BACHELOR OF SCIENCE IN APPLIED MATHEMATICS

The primary aim of applied mathematics is to elucidate scientific concepts and to describe and predict phenomena through the use of mathematics. The applied mathematician is at once a mathematical specialist and a systems analyst whose task is to confront complex real-world problems with mathematical analysis. In business and industry, the applied mathematician has opportunities to utilize both background and training in solving problems of a practical nature. To do so, one must know the mathematical theories involved and have an appreciation for the specific science or technology that provides the source of the problem. CR/NC grades are not acceptable in courses to be counted for a mathematics major or minor program.

Program Learning Outcomes

Upon completion of the Bachelor of Science in Applied Mathematics a student will be able to:

- a. develop basic programming skills and use of various software such as Mathematica, Matlab, SAS, and R; apply these skills to solve problems in optimization, applied linear algebra, differential equations, and statistical inference.
- b. formulate and analyze mathematical conjectures, construct proofs in sound mathematical English, and use these skills to write proofs of statements in linear algebra, abstract algebra, and analysis.
- c. develop practical insights in modeling real-world phenomena using a model toolbox of (partial) differential equations, optimization, applied analysis and linear algebra, and use numerical methods to obtain solutions in probing such models.
- d. communicate effectively to a variety of audiences using oral, written, and visual modes.

Applied Mathematics (B.S.) – 55 units

Required Courses (40 units)

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>MATH 226</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>MATH 227</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>MATH 228</td>
<td>Calculus III</td>
<td>4</td>
</tr>
<tr>
<td>MATH 301GW</td>
<td>Exploration and Proof - GWAR</td>
<td>3</td>
</tr>
<tr>
<td>Select One:</td>
<td>Mathematical Computing</td>
<td>3</td>
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- MATH 309 Mathematical Computing
- CSC 210 Introduction to Computer Programming
- CSC 215 Intermediate Computer Programming
- CSC 309 Computer Programming

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<tr>
<td>MATH 325</td>
<td>Linear Algebra</td>
<td>4</td>
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<tr>
<td>Select One:</td>
<td>Modern Algebra</td>
<td>3</td>
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- MATH 335 Modern Algebra
- MATH 370 Real Analysis I
- MATH 380 Introduction to Complex Analysis

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<tr>
<td>MATH 400</td>
<td>Numerical Analysis</td>
<td>3</td>
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<tr>
<td>MATH 440</td>
<td>Probability and Statistics I</td>
<td>3</td>
</tr>
<tr>
<td>MATH 460</td>
<td>Mathematical Modeling</td>
<td>3</td>
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Optional Courses (15 units)

Select six units of the following:

- MATH 430 Mathematics of Optimization
- MATH 442 Probability Models
- MATH 447 Design and Analysis of Experiments
- MATH 448 Introduction to Statistical Learning and Data Mining
- MATH 449 Categorical Data Analysis
- MATH 471 Fourier Analysis and Applications
- MATH 477 Partial Differential Equations
- MATH 491 Game Theory
- MATH 495 Introduction to Wavelets and Frames with Applications

A coherent collection of three courses emphasizing applications of mathematics, chosen with the consent of the applied mathematics advisor

SF State Studies

Courses certified as meeting the SF State Studies requirements may be upper or lower division in General Education (GE), a major or minor, or an elective.
American Ethnic and Racial Minorities | LD or UD | 3 | AERM
Environmental Sustainability | LD or UD | 3 | ES
Global Perspectives | LD or UD | 3 | GP
Social Justice | LD or UD | 3 | SJ

Note: LD = Lower-Division; UD = Upper-Division.

First-Time Student Roadmap (4 Year)

a. The roadmaps presented in this Bulletin are intended as suggested plans of study and do not replace meeting with an advisor. For a more personalized roadmap, please use the Degree Planner (https://registrar.sfsu.edu/degreeplanner) tool found in your Student Center.
b. In order to choose your English Composition A2 course and your QR/Math B4 course, please complete the online advising activities at writingadvising.sfsu.edu (https://writingadvising.sfsu.edu) and mathadvising.sfsu.edu. Questions? Contact Gator Smart Start (https://gatorsmartstart.sfsu.edu).

First-Time Student Roadmap (http://bulletin.sfsu.edu/colleges/science-engineering/mathematics/bs-applied-mathematics/roadmap-i-ii-eng/)

Transfer Student Roadmap (2 Year)

For students with an AS-T in Mathematics.
MATH ADT Roadmap (http://bulletin.sfsu.edu/colleges/science-engineering/mathematics/bs-applied-mathematics/adt-roadmap/)

This degree program is an approved pathway (“similar” major) for students earning the ADT in Applied Mathematics

California legislation SB 1440 (2009) mandated the creation of the Associate Degree for Transfer (ADT) to be awarded by the California Community Colleges. Two types of ADTs are awarded: Associate in Arts for Transfer (AA-T) and Associate in Science for Transfer (AS-T).

Note: no specific degree is required for admission as an upper-division student. However, the ADT includes specific guarantees related to admission and graduation and is designed to clarify the transfer process and strengthen lower-division preparation for the major.

An ADT totals 60 units and in most cases includes completion of all lower-division General Education requirements and at least 18 units in a specific major. (The Biology, Chemistry, and Environmental Science AS-T degrees defer 3 units in lower-division GE area C and 3 units in lower-division GE area D until after transfer.) Students pursuing an ADT are guaranteed admission to the CSU if minimum eligibility requirements are met, though not necessarily to the CSU campus of primary choice.

Upon verification that the ADT has been awarded prior to matriculation at SF State, students are guaranteed B.A. or B.S. completion in 60 units if pursuing a “similar” major after transfer. Determinations about “similar” majors at SF State are made by faculty in the discipline.

Degree completion in 60 units cannot be guaranteed when a student simultaneously pursues an additional major, a minor, certificate, or credential.

A sample advising roadmap for students who have earned an ADT and continue in a “similar” major at SF State is available on the Roadmaps tab on the degree requirements page for the major. The roadmap displays:

- How many lower-division units required for the major have been completed upon entry based on the award of a specific ADT;
- Which lower-division requirements are considered complete upon entry based on the award of a specific ADT;
- How to complete the remaining 60 units for the degree in four semesters.

Students who have earned an ADT should seek advising in the major department during the first semester of attendance.

General Advising Information for Transfer Students

a. Before transfer, complete as many lower-division requirements or electives for this major as possible.
b. The following courses are not required for admission but are required for graduation. Students are strongly encouraged to complete these units before transfer; doing so will provide more flexibility in course selection after transfer.

- a course in U.S. History
- a course in U.S. & California Government

For information about satisfying the requirements described in (1) and (2) above at a California Community College (CCC), please visit http://www.assist.org (http://assist.org). Check any geographically accessible CCCs; sometimes options include more than one college. Use ASSIST to determine:

- Which courses at a CCC satisfy any lower-division major requirements for this major;

Remedial courses are not transferable and do not apply to the minimum 60 semester units/90 quarter units required for admission.

Additional units for courses that are repeated do not apply to the minimum 60 units required for upper-division transfer (for example, if a course was not passed on the first attempt or was taken to earn a better grade).

Before leaving the last California Community College of attendance, obtain a summary of completion of lower-division General Education units (IGETC or CSU GE Breadth). This is often referred to as a GE certification worksheet. SF State does not require delivery of this certification to Admissions, but students should retain this document for verifying degree progress after transfer.

Credit for Advanced Placement, International Baccalaureate, or College-Level Examination Program courses: AP/IB/CLEP credit is not automatically transferred from the previous institution. Units are transferred only when an official score report is delivered to SF State. Credit is based on the academic year during which exams were taken. Refer to the University Bulletin in effect during the year of AP/IB/CLEP examination(s) for details regarding the award of credit for AP/IB/CLEP.

Students pursuing majors in science, technology, engineering, and mathematics (STEM) disciplines often defer 6-9 units of lower-division General Education in Areas C and D until after transfer to focus on
preparation courses for the major. This advice does not apply to students pursuing associate degree completion before transfer.

**Transferring From Institutions Other Than CCCs or CSUs**

Review SF State’s lower-division General Education requirements. Note that, as described below, the four basic skills courses required for admission meet A1, A2, A3, and B4 in the SF State GE pattern. Courses that fulfill the remaining areas of SF State’s lower-division GE pattern are available at most two-year and four-year colleges and universities.

Of the four required basic skills courses, a course in critical thinking (A3) may not be widely offered outside the CCC and CSU systems. Students should attempt to identify and take an appropriate course no later than the term of application to the CSU. To review more information about the A3 requirement, please visit bulletin.sfsu.edu/undergraduate-education/general-education/lower-division/#AAEL.

Waiting until after transfer to take a single course at SF State that meets both US and CA/local government requirements may be an appropriate option, particularly if transferring from outside of California.