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 Re	equired 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 R	Required Courses	
MAT 131	Elementary Statistics and Probability	3

	Problem Solving in Mathematics	3
MAT 241	Programming and Technology for Teaching Secondary School Mathematics	3
Upper Division Re	equired 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 t	he following	3
MAT 447	Number Theory	
MAT 448	Cryptography	
B. Select an uppe course approved	r division mathematics modeling or statistics by a mathematics advisor.	3
Total Hours		31
Mathematics Op	tion (25 units)	
Mathematics Op Code	tion (25 units) Title	Hours
Mathematics Op Code Lower Division Re	tion (25 units) Title equired Courses	Hours
Mathematics Op Code Lower Division Re CSC 121	tion (25 units) Title equired Courses Introduction to Computer Science and Programming I	Hours 4
Mathematics Op Code Lower Division Re CSC 121 Upper Division Re	tion (25 units) Title equired Courses Introduction to Computer Science and Programming I equired Courses	Hours 4
Mathematics Op Code Lower Division Re CSC 121 Upper Division Re MAT 321	tion (25 units) Title equired Courses Introduction to Computer Science and Programming I equired Courses Probability and Statistics	Hours 4 3
Mathematics Op Code Lower Division Re CSC 121 Upper Division Re MAT 321 MAT 333	tion (25 units) Title equired Courses Introduction to Computer Science and Programming I equired Courses Probability and Statistics Abstract Algebra	Hours 4 3 3
Mathematics Op Code Lower Division Re CSC 121 Upper Division Re MAT 321 MAT 333 MAT 403	tion (25 units) Title equired Courses Introduction to Computer Science and Programming I equired Courses Probability and Statistics Abstract Algebra Advanced Analysis II	Hours 4 3 3 3 3
Mathematics Op Code Lower Division Re CSC 121 Upper Division Re MAT 321 MAT 333 MAT 403 MAT 421	tion (25 units) Title equired Courses Introduction to Computer Science and Programming I equired Courses Probability and Statistics Abstract Algebra Advanced Analysis II Complex Analysis	Hours 4 3 3 3 3 3 3
Mathematics Op Code Lower Division Re CSC 121 Upper Division Re MAT 321 MAT 333 MAT 403 MAT 403 MAT 421 Electives	tion (25 units) Title equired Courses Introduction to Computer Science and Programming I equired Courses Probability and Statistics Abstract Algebra Advanced Analysis II Complex Analysis	Hours 4 3 3 3 3 3
Mathematics Op Code Lower Division Re CSC 121 Upper Division Re MAT 321 MAT 333 MAT 403 MAT 421 Electives A. Select one of t	tion (25 units) Title equired Courses Introduction to Computer Science and Programming I equired Courses Probability and Statistics Abstract Algebra Advanced Analysis II Complex Analysis he following (3)	Hours 4 3 3 3 3 3 3 3 3 3 3 3 3
Mathematics Op Code Lower Division Re CSC 121 Upper Division Re MAT 321 MAT 333 MAT 403 MAT 403 MAT 421 Electives A. Select one of t MAT 447	tion (25 units) Title equired Courses Introduction to Computer Science and Programming I equired Courses Probability and Statistics Abstract Algebra Advanced Analysis II Complex Analysis He following (3) Number Theory	Hours 4 3 3 3 3 3 3 3 3 3 3
Mathematics Op Code Lower Division Re CSC 121 Upper Division Re MAT 321 MAT 321 MAT 333 MAT 403 MAT 403 MAT 421 Electives A. Select one of t MAT 447 MAT 448	tion (25 units) Title equired Courses Introduction to Computer Science and Programming I equired Courses Probability and Statistics Abstract Algebra Advanced Analysis II Complex Analysis the following (3) Number Theory Cryptography	Hours 4 3 3 3 3 3 3 3 3 3 3
Mathematics Op Code Lower Division Re CSC 121 Upper Division Re MAT 321 MAT 321 MAT 333 MAT 403 MAT 403 MAT 403 MAT 421 Electives A. Select one of t MAT 447 MAT 448 B. Select two upp courses approved	tion (25 units) Title equired Courses Introduction to Computer Science and Programming I equired Courses Probability and Statistics Abstract Algebra Advanced Analysis II Complex Analysis II Complex Analysis He following (3) Number Theory Cryptography er division mathematical modeling or statistics I by a mathematics advisor (6)	Hours 4 3 3 3 3 3 3 3 6

Requirements

Total Course Requirements for the Bachelor's Degree

See the "Requirements for the Bachelor's Degree (https:// catalog.csudh.edu/general-information/baccalaureate-degreesundergraduate-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/generaleducation/)" 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-degreesundergraduate-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	n 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)

Title

Code	
Required	Courses

nequired 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	f the following	3
MAT 447	Number Theory	
MAT 448	Cryptography	
B. Select an up course approve	per division mathematics modeling or statistics d by a mathematics advisor.	3
Total Hours		31
Mathematics (Intion (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	Probability and Statistics Abstract Algebra	3
MAT 333 MAT 403	Probability and Statistics Abstract Algebra Advanced Analysis II	3 3 3
MAT 333 MAT 403 MAT 421	Probability and Statistics Abstract Algebra Advanced Analysis II Complex Analysis	3 3 3 3
MAT 333 MAT 403 MAT 421 Electives	Probability and Statistics Abstract Algebra Advanced Analysis II Complex Analysis	3 3 3 3
MAT 333 MAT 403 MAT 421 Electives A. Select one of	Probability and Statistics Abstract Algebra Advanced Analysis II Complex Analysis f the following (3)	3 3 3 3 3
MAT 333 MAT 403 MAT 421 Electives A. Select one of MAT 447	Probability and Statistics Abstract Algebra Advanced Analysis II Complex Analysis f the following (3) Number Theory	3 3 3 3 3 3
MAT 333 MAT 403 MAT 421 Electives A. Select one of MAT 447 MAT 448	Probability and Statistics Abstract Algebra Advanced Analysis II Complex Analysis f the following (3) Number Theory Cryptography	3 3 3 3 3 3
MAT 333 MAT 403 MAT 421 Electives A. Select one of MAT 447 MAT 448 B. Select two u courses approv	Probability and Statistics Abstract Algebra Advanced Analysis II Complex Analysis f the following (3) Number Theory Cryptography oper division mathematical modeling or statistics ed by a mathematics advisor (6)	3 3 3 3 3 3 3 6

Program Learning Outcomes

Hours

- 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

2 year Roadmap

Junior

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 His	torical Perspectives	3
GE Area 1C Oral Communio	cation	3
	Hours	15
Sophomore		
Fall		
MAT 211	Calculus III	5
MAT 281	Discrete Mathematics	3
GE Area 3A Arts		3
GE Area 5B Biological Scie	nces	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 o	n 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	or Data Science	3
Select an upper division m	ath 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 divis	sion math elective	3
GE Area 5UD Integrative St	udies 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 St	udies in the Social Sciences	3
Elective course in any subj	ect to meet 120 units	3
Upper division elective cou	rse in any subject to meet 40 units of upper division	3
	Hours	12
	Total Hours	120

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 di	vision 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 divis	ion mathematics elective	3
GE Area 3UD Integrative	Studies in Arts & Humanities	3
Elective course in any su	bject to meet 120 units	2
Elective course in any su	bject 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	З
HIS 101	History Of United States	3
GE Area 1A English Compo	sition	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 Communio	cation	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 Sci	ences	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 S	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 S	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 Be	havioral Sciences	3
GE Area 4UD Integrative S	Studies in the Social and Behavioral Sciences	3
Elective to meet 120 units	S	3
	Hours	16
	Total Hours	120

2-Year Roadmap (transfer students)

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

	Total Hours	60
	Hours	15
Elective to meet 120 units		2
Elective A		3
MAT 489	Fundamental Mathematics and Teaching in Secondary Schools	4
MAT 347	Modern Geometry	3
MAT 333	Abstract Algebra	3
Spring		

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 Introduction to Programming Concepts CSC 115 3 GE Area 1C Oral Communication 3 GE Area 3A Arts 3 Elective to meet 120 units 2 16 Hours 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 14 Hours 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 General Physics I (satisfies GE Area 5A & 5C) 5 PHY 130 GE Area 3B Humanities 3 Hours 14 Spring Abstract Algebra MAT 333 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 15 Hours 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 1	120 units	3
	Hours	15
	Total Hours	120

2-Year Roadmap (transfer students)

	Hours
Foundations Of Higher Math	3
Introduction to Programming Concepts	3
tudies in the Physical and Biological Sciences	3
	2
Advanced Composition (satisfies GWAR requirement)	3
Hours	14
Probability and Statistics	3
Linear Algebra	3
	3
Introduction to Computer Science and Programming I	4
tudies in the Arts and Humanities	3
Hours	16
Abstract Algebra	3
Advanced Analysis I	3
Discrete Mathematics	3
	3
tudies in the Social and Behavioral Sciences	3
Hours	15
Advanced Analysis II	3
Complex Analysis	3
	3
	3
irse in any subject	3
Hours	15
Total Hours	60
	Foundations Of Higher Math Introduction to Programming Concepts udies in the Physical and Biological Sciences Advanced Composition (satisfies GWAR requirement) Hours Probability and Statistics Linear Algebra Introduction to Computer Science and Programming I udies in the Arts and Humanities Hours Abstract Algebra Advanced Analysis I Discrete Mathematics Hours Advanced Analysis II Complex Analysis II Complex Analysis II Total Hours