Mathematics

Each year, the list of careers demanding familiarity with basic mathematical skills grows. Environmental sciences, architecture, business management, nursing, dentistry, computer programming, electronics, forestry management, psychology and photography represent only a small sample from this list.

The Mathematics Department at Santa Barbara City College offers a broad curriculum to meet the needs of students with a wide variety of goals. It offers a standard college-level sequence in single and multivariable calculus, analytic geometry, linear algebra and ordinary differential equations for freshman and sophomore students who plan to transfer to four-year colleges or universities. In addition, the department offers courses in statistics and calculus for Business, Biological Sciences and Social Science majors.

It also serves students who want to remedy their high school mathematics background deficiencies, as well as students who are returning to the classroom after a period away from school. The department provides a complete precalculus program, including elementary algebra, intermediate algebra, college algebra and trigonometry for those who wish to review old or gain new mathematical skills.

Through its "Basic Math" and pre-algebra courses, the department provides an opportunity to students to refresh their arithmetic skills in order to participate in educational and vocational endeavors.

In all of the department's course offerings, there is a strong commitment to training the student in analytical and logical thinking skills as part of a problem-solving attitude which can be transferred outside the formal classroom setting.

Faculty & Offices

Jason Miner, *Chair* (IDC-342, ext. 2267)
Ignacio Alarcón (IDC-344, ext. 2559)
Gregory Armstrong (IDC-340, ext. 2524)
Lindsey Bramlett-Smith (IDC-343, ext. 2777)
James Campbell (IDC-327-B, ext. 2340)
Lee Chang (IDC-327)
Elizabeth Cunningham (IDC-327-B, ext. 2340)
Robert M. Elmore (IDC-341, ext. 2447)
Peter Georgakis (IDC-346, ext. 2553)
David Gilbert (IDC-345, ext. 2208)
Pamela Guenther (IDC-336-A, ext. 2707)
Jared Hersh (IDC-327-B, ext. 2340)
James Kruidenier (IDC-339, ext. 2682)

Noureddine (Eddie) Laanaoui (IDC-330, ext. TBA)
Sharareh Masooman (IDC-336B, ext. 2472)
Bronwen Moore (IDC-337, ext. 2432)
Anna Parmely (IDC-331, ext. 4720)
Peter Rojas (IDC-328, ext. 2737)
Ron Wopat (IDC-338, ext. 2708)

Department Office & Secretary

Debra Fondren (IDC-317, ext. 2340)
Math Computer Lab (IDC-109, ext. 2473)
Math Tutorial Lab (IDC-102, ext. 2300)

Emeritus Faculty

Robert Traughber, J. Eugene Brady, R. Michael Mallen, James Edmondson, Elizabeth Hodes, Margarete Reinhart, Greg Armstrong

Degrees & Certificates Awarded

Associate in Arts Degree, Mathematics

A.A. Degree: Mathematics

Department Requirements (35-36 units)

CS 119 — FORTRAN Programming *or* 3
    CS 120 — Java Programming *or* 3
    CS 131 — Assembly Language Programming *or* 4
    CS 135 — Programming Fundamentals *or* 3
    CS 137 — C Programming *or* 3
    CS 140 — Object-Oriented
    Programming Using C++ *or* 4
    CS 160 — BASIC Programming *or* 3
    CS 170 — Ada Programming *or* 3
    CIS 209 — Visual Basic.NET Programming...................4
MATH 150 — Calculus with Analytic Geometry I.................5
MATH 160 — Calculus with Analytic Geometry II...............5
MATH 200 — Multivariable Calculus 4
MATH 210 — Linear Algebra...4
MATH 220 — Differential Equations....................................4
PHYS 121 — Mechanics of Solids and Fluids.....................5
PHYS 122 — Electricity and Magnetism 5

For a Math A.A. Degree, at least one of the courses MATH 200, 210, 220 must be taken at SBCC.

Planning a Program of Study

The required first-year calculus and Computer Science courses are offered each semester (except in summer). The Physics courses are offered sequentially, beginning each spring with PHYS 121.

Care should be taken, however, that one semester of calculus is completed before attempting the Physics sequence. It is recommended that students take courses in order. A programming language course should be taken as soon as possible because of its usefulness as a computational tool.

The mathematics major at Santa Barbara City College meets the accepted normal curriculum. However, transfer students are advised to review, in depth, the current catalogs of institutions to which they plan to transfer for additional course requirement information.

Because mathematics is such a precisely structured discipline, students who have not acquired adequate skills and understanding at one course level will find it most difficult to succeed in the next higher course. For this reason, an important part of the Mathematics Program at Santa Barbara City College is appropriate placement of students into classes to increase their chances of success in mastering course content.

The department uses a range of tests (and background information) to determine an entering student's mathematical preparation and "readiness" to attempt courses at the basic, precalculus or calculus levels. Mathematics placement examinations are administered at conveniently scheduled hours on a number of days throughout each semester.

Any student who has not been enrolled in a mathematics course at Santa Barbara City College is required to take an appropriate placement examination prior to registering for any math class, from Math 1 to 150. Transfer students who have satisfactorily completed an equivalent math course at another college should check for updated information in the Assessment Office.

Students are urged to take placement examinations as soon as possible so that they may make up deficiencies right away and enter the regular major's sequence without unnecessary delay.

Sample Program

The following suggested program is designed for Mathematics majors contemplating transfer to the University of California or California State University systems, or comparable institutions.

First Year
Fall Semester

MATH 150 — Calculus, with Analytic Geom I.......................5

CHEM 155* — General Chemistry I...................................5

ENG 110 — Composition & Reading *or*
 ENG 110H — Composition & Reading, Honors 3

CS 119 — FORTRAN Programming *or*...............................3
 CS 120 — Java Programming *or*...................................3
 CS 131 — Assembly Programming *or* 4
 CS 135 — Programming Fundamentals *or*....................3
 CS 137 — C Programming *or*..3
 CS 140 — C++ Programming *or*....................................4
 CS 160 — BASIC Programming *or*.................................3
 CS 170 — Ada Programming *or*......................................3
 CIS 209 — Visual Basic Programming.............................4

Spring Semester

MATH 160 — Calculus, with Analytic Geom II.....................5

CHEM 156* — General Chemistry II...................................5

ENG 111 — Critical Thinking Through Lit *or*
 ENG 111H — Critical Think Through Lit, Honors..............3

PHYS 121 — Mechanics of Solids & Fluids 5

Second Year
Fall Semester

MATH 200 — Multivariable Calculus 4

MATH 210 — Linear Algebra..4

Social Science/Humanities

Spring Semester

MATH 220 – Differential Equations 4

PHYS 122 — Electricity & Magnetism..................................5

Social Science/Humanities

American Institutions Requirements

*CHEM 155-156 is recommended for transfer students, but not required for the Associate Degree. Another elective course can be selected in its place.

Preparation for Transfer

Course requirements for transfer vary depending upon the college or university a student wishes to attend. Therefore, it is *most important* for a student to consult with his/her counselor and departmental adviser before planning an academic program for transfer. Information sheets for majors, outlining transfer requirements, are available in the Counseling Center and the Transfer Center.

College Requirements

For complete information, see "Graduation Requirements" in the *Catalog* Index.

Course Descriptions

MATH 001 — Basic Mathematics
(3) F, S

Basic math course, including place value, reading and writing numbers; arithmetic operations on whole numbers; fraction concepts and operations on fractions; decimal concepts an operations on decimals; ratio and proportion; percentage; U.S. and metric systems of measurement; numerical geometry; graph reading; operations on signed numbers. Application of arithmetic to everyday life (word problems) is emphasized throughout the course.

MATH 004 — Pre-Algebra
(3) F, S
Prerequisites: MATH 1 with a "C" or better or qualifying score on SBCC placement exam.

Introduction to algebra: signed numbers, exponents, roots, evaluation of algebraic expressions, simplification of algebraic expressions, translation from English to algebra, solution of linear equations.

MATH 074 — Pre-Algebra Refresher
(1) F, S, Summer

Short courses intended for those students who have assessed into Math 4 and wish to improve their assessment level; those who have successfully completed Math 4 but need more review; or students who unsuccessfully attempted Math 100 and need review of prealgebra skills. Features a computer program to refresh those concepts identified as needed for each student, plus weekly contact with the instructor. Successful completion of this course may serve as a petition to challenge Math 4. Course does not replace a failing grade in Math 4.

MATH 080 — Elementary Algebra Refresher
(1) F, S, Summer

Short course intended for those students who have assessed into Math 100 and wish to improve their assessment level; those who have successfully completed Math 100 but need more review; or students who unsuccessfully attempted Math 107 and need review of elementary algebra skills. Features a computer program to refresh those concepts identified as needed for each student, plus weekly contact with the instructor. Successful completion of this course may serve as a petition to challenge Math 100. Course does not replace a failing grade in Math 100.

MATH 087 — Intermediate Algebra Refresher
(1) F, S, Summer

Short course intended for those students who have assessed into Math 107 and wish to improve their assessment level; those who have successfully completed Math 107 but need more review; or students who unsuccessfully attempted Math 120 and need review of intermediate algebra skills. Features a computer program to refresh those concepts identified as needed for each student, plus weekly contact with the instructor. Successful completion of this course may serve as a petition to challenge Math 107. Course does not replace a failing grade in Math 107.

MATH 090 — Orientation to Mathematics Assessment
(0.2) F, S

Orientation to math assessment at SBCC. Four testing levels are reviewed. Discussion of test-taking strategies. Supervised practice testing in a test-like situation.

MATH 100 — Elementary Algebra
(5) F, S
Prerequisites: MATH 4 with a "C" or better or qualifying score on SBCC placement exam.
Skills Advisories: Eligibility for ENG 100 and ENG 103

Beginning algebra, similar to a standard first-year high school algebra course, including a review of signed numbers and their properties, equations and inequalities in one variable, graphing linear equations, systems in two variables, integer exponents, rational and polynomial expressions, quadratic equations, the quadratic formula, graphing parabolas.

MATH 100N — Study Skills in Mathematics
(1) F, S
Co-requisites: MATH 100
Skills Advisories: Eligibility for ENG 100 and 103

Topics designed to increase student success in mathematics. *Note: MATH 100N to be taken as a corequisite for a specified section of MATH 100. (See Schedule of Classes for the specific section).*

MATH 103 — Nursing and Allied Health Math
(3)
Prerequisites: MATH 4 with a minimum grade of "C" or better or qualifying score on SBCC placement exam

Designed for nursing and allied health professionals to focus on the math skills necessary to be successful in an allied health occupational area. After reviewing basic math skills and algebra concepts, students learn metric system conversions, and conversion among and between the metric, apothecary and household units of measure. The computational methods used in the preparation of oral medications, solutions, parenteral therapy and pediatric dosages are presented.

MATH 107 — Intermediate Algebra
(4) F, S
Prerequisites: MATH 100 with a "C" or better or qualifying score on SBCC placement exam.
Skills Advisories: Eligibility for ENG 100 and 103

Second course in algebra, including algebraic manipulation of polynomials, rational expressions, exponents, radicals, linear equations, ratio and proportion, inequalities, word problems, quadratic equations, systems of linear and quadratic equations and sequences. An introduction to functions and nonlinear equations. Exponential and logarithmic functions and their applications.

MATH 108 — Mathematics for Elementary Teachers
(4) F, S — CSU, UC
Prerequisites: MATH 107 or MATH 111 with a "C" or better or qualifying score on SBCC placement exam.
Skills Advisories: Eligibility for ENG 100 and ENG 103

Recommended for prospective and in-service elementary school teachers. Mathematical investigations involving sets, number sense, integers, rational numbers, and real numbers. (CAN MATH 4)

MATH 111 — Intermediate Algebra for Math, Science and Business Majors
(5) F, S
Prerequisites: MATH 100 with a "C" or better, or qualifying score on SBCC placement exam.
Skills Advisories: Eligibility for ENG 100 and ENG 103
Course Advisory: MATH 100 with a "B" or better.

Second course in algebra, including algebraic manipulation of polynomials, rational expressions, exponents, radicals, linear equations, ratio and proportion, inequalities, word problems, complex numbers, quadratic equations, and systems of linear and quadratic equations. Introduction to functions and nonlinear equations. Exponential and logarithmic functions and their applications. Introduction to graphing calculators.

MATH 117 — Elementary Statistics
(4) F, S — CSU, UC*
Prerequisites: MATH 107 or MATH 111 with a "C" or better or qualifying score on SBCC placement exam.
Skills Advisories: Eligibility for ENG 110 or ENG 110H

General education mathematics course. Introduction to design of experiments, descriptive statistics and sampling distributions, the Central Limit Theorem, statistical inference, confidence interval estimation and tests of hypotheses, correlation and linear regression, categorical variables and Chi-square distribution, one-way analysis of variance, and multiple comparisons procedure. *(*UC Transfer Limit: MATH 117, 117H and PSY 150 combined: maximum credit, one course)* (CAN STAT 2)

MATH 117H — Elementary Statistics, Honors
(4) — CSU, UC*
Prerequisites: MATH 107 or MATH 111 with a "C" or better or qualifying score on SBCC placement exam.
Skills Advisories: Eligibility for ENG 110 or ENG 110H
Limitation on Enrollment: Acceptance into the Honors Program

General education mathematics course. Introduction to design of experiments, descriptive statistics and sampling distributions, the Central Limit Theorem, statistical inference, confidence interval estimation and tests of hypotheses, correlation and linear regression, categorical variables and Chi-square distribution. One-way ANOVA, and multiple comparisons procedure. *(*UC Transfer Limit: MATH 117, 117H and PSY 150 combined: maximum credit, one course)* (CAN STAT 2)

MATH 120 — College Algebra
(4) — CSU, UC*
Prerequisites: MATH 107 or MATH 111 with a "C" or better or qualifying score on SBCC placement exam.
Skills Advisories: Eligibility for ENG 100 and ENG 103

Study of functions and their graphs, including polynomial, rational, exponential and logarithmic functions. Systems of equations and conics. *(*UC Transfer Limit: MATH 120, 137 and 138 combined: maximum credit, one course)* (CAN MATH 10)

MATH 130 — Calculus for Biological Sciences, Social Sciences and Business I
(5) F, S — CSU, UC*
Prerequisites: MATH 111 or 120 with a "C" or better or qualifying score on SBCC placement exam.
Skills Advisories: Eligibility for ENG 100 and ENG 103

Calculus of one variable, limits, continuity, differentiation, Riemann approximations, definite and indefinite integrals, introduction to integration techniques, exponential and logarithmic functions, curve-sketching, maxima/minima problems, related rates and applications. (CAN MATH 30 or CAN SEQ D [with MATH 131]) *(*UC Transfer Limit: MATH 130 and 131 combined with MATH 150 and 160: maximum credit, one series)*

MATH 131 — Calculus for Biological Sciences, Social Sciences and Business II
(3) S — CSU, UC*
Prerequisites: MATH 130 with a "C" or better
Skills Advisories: Eligibility for ENG 100 and ENG 103

Techniques of integration for single and multivariable calculus, functions of several variables, partial differentiation, maxima/minima problems, differential equations, and probability. Optional topics: infinite series, Taylor's Theorem and the calculus of trigonometric functions. (CAN MATH 32 or CAN SEQ D [with MATH 130]) *(*UC Transfer Limit: MATH 130 and 131 combined with MATH 150 and 160: maximum credit, one series)*

MATH 137 — Precalculus I - College Algebra and Functions
(5) F, S — CSU, UC*
Prerequisites: MATH 111 or MATH 120 with a "C" or better or qualifying score on SBCC placement exam
Skills Advisories: Eligibility for ENG 100 and ENG 103

Short review of intermediate algebra topics, extensive treatment of functions and graphing techniques including translations, symmetries, reflections and graphs of inverse functions. Identities and conditional equations. Analysis and applications of polynomial, rational, exponential and logarithmic functions. Solving linear and nonlinear systems, using matrix algebra, and roots of higher-degree polynomials. Logic and structure of proofs. *(*UC Transfer Limit: MATH 120, 137 and 138 combined: maximum credit, one course)*

Note: MATH 137/138 precalculus sequence is equivalent to the former 140/141 precalculus sequence. Students who have passed the 140/141 sequence may not enroll in the 137/138 sequence.

MATH 138 — Precalculus II - College Algebra and Trigonometry
(4) F, S — CSU, UC*
Prerequisites: MATH 137 with a "C" or better or qualifying score on SBCC placement exam
Skills Advisories: Eligibility for ENG 100 and ENG 103

Advanced algebra course emphasizing analysis, graphing and applications of trigonometric functions. Such functions are developed from circular functions. Trigonometric identities and conditional equations, as well as applications to triangles, vectors, complex numbers, parametric equations and polar coordinates. Additional topics include sequences, series and the Binomial Theorem. (CAN MATH 16) *(*UC Transfer Limit: MATH 120, 137 and 138 combined: maximum credit, one course)*

MATH 150 — Calculus with Analytic Geometry I
(5) F, S — CSU, UC*
Prerequisites: MATH 138 with a "C" or better or qualifying score on SBCC placement exam
Skills Advisories: Eligibility for ENG 100 and ENG 103

Limits, derivatives and integrals of algebraic, trigonometric, exponential and logarithmic functions. Differentials and applications of the derivative. Introduction to differential equations. *(*UC Transfer Limit: MATH 150 and 160 combined with MATH 130 and 131: maximum credit, one series)* (CAN MATH 18 or CAN MATH SEQ B [with MATH 160])

MATH 160 — Calculus with Analytic Geometry II
(5) F, S — CSU, UC*
Prerequisites: MATH 150 with a "C" or better
Skills Advisories: Eligibility for ENG 100 and ENG 103

Techniques of integration; applications of definite integrals; polar coordinates; sequences and infinite series; an introduction to differential equations and vectors. *(*UC Transfer Limit: MATH 150 and 160 combined with MATH 130 and 131: maximum credit, one series)* (CAN MATH 20 or CAN MATH SEQ B [with MATH 150])

MATH 199 — EMSE Labs for MATH 150
(1)
Co-requisites: MATH 150
Skills Advisories: Eligibility for ENG 100 and ENG 103

Optional course to accompany either the precalculus or the calculus course.

MATH 200 — Multivariable Calculus
(4) F, S — CSU, UC
Prerequisites: MATH 160 with a "C" or better.

Functions of several variables, multiple integrals and applications, partial differentiation and applications, calculus of vector functions, Green's Theorem, Stokes's Theorem, and three-dimensional analytic geometry using vectors.

MATH 210 — Linear Algebra
(4) F, S — CSU, UC
Prerequisites: MATH 160 with a "C" or better.

Finite dimensional vector spaces, linear independence, bases, systems of linear equations, linear transformations, matrices, change of bases, similarity of matrices, eigenvalues and eigenvectors, diagonalization, applications, quadratic forms, symmetric and orthogonal matrices, canonical forms, introduction to infinite dimensional vector spaces.

MATH 220 — Differential Equations
(4) F, S — CSU, UC
Prerequisites: MATH 200 with a "C" or better

Introductory course in the theory and applications of ordinary and partial differential equations. Topics include constant coefficient equations, series techniques, introduction to LaPlace Transforms, qualitative and quantitative solutions to linear and nonlinear systems of differential equations, and separable partial differential equations.

MATH 295 — Internship in Mathematics
(2-4) F, S — CSU
Prerequisites: MATH 107 or MATH 111 with a "C" or better or qualifying score on SBCC placement exam.
Skills Advisories: Eligibility for ENG 110 or ENG 110H
Limitation on Enrollment: Completion of two courses in the Mathematics Department at SBCC prior to enrolling in an internship course.
Five to 10 hours weekly on-the-job experience.

Structured internship program in which students gain experience in community organizations related to the discipline.