MATHEMATICS, BACHELOR OF SCIENCE

Minor Requirements

No minor is required.

Major Requirements (60-66 units)

Students must select one of the options listed below. The following courses, or their approved transfer equivalents, are required of all candidates for this degree. All courses used to satisfy this major must be passed with a grade of "C" or better.

Core Requirements (35 units)

Code	Title	Hours
Lower Division Required Courses		
MAT 191	Calculus I	5
MAT 193	Calculus II	5
MAT 211	Calculus III	5
MAT 247	Elements of Linear Algebra	3
MAT 271	Foundations Of Higher Math	3
MAT 281	Discrete Mathematics	3
PHY 130	General Physics I	5
Upper Division Required Courses		
MAT 331	Linear Algebra	3
MAT 401	Advanced Analysis I	3
Total Hours		**35**

Data Science Option (25 units)

Code	Title	Hours
Required Courses		
CSC 121	Introduction to Computer Science and Programming I	4
MAT 321	Probability and Statistics	3
MAT 323	Statistical Inference	3
MAT 327	Introduction to Machine Learning with Software	3
MAT 417	Math Methods for Data Science	3
Electives		**9**
MAT 311	Differential Equations	
MAT 315	Introduction to Survival Analysis	
MAT 411	Mathematical Modeling	
MAT 415	Financial Mathematics	
MAT 448	Cryptography	
MAT 460	Graph Theory and Algorithms	
Total Hours		**25**

Mathematics Education Option (31 units)

This option will satisfy the subject matter preparation necessary for a secondary teaching credential in mathematics. Students do not get Subject Matter Preparation on their diploma; the diploma says Mathematics Education option.

Code	Title	Hours
Lower Division Required Courses		
MAT 131	Elementary Statistics and Probability	3
MAT 143	Problem Solving in Mathematics	3
MAT 241	Programming and Technology for Teaching Secondary School Mathematics	3
Upper Division Required Courses		
MAT 333	Abstract Algebra	3
MAT 347	Modern Geometry	3
MAT 443	History Of Mathematics	3
MAT 489	Fundamental Mathematics and Teaching in Secondary Schools	4
MAT 490	Seminar in Mathematics Education	3
Electives		
A. Select one of the following		**3**
MAT 447	Number Theory	
MAT 448	Cryptography	
B. Select an upper division mathematics modeling or statistics course approved by a mathematics advisor.		**3**
Total Hours		**31**

Mathematics Option (25 units)

Code	Title	Hours
Lower Division Required Courses		
CSC 121	Introduction to Computer Science and Programming I	4
Upper Division Required Courses		
MAT 321	Probability and Statistics	3
MAT 333	Abstract Algebra	3
MAT 403	Advanced Analysis II	3
MAT 421	Complex Analysis	3
Electives		
A. Select one of the following (3)		**3**
MAT 447	Number Theory	
MAT 448	Cryptography	
B. Select two upper division mathematical modeling or statistics courses approved by a mathematics advisor (6)		**6**
Total Hours		**25**

Requirements

Total Course Requirements for the Bachelor's Degree

See the "Requirements for the Bachelor's Degree (https://catalog.csudh.edu/general-information/baccalaureate-degrees-undergraduate-studies/)" in the University Catalog for complete details on general degree requirements. A minimum of 40 units, including those required for the major, must be upper division.

Elective Requirements

Completion of elective courses (beyond the requirements listed below) to reach a total of a minimum of 120 units.

General Education Requirements (43 units)

See the "General Education (https://catalog.csudh.edu/general-education/)" requirements in the University Catalog or the Class Schedule for the most current information on General Education requirements and course offerings.

Graduation Writing Assessment Requirement (3 Units)

See the "Graduation Writing Assessment Requirement (https://catalog.csudh.edu/general-information/baccalaureate-degrees-

undergraduate-studies/gwar-certifying-courses/)" section in the University Catalog.

Statutory Requirements: United States History, Constitution and American Ideals (6 Units)

See the "University Graduation Requirements (https://catalog.csudh.edu/general-information/baccalaureate-degrees-undergraduate-studies/university-graduation-requirements/)" section in the University Catalog.

Minor Requirements

No minor is required.

Major Requirements (60-66 units)

Students must select one of the options listed below. The following courses, or their approved transfer equivalents, are required of all candidates for this degree. All courses used to satisfy this major must be passed with a grade of "C" or better.

Core Requirements (35 units)

Code	Title	Hours
Lower Division Required Courses		
MAT 191	Calculus I	5
MAT 193	Calculus II	5
MAT 211	Calculus III	5
MAT 247	Elements of Linear Algebra	3
MAT 271	Foundations Of Higher Math	3
MAT 281	Discrete Mathematics	3
PHY 130	General Physics I	5
Upper Division Required Courses		
MAT 331	Linear Algebra	3
MAT 401	Advanced Analysis I	3
Total Hours		**35**

Data Science Option (25 units)

Code	Title	Hours
Required Courses		
CSC 121	Introduction to Computer Science and Programming I	4
MAT 321	Probability and Statistics	3
MAT 323	Statistical Inference	3
MAT 327	Introduction to Machine Learning with Software	3
MAT 417	Math Methods for Data Science	3
Electives		**9**
MAT 311	Differential Equations	
MAT 315	Introduction to Survival Analysis	
MAT 411	Mathematical Modeling	
MAT 415	Financial Mathematics	
MAT 448	Cryptography	
MAT 460	Graph Theory and Algorithms	
Total Hours		**25**

Mathematics Education Option (31 units)

This option will satisfy the subject matter preparation necessary for a secondary teaching credential in mathematics. Students do not get Subject Matter Preparation on their diploma; the diploma says Mathematics Education option.

Code	Title	Hours
Lower Division Required Courses		
MAT 131	Elementary Statistics and Probability	3
MAT 143	Problem Solving in Mathematics	3
MAT 241	Programming and Technology for Teaching Secondary School Mathematics	3
Upper Division Required Courses		
MAT 333	Abstract Algebra	3
MAT 347	Modern Geometry	3
MAT 443	History Of Mathematics	3
MAT 489	Fundamental Mathematics and Teaching in Secondary Schools	4
MAT 490	Seminar in Mathematics Education	3
Electives		
A. Select one of the following		**3**
MAT 447	Number Theory	
MAT 448	Cryptography	
B. Select an upper division mathematics modeling or statistics course approved by a mathematics advisor.		**3**
Total Hours		**31**

Mathematics Option (25 units)

Code	Title	Hours
Lower Division Required Courses		
CSC 121	Introduction to Computer Science and Programming I	4
Upper Division Required Courses		
MAT 321	Probability and Statistics	3
MAT 333	Abstract Algebra	3
MAT 403	Advanced Analysis II	3
MAT 421	Complex Analysis	3
Electives		
A. Select one of the following (3)		**3**
MAT 447	Number Theory	
MAT 448	Cryptography	
B. Select two upper division mathematical modeling or statistics courses approved by a mathematics advisor (6)		**6**
Total Hours		**25**

Program Learning Outcomes

- Demonstrate skill in using mathematical symbols, standard procedures and techniques, and definitions.
- Demonstrate a sense of inquiry and perseverance in mathematics.
- Demonstrate communication skills in conjunction with mathematical literacy in each major area.
- Prove or disprove mathematical statements as appropriate.
- Use technology and programming languages to model and solve mathematical problems.
- Demonstrate an understanding of the history of early mathematics (Math Ed Option only)

4 year Roadmap

Freshman		
Fall		**Hours**
MAT 191	Calculus I	5
HIS 101	History Of United States	3
GE Area A2 Composition		3
CSC 115	Introduction to Programming Concepts	3
	Hours	**14**
Spring		
MAT 193	Calculus II	5
CSC 121	Introduction to Computer Science and Programming I	4
GE Area 4B Global and Historical Perspectives		3
GE Area 1C Oral Communication		3
	Hours	**15**
Sophomore		
Fall		
MAT 211	Calculus III	5
MAT 281	Discrete Mathematics	3
GE Area 3A Arts		3
GE Area 5B Biological Sciences		3
POL 101	American Institutions	3
	Hours	**17**
Spring		
MAT 247	Elements of Linear Algebra	3
MAT 271	Foundations Of Higher Math	3
MAT 321	Probability and Statistics	3
GE Area 4A Perspectives on Indiv., Groups, and Society		3
GE Area 3B Humanities		3
	Hours	**15**
Junior		
Fall		
MAT 323	Statistical Inference	3
GWAR course		3
MAT 327	Introduction to Machine Learning with Software	3
MAT 331	Linear Algebra	3
PHY 130	General Physics I	5
	Hours	**17**
Spring		
MAT 311	Differential Equations	3
MAT 417. Math Methods for Data Science		3
Select an upper division math elective		3
Elective to meet 120		3
Elective to meet 120		3
	Hours	**15**
Senior		
Fall		
MAT 401	Advanced Analysis I	3
Select a second upper division math elective		3
GE Area 5UD Integrative Studies in Natural Sciences		3
GE Area 6 Ethnic Studies		3
GE Area 3UD		3
	Hours	**15**
Spring		
Select third upper division math elective		3
GE Area 4UD Integrative Studies in the Social Sciences		3
Elective course in any subject to meet 120 units		3
Upper division elective course in any subject to meet 40 units of upper division		3
	Hours	**12**
	Total Hours	**120**

2 year Roadmap

Junior		
Fall		**Hours**
MAT 271	Foundations Of Higher Math	3
CSC 121	Introduction to Computer Science and Programming I	4
GE Area 5UD Integrative Studies in Natural Sciences		3
GWAR satisfying course		3
MAT 247	Elements of Linear Algebra	3
	Hours	**16**
Spring		
MAT 281	Discrete Mathematics	3
MAT 321	Probability and Statistics	3
MAT 327	Introduction to Machine Learning with Software	3
MAT 331	Linear Algebra	3
Select an upper division mathematics elective		3
	Hours	**15**
Senior		
Fall		
MAT 401	Advanced Analysis I	3
MAT 323	Statistical Inference	3
Select a second upper division math elective		3
GE Area 4UD Integrative Studies in the Social Sciences		3
Select an upper division elective to meet upper division 40-unit requirement		3
	Hours	**15**
Spring		
MAT 417. Math Methods for Data Science		3
Select a third upper division mathematics elective		3
GE Area 3UD Integrative Studies in Arts & Humanities		3
Elective course in any subject to meet 120 units		2
Elective course in any subject to meet 120 units		3
	Hours	**14**
	Total Hours	**60**

Mathematics Education Option Roadmaps

4-Year Roadmap

First Year		
Fall		**Hours**
MAT 153	Pre-Calculus with Trigonometry with Lab	4
MAT 143	Problem Solving in Mathematics	3
HIS 101	History Of United States	3
GE Area 1A English Composition		3
Elective to meet 120 units		3
	Hours	**16**
Spring		
MAT 131	Elementary Statistics and Probability	3
MAT 191	Calculus I	5
GE Area 1C Oral Communication		3
GE Area 3A Arts		3
Elective to meet 120 units		2
	Hours	**16**
Second Year		
Fall		
MAT 193	Calculus II	5
MAT 271	Foundations Of Higher Math (satisfies GE Area 1B)	3
POL 101	American Institutions	3
GE Area 4A Social and Behavioral Sciences		3
	Hours	**14**
Spring		
MAT 211	Calculus III	5
MAT 247	Elements of Linear Algebra	3

MAT 281	Discrete Mathematics	3
GE Area 5B Biological Sciences		3
	Hours	**14**
Third Year		
Fall		
MAT 241	Programming and Technology for Teaching Secondary School Mathematics	3
MAT 331	Linear Algebra	3
PHY 130	General Physics I (satisfies GE Area 5A and 5C)	5
GE Area 3B Humanities		3
	Hours	**14**
Spring		
MAT 333	Abstract Algebra	3
MAT 347	Modern Geometry	3
MAT 443	History Of Mathematics	3
Elective A		3
GE Area 3UD Integrative Studies in the Arts and Humanities		3
	Hours	**15**
Fourth Year		
Fall		
MAT 401	Advanced Analysis I	3
MAT 490	Seminar in Mathematics Education	3
Elective B		3
GE Area 5UD Integrative Studies in Physical and Biological Sciences		3
GE Area 6 Ethnic Studies		3
	Hours	**15**
Spring		
MAT 489	Fundamental Mathematics and Teaching in Secondary Schools	4
ENG 350	Advanced Composition (or a GWAR satisfying course)	3
GE Area 4B Social and Behavioral Sciences		3
GE Area 4UD Integrative Studies in the Social and Behavioral Sciences		3
Elective to meet 120 units		3
	Hours	**16**
	Total Hours	**120**

2-Year Roadmap (transfer students)

First Year		
Fall		**Hours**
MAT 271	Foundations Of Higher Math	3
MAT 281	Discrete Mathematics	3
MAT 241	Programming and Technology for Teaching Secondary School Mathematics	3
ENG 350	Advanced Composition (or a course to meet GWAR)	3
GE Area 5UD Integrative Studies in Physical and Biological Sciences		3
	Hours	**15**
Spring		
MAT 331	Linear Algebra	3
MAT 411	Mathematical Modeling	3
MAT 443	History Of Mathematics	3
GE Area 3UD Integrative Studies in the Arts and Humanities		3
Elective to meet 120 units		3
	Hours	**15**
Second Year		
Fall		
MAT 401	Advanced Analysis I	3
MAT 490	Seminar in Mathematics Education	3
Elective A		3
GE Area 4UD Integrative Studies in the Social and Behavioral Sciences		3
Elective to meet 120 units		3
	Hours	**15**
Spring		
MAT 333	Abstract Algebra	3
MAT 347	Modern Geometry	3
MAT 489	Fundamental Mathematics and Teaching in Secondary Schools	4
Elective A		3
Elective to meet 120 units		2
	Hours	**15**
	Total Hours	**60**

Mathematics Option Roadmaps

4- Year Roadmap

First Year		
Fall		**Hours**
MAT 153	Pre-Calculus with Trigonometry with Lab	4
HIS 101	History Of United States	3
POL 101	American Institutions	3
GE Area 1A English Composition		3
Elective to meet 120 units		3
	Hours	**16**
Spring		
MAT 191	Calculus I	5
CSC 115	Introduction to Programming Concepts	3
GE Area 1C Oral Communication		3
GE Area 3A Arts		3
Elective to meet 120 units		2
	Hours	**16**
Second Year		
Fall		
MAT 193	Calculus II	5
MAT 271	Foundations Of Higher Math (satisfies GE Area 1B)	3
GE Area 4A Social and Behavioral Sciences		3
GE Area 5B Biological Sciences		3
	Hours	**14**
Spring		
MAT 211	Calculus III	5
MAT 247	Elements of Linear Algebra	3
MAT 281	Discrete Mathematics	3
CSC 121	Introduction to Computer Science and Programming I	4
	Hours	**15**
Third Year		
Fall		
MAT 321	Probability and Statistics	3
MAT 331	Linear Algebra	3
PHY 130	General Physics I (satisfies GE Area 5A & 5C)	5
GE Area 3B Humanities		3
	Hours	**14**
Spring		
MAT 333	Abstract Algebra	3
Elective A		3
Elective B		3
ENG 350	Advanced Composition (or a GWAR satisfying course)	3
GE Area 3UD Integrative Studies in the Arts and Humanities		3
	Hours	**15**
Fourth Year		
Fall		
MAT 401	Advanced Analysis I	3
Elective B		3
GE Area 4B Social and Behavioral Sciences		3
GE Area 5UD Integrative Studies in the Physical and Biological Sciences		3

GE Area 6 Ethnic Studies		3
	Hours	**15**
Spring		
MAT 403	Advanced Analysis II	3
MAT 421	Complex Analysis	3
Upper Division elective course in MAT		3
GE Area 4UD Integrative Studies in the Social Sciences		3
Elective to meet 120 units		3
	Hours	**15**
	Total Hours	**120**

2-Year Roadmap (transfer students)

First Year		
Fall		**Hours**
MAT 271	Foundations Of Higher Math	3
CSC 115	Introduction to Programming Concepts	3
GE Area 5UD Integrative Studies in the Physical and Biological Sciences		3
Elective to meet 120 units		2
ENG 350	Advanced Composition (satisfies GWAR requirement)	3
	Hours	**14**
Spring		
MAT 321	Probability and Statistics	3
MAT 331	Linear Algebra	3
Elective A		3
CSC 121	Introduction to Computer Science and Programming I	4
GE Area 3UD Integrative Studies in the Arts and Humanities		3
	Hours	**16**
Second Year		
Fall		
MAT 333	Abstract Algebra	3
MAT 401	Advanced Analysis I	3
MAT 281	Discrete Mathematics	3
Elective B		3
GE Area 4UD Integrative Studies in the Social and Behavioral Sciences		3
	Hours	**15**
Spring		
MAT 403	Advanced Analysis II	3
MAT 421	Complex Analysis	3
Elective B		3
Elective to meet 120 units		3
Upper division elective course in any subject		3
	Hours	**15**
	Total Hours	**60**