

BA IN MATHEMATICS

Units required for BA: 48-54

Total units required for BA: 120

Program Description

The mathematics bachelor's degree provides students with a firm foundation in mathematics. Mathematics is a discipline that studies patterns, numbers, shapes, structures, and their relationships. It is fundamental for making sense of the world around us, providing a precise and systematic framework for logical reasoning, modeling, and problem-solving. Mathematics plays a crucial role in advancing human knowledge, serving as the language of science and the foundation of many other disciplines such as statistics, computer science, and engineering.

All mathematics majors complete the same core coursework, and then select an area of emphasis. The applied emphasis and the statistics emphasis provide a strong background for students interested in pursuing quantitative careers in industry, government, or academia. The pure emphasis prepares students to pursue higher-level degrees in mathematics. The teacher preparation emphasis prepares students to teach mathematics at the middle or high school level.

Admission Requirements

All students planning to take MATH 30, Calculus I, must first satisfy one of the following criteria.

- Receive a score of 3 on the Calculus AB AP Exam.
- Receive a C- or better in Math 29 (or equivalent).
- Receive a score of 76+ on an ALEKS PPL proctored exam.

For more information about ALEKS PPL and placement into mathematics and statistics courses visit the department website (<https://www.csus.edu/math> (<https://www.csus.edu/math/>)).

Minimum Grade Requirements

- Prerequisites must be completed with grade "C-" or better.
- Grade "C-" or better required in all courses applied to Mathematics major or to the Mathematics or Statistics minors.

Recommended Coursework

- PHYS 11A and PHYS 11C are recommended for all Mathematics majors.

Program Requirements

Code	Title	Units
Lower Division Core Courses (21 Units)		
MATH 30	Calculus I ¹	4
MATH 31	Calculus II ¹	4
MATH 32	Calculus III	4
MATH 35	Introduction to Linear Algebra	3
MATH 45	Differential Equations for Science and Engineering	3
Select one of the following:		3
MATH 64	Mathematical Programming	
CSC 10	Introduction to Programming Logic	
CSC 15	Programming Concepts and Methodology I	
CSC 22	Visual Programming in BASIC	
CSC 25	Introduction to C Programming	

Upper Division Core Courses (15 Units)

MATH 108	Introduction to Formal Mathematics	3
MATH 110A	Modern Algebra	3
MATH 110B	Modern Algebra	3
MATH 130A	Functions of a Real Variable	3
MATH 130B	Functions of a Real Variable	3

Additional Requirements for Specialized Study (12-18 Units)

Select an emphasis from the following four options:	12
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	18
Emphasis in Pure Mathematics	
Emphasis in Applied Mathematics	
Emphasis in Statistics	
Teacher Preparation Program	

Total Units **48-54**

¹ Course also satisfies General Education (GE)/Graduation Requirement.

Emphasis in Pure Mathematics

Code	Title	Units
MATH 117	Linear Algebra	3
MATH 134	Functions of a Complex Variable and Applications	3

Select two of the following: 6 - 11

MATH 101	Combinatorics	
MATH 102	Number Theory	
MATH 104	Vector Analysis	
MATH 105A	Advanced Mathematics for Science and Engineering I	
MATH 105B	Advanced Mathematics for Science and Engineering II	
MATH 121	College Geometry	
MATH 150	Introduction to Numerical Analysis	
MATH 161	Mathematical Logic	
MATH 162	Set Theory	
MATH 170	Linear Programming	
MATH 190	History Of Mathematics	
STAT 115A	Introduction to Probability Theory ¹	
STAT 115B	Introduction to Mathematical Statistics ¹	

Total Units **12-17**

¹ Has an extra prerequisite that is not in the lower or upper division core.

Emphasis in Applied Mathematics

Code	Title	Units
MATH 105A	Advanced Mathematics for Science and Engineering I	4
MATH 105B	Advanced Mathematics for Science and Engineering II	4

Select two of the following: 6 - 10

MATH 101	Combinatorics	
MATH 102	Number Theory	

MATH 104	Vector Analysis	
MATH 117	Linear Algebra	
MATH 134	Functions of a Complex Variable and Applications	
MATH 150	Introduction to Numerical Analysis	
MATH 170	Linear Programming	
STAT 115A	Introduction to Probability Theory ¹	
STAT 115B	Introduction to Mathematical Statistics ¹	
STAT 128	Statistical Computing	
STAT 129	Analyzing and Processing Big Data	
STAT 155	Introduction to Techniques of Operations Research ¹	
Total Units		14-18

¹ Has an extra prerequisite that is not in the lower or upper division core.

Emphasis in Statistics

Code	Title	Units
STAT 1	Introduction to Statistics	3 - 4
or STAT 50	Introduction to Probability and Statistics	
STAT 115A	Introduction to Probability Theory	3
STAT 115B	Introduction to Mathematical Statistics	3
Select two of the following:		6
MATH 101	Combinatorics	
MATH 117	Linear Algebra	
MATH 134	Functions of a Complex Variable and Applications	
MATH 150	Introduction to Numerical Analysis	
MATH 170	Linear Programming	
STAT 128	Statistical Computing	
STAT 129	Analyzing and Processing Big Data	
STAT 155	Introduction to Techniques of Operations Research	
Total Units		15-16

Emphasis in Teacher Preparation

Code	Title	Units
STAT 1	Introduction to Statistics	3
MATH 102	Number Theory	3
MATH 121	College Geometry	3
MATH 190	History Of Mathematics	3
MATH 193	Capstone Course for the Teaching Credential Candidate	3
Total Units		15

General Education Requirements ¹

Code	Title	Units
Area A: Basic Subjects (9 Units)		
A1	Oral Communication	3
A2	Written Communication	3
A3	Critical Thinking	3
Area B: Physical Universe and Its Life Forms (10 Units)		
B1	Physical Science	3
B2	Life Forms	3

B3 - Lab (Note: Lab experience to be taken with one of the following: B1, B2 or B5)	1
B4 - Math Concepts ²	0
B5 - Additional Course (Any B to reach 12 units) - Take upper-division course to complete Area & upper division requirements.	3

Area C: Arts and Humanities (12 Units)

C1 - Arts	3
C2 - Humanities	3
C1/C2 - Area C Course	3
C1/C2 - Area C Course - Take upper-division course to complete Area & upper division requirements.	3

Area D: The Individual and Society (9 Units)

Area D Course	3
Area D Course	3
Area D Course - Take upper-division course to complete Area & upper division requirements.	3

Area E: Understanding Personal Development (3 Units)

Area E Course	3
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Area F: Ethnic Studies (3 Units)

Area F Course	3
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Total Units **46**

¹ To help you complete your degree in a timely manner and not take more units than absolutely necessary, there are ways to use single courses to meet more than one requirement (overlap). For further information, please visit the General Education page (<https://catalog.csus.edu/colleges/academic-affairs/general-education/>).

Note: There is no way to list all possible overlaps so please consult with a professional advisor. The Academic Advising Center can be visited online (<http://www.csus.edu/acad/>), by phone (916) 278-1000, or email (advising@csus.edu).

² Required in Major; also satisfies GE.

Graduation Requirements ¹

Code	Title	Units
Graduation Requirements (required by CSU) (9 Units)		
American Institutions: U.S. History		3
American Institutions: U.S. Constitution & CA Government		3
Writing Intensive (WI)		3
Graduation Requirements (required by Sacramento State) (12 Units)		
English Composition II		3
Race and Ethnicity in American Society (RE)		3
Foreign Language Proficiency Requirement ²		6

¹ To help you complete your degree in a timely manner and not take more units than absolutely necessary, there are ways to use single courses to meet more than one requirement (overlap). For further information, please visit the General Education page (<https://catalog.csus.edu/colleges/academic-affairs/general-education/>).

Note: There is no way to list all possible overlaps so please consult with a professional advisor. The Academic Advising Center can be visited online (<http://www.csus.edu/acad/>), by phone (916) 278-1000, or email (advising@csus.edu).

² If not satisfied before entering Sacramento State, it may be satisfied in General Education Area C2 (Humanities). "C- or better required." The alternative methods for satisfying the Foreign Language Proficiency

Requirement are described here: <https://www.csus.edu/college/arts-letters/world-languages-literatures/foreign-language-requirement.html>

The following roadmaps are sample planning resources. Please consult your academic advisor and Academic Catalog for graduation requirements as you develop your individualized academic plan.

Mathematics (Emphasis in Pure Mathematics), BA: 4-Year Roadmap

Course	Title	Units
Year 1		
First Semester		
MATH 30	Calculus I	4
GE Area 1A - English Composition ²		3
GE Area 1C - Oral Communication ²		3
GE Area 3A - Arts ²		3
Elective of Choice		3
Units		16
Second Semester		
MATH 31	Calculus II	4
MATH 64 or CSC 10 or CSC 15 or CSC 22 or CSC 25	Mathematical Programming ³ or Introduction to Programming Logic or Programming Concepts and Methodology I or Visual Programming in BASIC or Introduction to C Programming	3
GE Area 1B - Critical Thinking ²		3
GE Area 5B - Biological Science ²		3
GE Area 6 - Ethnic Studies ²		3
Units		16
Year 2		
First Semester		
MATH 32	Calculus III	4
MATH 35	Introduction to Linear Algebra	3
GE Area 4 - Social & Behavioral Sciences ²		3
Foreign Language Semester 1 ²		4
Units		14
Second Semester		
ENGL 20	College Composition II	3
MATH 45	Differential Equations for Science and Engineering	3
MATH 108	Introduction to Formal Mathematics	3
Foreign Language Semester 2 ²		4
Elective of Choice		3
Units		16
Year 3		
First Semester		
MATH 110A	Modern Algebra	3
Pure Mathematics Elective ³		3
Upper Division GE Area 4 - Social & Behavioral Sciences + Writing Intensive ²		3
Upper Division GE Area 5 or 2 - Science or Mathematical Concepts/Quantitative Reasoning ²		3
Elective of Choice		3
Units		15
Second Semester		
MATH 110B	Modern Algebra	3
Pure Mathematics Elective ³		3
GE Area 5A - Physical Science ²		3

GE Area 5C - Laboratory ²		1
GR American Institutions (GOVT) ²		3
Elective of Choice		3
Units		16
Year 4		
First Semester		
MATH 130A	Functions of a Real Variable	3
MATH 117 or MATH 134	Linear Algebra ³ or Functions of a Complex Variable and Applications	3
Upper Division GE Area 3 - Arts or Humanities ²		3
GR American Institutions (US History) ²		3
Elective of Choice		3
Units		15
Second Semester		
MATH 130B	Functions of a Real Variable	3
MATH 134 or MATH 117	Functions of a Complex Variable and Applications ³ or Linear Algebra	3
GE Area 3B - Humanities ²		3
Upper Division Elective		3
Units		12
Total Units		120

Mathematics (Emphasis in Pure Mathematics), BA: 2-Year Roadmap

Course	Title	Units
Year 1		
First Semester		
MATH 108	Introduction to Formal Mathematics	3
MATH 110A	Modern Algebra	3
Pure Mathematics Elective ³		3
Upper Division GE Area 5 or 2 - Science or Mathematical Concepts/Quantitative Reasoning ²		3
Elective of Choice		3
Units		15
Second Semester		
MATH 110B	Modern Algebra	3
Pure Mathematics Elective ³		3
Upper Division GE Area 3 - Arts or Humanities ²		3
GR American Institutions (GOVT) ²		3
Upper Division Elective		3
Units		15
Year 2		
First Semester		
MATH 117 or MATH 134	Linear Algebra ³ or Functions of a Complex Variable and Applications	3
MATH 130A	Functions of a Real Variable	3
GR American Institutions (US History) ²		3
Foreign Language Semester 1 ²		4
Elective of Choice		3
Units		16
Second Semester		
MATH 130B	Functions of a Real Variable	3
MATH 134 or MATH 117	Functions of a Complex Variable and Applications ³ or Linear Algebra	3
Upper Division GE Area 4 - Social & Behavioral Sciences + Writing Intensive ²		3
Foreign Language Semester 2 ²		4

Elective of Choice	3
Units	16
Total Units	62

Mathematics (Emphasis in Applied Mathematics), BA: 4-Year Roadmap

Course	Title	Units
Year 1		
First Semester		
MATH 30	Calculus I	4
GE Area 1A - English Composition ²		3
GE Area 1C - Oral Communication ²		3
GE Area 3A - Arts ²		3
Elective of Choice		3
Units		16
Second Semester		
MATH 31	Calculus II	4
MATH 64 or CSC 10 or CSC 15 or CSC 22 or CSC 25	Mathematical Programming ³ or Introduction to Programming Logic or Programming Concepts and Methodology I or Visual Programming in BASIC or Introduction to C Programming	3
GE Area 1B - Critical Thinking ²		3
GE Area 5B - Biological Science ²		3
GE Area 6 - Ethnic Studies ²		3
Units		16
Year 2		
First Semester		
MATH 32	Calculus III	4
MATH 35	Introduction to Linear Algebra	3
GE Area 4 - Social & Behavioral Sciences ²		3
Foreign Language Semester 1 ²		4
Units		14
Second Semester		
ENGL 20	College Composition II	3
MATH 45	Differential Equations for Science and Engineering	3
MATH 108	Introduction to Formal Mathematics	3
Foreign Language Semester 2 ²		4
Elective of Choice		3
Units		16
Year 3		
First Semester		
MATH 105A	Advanced Mathematics for Science and Engineering I	4
MATH 110A	Modern Algebra	3
Upper Division GE Area 4 - Social & Behavioral Sciences + Writing Intensive ²		3
Upper Division GE Area 5 or 2 - Science or Mathematical Concepts/Quantitative Reasoning ²		3
Elective of Choice		3
Units		16
Second Semester		
MATH 105B	Advanced Mathematics for Science and Engineering II	4
MATH 110B	Modern Algebra	3
Upper Division GE Area 3 - Arts or Humanities ²		3
GE Area 5A - Physical Science ²		3

GE Area 5C - Laboratory ²	1
Units	14

Year 4

First Semester

MATH 130A	Functions of a Real Variable	3
Applied Mathematics Elective ³		3
GE Area 3B - Humanities ²		3
GR American Institutions (GOVT) ²		3
Elective of Choice		3
Units		15

Second Semester

MATH 130B	Functions of a Real Variable	3
Applied Mathematics Elective ³		3
GR American Institutions (US History) ²		3
Upper Division Elective		3
Elective of Choice		3
Units		15
Total Units		122

Mathematics (Emphasis in Applied Mathematics), BA: 2- Year Roadmap

Course	Title	Units
Year 1		
First Semester		
MATH 108	Introduction to Formal Mathematics	3
MATH 105A	Advanced Mathematics for Science and Engineering I	4
MATH 110A	Modern Algebra	3
Upper Division GE Area 5 or 2 - Science or Mathematical Concepts/Quantitative Reasoning ²		3
Elective of Choice		3
Units		16
Second Semester		
MATH 105B	Advanced Mathematics for Science and Engineering II	4
MATH 110B	Modern Algebra	3
Upper Division GE Area 3 - Arts or Humanities ²		3
GR American Institutions (GOVT) ²		3
Elective of Choice		3
Units		16
Year 2		
First Semester		
MATH 130A	Functions of a Real Variable	3
Applied Mathematics Elective ³		3
Upper Division GE Area 4 - Social & Behavioral Sciences + Writing Intensive ²		3
Foreign Language Semester 1 ²		4
Upper Division Elective		3
Units		16
Second Semester		
MATH 130B	Functions of a Real Variable	3
Applied Mathematics Elective ³		3
GR American Institutions (US History) ²		3
Foreign Language Semester 2 ²		4
Elective of Choice		3
Units		16
Total Units		64

Mathematics (Emphasis in Statistics), BA: 4-Year Roadmap

Course	Title	Units
Year 1		
First Semester		
MATH 30	Calculus I	4
GE Area 1A - English Composition ²		3
GE Area 1C - Oral Communication ²		3
GE Area 3A - Arts ²		3
Elective of Choice		3
Units		16
Second Semester		
MATH 31	Calculus II	4
STAT 1 or STAT 50	Introduction to Statistics ³ or Introduction to Probability and Statistics	3 - 4
GE Area 1B - Critical Thinking ²		3
GE Area 5B - Biological Science ²		3
GE Area 6 - Ethnic Studies ²		3
Units		16-17
Year 2		
First Semester		
MATH 32	Calculus III	4
MATH 35	Introduction to Linear Algebra	3
MATH 64 or CSC 10 or CSC 15 or CSC 22 or CSC 25	Mathematical Programming ³ or Introduction to Programming Logic or Programming Concepts and Methodology I or Visual Programming in BASIC or Introduction to C Programming	3
Foreign Language Semester 1 ²		4
Units		14
Second Semester		
ENGL 20	College Composition II	3
MATH 45	Differential Equations for Science and Engineering	3
MATH 108	Introduction to Formal Mathematics	3
GE Area 3B - Humanities ²		3
Foreign Language Semester 2 ²		4
Units		16
Year 3		
First Semester		
MATH 110A	Modern Algebra	3
STAT 115A	Introduction to Probability Theory	3
Upper Division GE Area 4 - Social & Behavioral Sciences + Writing Intensive ²		3
Upper Division GE Area 5 or 2 - Science or Mathematical Concepts/Quantitative Reasoning ²		3
GE Area 4 - Social & Behavioral Sciences ²		3
Units		15
Second Semester		
MATH 110B	Modern Algebra	3
STAT 115B	Introduction to Mathematical Statistics	3
GE Area 5A - Physical Science ²		3
GE Area 5C - Laboratory ²		1
GR American Institutions (GOVT) ²		3
Elective of Choice		3
Units		16

Year 4

First Semester		
MATH 130A	Functions of a Real Variable	3
Statistics Elective ³		3
GR American Institutions (US History) ²		3
Upper Division Elective		3
Elective of Choice		3
Units		15
Second Semester		
MATH 130B	Functions of a Real Variable	3
Statistics Elective ³		3
Upper Division GE Area 3 - Arts or Humanities ²		3
Upper Division Elective		3
Elective of Choice		3
Units		15
Total Units		123-124

Mathematics (Emphasis in Statistics), BA: 2-Year Roadmap

Course	Title	Units
Year 1		
First Semester		
MATH 108	Introduction to Formal Mathematics	3
MATH 110A	Modern Algebra	3
STAT 115A	Introduction to Probability Theory	3
Upper Division GE Area 5 or 2 - Science or Mathematical Concepts/Quantitative Reasoning ²		3
GR American Institutions (US History) ²		3
Units		15
Second Semester		
MATH 110B	Modern Algebra	3
STAT 115B	Introduction to Mathematical Statistics	3
Upper Division GE Area 3 - Arts or Humanities + Writing Intensive ²		3
GR American Institutions (GOVT) ²		3
Elective of Choice		3
Units		15
Year 2		
First Semester		
MATH 130A	Functions of a Real Variable	3
Statistics Elective ³		3
Upper Division GE Area 4 - Social & Behavioral Sciences ²		3
Foreign Language Semester 1 ²		4
Elective of Choice		3
Units		16
Second Semester		
MATH 130B	Functions of a Real Variable	3
Statistics Elective ³		3
Foreign Language Semester 2 ²		4
Upper Division Elective		3
Elective of Choice		3
Units		16
Total Units		62

Mathematics (Emphasis in Teacher Preparation), BA: 4-Year Roadmap

Course	Title	Units
Year 1		
First Semester		
MATH 30	Calculus I	4
GE Area 1A - English Composition ²		3
GE Area 1C - Oral Communication ²		3
GE Area 3A - Arts ²		3
Elective of Choice		3
Units		16
Second Semester		
MATH 31	Calculus II	4
STAT 1	Introduction to Statistics	3
GE Area 1B - Critical Thinking ²		3
GE Area 5B - Biological Science ²		3
GE Area 6 - Ethnic Studies ²		3
Units		16
Year 2		
First Semester		
MATH 32	Calculus III	4
MATH 35	Introduction to Linear Algebra	3
MATH 64	Mathematical Programming ³	3
or CSC 10 or CSC 15 or CSC 22 or CSC 25	or Introduction to Programming Logic or Programming Concepts and Methodology I or Visual Programming in BASIC or Introduction to C Programming	
Foreign Language Semester 1 ²		4
Units		14
Second Semester		
ENGL 20	College Composition II	3
MATH 45	Differential Equations for Science and Engineering	3
MATH 108	Introduction to Formal Mathematics	3
GE Area 3B - Humanities ²		3
Foreign Language Semester 2 ²		4
Units		16
Year 3		
First Semester		
MATH 102	Number Theory	3
MATH 110A	Modern Algebra	3
Upper Division GE Area 5 or 2 - Science or Mathematical Concepts/Quantitative Reasoning ²		3
GE Area 5A - Physical Science ²		3
GE Area 5C - Laboratory ²		1
Elective of Choice		3
Units		16
Second Semester		
MATH 110B	Modern Algebra	3
MATH 121	College Geometry	3
Upper Division GE Area 4 - Social & Behavioral Sciences ²		3
GE Area 4 - Social & Behavioral Sciences ²		3
GR American Institutions (GOVT) ²		3
Units		15
Year 4		
First Semester		
MATH 130A	Functions of a Real Variable	3
MATH 190	History Of Mathematics	3

GR American Institutions (US History) ²	3	
Upper Division Elective	3	
Elective of Choice	3	
Units		
15		
Second Semester		
MATH 130B	Functions of a Real Variable	3
MATH 193	Capstone Course for the Teaching Credential Candidate	3
Upper Division GE Area 3 - Arts or Humanities + Writing Intensive ²	3	
Elective of Choice	3	
Elective of Choice	3	
Units		
15		
Total Units		
123		

Mathematics (Emphasis in Teacher Preparation), BA: 2-Year Roadmap

Course	Title	Units
Year 1		
First Semester		
MATH 102	Number Theory	3
MATH 108	Introduction to Formal Mathematics	3
MATH 110A	Modern Algebra	3
Upper Division GE Area 5 or 2 - Science or Mathematical Concepts/Quantitative Reasoning ²		3
Elective of Choice		3
Units		15
Second Semester		
MATH 110B	Modern Algebra	3
MATH 121	College Geometry	3
Upper Division GE Area 3 - Arts or Humanities + Writing Intensive ²		3
GR American Institutions (US History) ²		3
Upper Division Elective		3
Units		15
Year 2		
First Semester		
MATH 130A	Functions of a Real Variable	3
MATH 190	History Of Mathematics	3
Upper Division GE Area 4 - Social & Behavioral Sciences ²		3
Foreign Language Semester 1 ²		4
Elective of Choice		3
Units		16
Second Semester		
MATH 130B	Functions of a Real Variable	3
MATH 193	Capstone Course for the Teaching Credential Candidate	3
GR American Institutions (US History) ²		3
Foreign Language Semester 2 ²		4
Elective of Choice		3
Units		16
Total Units		62

- Any course not completed in the first semester should be taken in the second or a later semester.
- Please see General Education/Graduation Requirement **course options** (https://www.csus.edu/academic-affairs/curriculum-%20workflow/_internal/_documents/program-road-maps/als_2yr/art_transfer-%20roadmap-2024-25.pdf).
- Please see an academic advisor for elective options.