (pass/no pass grading)

**MATH 0010. Problem Solving***Units: 4*

Prerequisite: Two years of high school algebra or MATH D with grade of "C" or better or placement by matriculation assessment process

Hours: 72 lecture

Individual and small-group problem solving geared toward real life situations and nontraditional problems. Problem solving strategies include: draw a diagram, eliminate possibilities, make a systematic list, look for a pattern, guess and check, solve an easier related problem, subproblems, use manipulatives, work backward, act it out, unit analysis, use algebra, finite differences, and many others. Divergent thinking and technical communication skills of writing and oral presentation are enhanced. Designed to teach students to think more effectively and vastly increase their problem solving ability. (CSU)

**MATH 0012. College Algebra***Units: 4*

Prerequisite: Completion of MATH D with grade of "C" or better or placement by matriculation assessment process

Hours: 72 lecture

Study of algebra topics beyond MATH D; including functions, graphs, logarithms, systems of equations, matrices, analytic geometry sequences, mathematical induction, and introduction to counting techniques. (CSU, UC-with unit limitation)

**MATH 0013. Elementary Statistics***Units: 4*

Prerequisite: Completion of MATH D or E with grade of "C" or better or placement by matriculation assessment process or equivalent

Hours: 72 lecture

Introduction to the basic concepts of statistics. Emphasis on statistical reasoning and application of statistical methods. Areas included: graphical and numerical methods of descriptive statistics; basic elements of probability and sampling; binomial, normal, and Student's t distributions; confidence intervals and hypothesis testing for one and two population means and proportions; chi-square tests for goodness-of-fit and independence; linear regression and correlation; and one-way analysis of variance (ANOVA). (C-ID MATH 110) (CSU, UC-with unit limitation)

**MATH 0015. Discrete Mathematics***Units: 4*

Prerequisite: Completion of MATH 30 with grade of "C" or better

Hours: 72 lecture

Study of set theory, relations and functions, logic, combinatorics and probability, algorithms, computability, matrix algebra, graph theory, recurrence relations, number theory including modular arithmetic. Various forms of mathematical proof are developed: proof by induction, proof by contradiction. (CSU, UC)

**MATH 0016A. Calculus for Social and Life Sciences***Units: 4*

Prerequisite: Completion of MATH 12 with grade of "C" or better or placement by matriculation assessment process

Advisory: Not recommended for students with grade of "C" or better in MATH 30

Hours: 72 lecture

Review of functions, limits, differentiation and integration of algebraic functions, calculus for exponential and logarithmic functions, applications of calculus in social and life sciences. This course is not intended for students majoring in mathematics, engineering, physics, or chemistry. (CSU, UC-with unit limitation)

**MATH 0016B. Calculus for Social and Life Sciences***Units: 4*

Prerequisite: Completion of MATH 16A or 30 with grade of "C" or better

Advisory: Completion of MATH 27 with grade of "C" or better

Hours: 72 lecture

Differentiation and integration of trigonometric functions, functions of several variables, partial derivatives, double integrals, introduction to differential equations, sequences and series, applications of calculus in the social and life sciences. (CSU, UC-with unit limitation)

**MATH 0017. Concepts of Mathematics***Units: 3*

Prerequisite: Three years of high school mathematics which includes two years of algebra and one year of geometry; or MATH D and B with grades of "C" or better; or placement by matriculation assessment process

Hours: 54 lecture

Exploration of mathematical patterns and relations, formulation of conjectures based on the explorations, proving (or disproving) the conjectures. Includes different problem solving techniques, number theory, probability, statistics, sequences and series, and geometry. Intended for students interested in elementary education. (CSU, UC-with unit limitation)

**MATH 0018. The Nature of Mathematics***Units: 3*

Prerequisite: Two years of high school algebra or MATH D with grade of "C" or better or placement by matriculation assessment process

Hours: 54 lecture

Introduces students to the art and application of mathematics in the world around them. Topics include mathematical modeling, voting and apportionment, and mathematical reasoning with applications chosen from a variety of disciplines. Not recommended for students entering elementary school teaching or business. (CSU, UC-with unit limitation)

**MATH 0019. Mathematical Concepts for Elementary School Teachers***Units: 3*

Prerequisite: Completion of two years of high school algebra or MATH D with grade(s) of "C" or better or placement by matriculation assessment process

Hours: 54 lecture

This course focuses on the development of quantitative reasoning skills through in-depth, integrated explorations of topics in mathematics, including the real number system and its subsystems. The emphasis is on comprehension and analysis of mathematical concepts and applications of logical systems. (C-ID MATH 120) (CSU, UC)

**MATH 0024. Modern Business Mathematics***Units: 3*

Prerequisite: Two years of high school algebra or MATH D with grade(s) of "C" or better or placement by matriculation assessment process

Hours: 54 lecture

Applications of mathematics in economics and business contexts. Topics include tables and graphs, functions, finance (interest and exponential models), rates of change including applications and optimization, and linear programming. (CSU)

**MATH 0027. Trigonometry***Units: 4*

Formerly known as MATH 8

Prerequisite: Completion of MATH D with grade of "C" or better or placement by matriculation assessment process

Hours: 72 lecture

Fundamentals of trigonometry. Topics include review of algebraic functions, definitions of trigonometric and circular functions, graphs, identities and applications. Other material includes solving trigonometric equations, solving triangles using the Laws of Sines and Cosines, vectors, polar coordinates and graphs, polar representations of complex numbers and conic sections. (CSU)

**MATH 0028. Independent Study***Units: 1-3*

Designed for students interested in furthering their knowledge at an independent study level in an area where no specific curriculum offering is currently available. Independent study might include, but is not limited to, research papers, special subject area projects, and research projects. See Independent Study page in catalog. (CSU, UC-with unit limitation)

**MATH 0029. Pre-Calculus Mathematics***Units: 4*

Prerequisite: Completion of MATH 27 with grade of "C" or better or placement by matriculation assessment process

Hours: 72 lecture

Preparation for calculus. Study of polynomials, rational functions, exponential and logarithmic functions, trigonometric functions, systems of linear equations, matrices, determinants, rectangular and polar coordinates, conic sections, complex number systems, mathematical induction, binomial theorem, and sequences. Recommended for students who plan to take MATH 30. (CSU, UC-with unit limitation)

**MATH 0030. Analytical Geometry and Calculus I***Units: 4*

Prerequisite: Completion of MATH 27 and either MATH 12 or 29 with grades of "C" or better or placement by matriculation assessment process

Hours: 72 lecture

Introduction to differential and integral calculus. Content includes limits, continuity, differentiation and integration of algebraic, trigonometric, exponential, logarithmic, hyperbolic and other transcendental functions; as well as application problems. (C-ID MATH 210) (combined with MATH 31, C-ID MATH 900S) (CSU, UC-with unit limitation)

**MATH 0031. Analytical Geometry and Calculus II***Units: 4*

Prerequisite: Completion of MATH 30 with grade of "C" or better

Hours: 72 lecture

Continuation of MATH 30. Content includes techniques of integration, improper integrals, applications of integration, infinite series, parametric equations and polar coordinates. (C-ID MATH 220) (combined with MATH 30, C-ID MATH 900S) (CSU, UC-with unit limitation)

**MATH 0032. Analytical Geometry and Calculus III***Units: 4*

Prerequisite: Completion of MATH 31 with grade of "C" or better

Hours: 72 lecture

Continuation of MATH 31. Vectors and analytic geometry in the plane and space; functions of several variables; partial differentiation, multiple integrals, and application problems; vector functions and their derivatives; motion in space; and surface and line integrals, Stokes' and Green's Theorems, and the Divergence Theorem. (C-ID MATH 230) (CSU, UC)

**MATH 0033. Differential Equations and Linear Algebra***Units: 6*

Prerequisite: Completion of MATH 31 with grade of "C" or better

Advisory: Completion of MATH 32 with grade of "C" or better strongly recommended

Hours: 108 lecture

First and second order ordinary differential equations, linear differential equations, numerical methods and series solutions, Laplace transforms, modeling and stability theory, systems of linear differential equations, matrices, determinants, vector spaces, linear transformations, orthogonality, eigenvalues and eigenvectors. (C-ID MATH 910S) (CSU, UC)

**MATH 0042. Business Calculus***Units: 4*

Prerequisite: Completion of MATH D with grade of "C" or better or placement by matriculation assessment process

Advisory: Completion of MATH 12 strongly recommended, especially for students who have not recently taken MATH D

Hours: 72 lecture

Introduction to differential and integral calculus, with particular emphasis on applications in the fields of business, economics, and social sciences. Includes: concepts of a function, limits, derivatives, integrals of polynomial, exponential and logarithmic functions, optimization problems, and calculus of functions of more than one variable. Not recommended for students with credit for MATH 30. (C-ID MATH 140) (CSU, UC-with unit limitation)



**MATH 0581. Arithmetic Review***Units: 4*

Prerequisite: Placement by matriculation assessment process

Hours: 108 (54 lecture; 54 laboratory which may be scheduled TBA)

Basic review of fundamental arithmetic operations with whole numbers, decimals, fractions, ratio and proportion, and percentages. Not open to students who have completed MATH 581S. (not degree applicable)

**MATH 0581S. Summer Bridge Arithmetic Review***Units: 3*

Prerequisite: Placement by matriculation assessment process

Hours: 54 lecture

Summer Bridge Program with accelerated curriculum. Basic review of fundamental arithmetic operations with whole numbers, decimals, fractions, ratio and proportion, and percentages. Not open to students who have completed MATH 581. (not degree applicable)

**MATH 0582. Pre-Algebra***Units: 4*

Prerequisite: Completion of MATH 581 or 581S with grade of "C" or better or placement by matriculation assessment process

Hours: 108 (54 lecture; 54 laboratory which may be scheduled TBA)

Integrates and utilizes algebraic concepts and skills, such as integers, algebraic equations, polynomials, radicals, factoring and graphing, as well as reviews whole numbers, decimals, fractions, ratio and proportions, exponential notation, percentages, basic geometry and problem solving. (not degree applicable)

**MATH 0584. Math Success-Overcoming Math Anxiety***Unit: 1*

Hours: 18 lecture

Designed to assist students to recognize common fears and misconceptions of mathematics and develop personal strategies to overcome math and test anxiety. Specific study skills and strategies are discussed. Individual math learning styles are analyzed. (not degree applicable)

**MATH 0585. Foundations of Mathematics***Units: 6*

Prerequisite: Placement by matriculation assessment process

Hours: 108 lecture

Covers the topics of numeracy, algebraic reasoning and computation, proportional reasoning, critical thinking and problem solving through application, and math confidence. Explores student attitudes towards mathematics and develops student-specific study skills and learning strategies. Topics covered include: history of numbers, the real number system, mathematical operations, order of operations, linear equations, graphing, proportions, and applications. (not degree applicable)

## Program Student Learning Outcomes (PSLOs)

- Use mathematical techniques to translate, model, and solve applied problems.
- Differentiate between expressions and equations; and, using appropriate mathematical techniques, simplify expressions and solve equations.
- Interpret and construct visual models of mathematical concepts.
- Clearly communicate mathematical information, concepts, and processes to others.
- Develop a growth mindset, math sophistication, and confidence.