## MATHEMATICS, BACHELOR OF SCIENCE

## 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 (49 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

See the "Graduation Writing Assessment Requirement (https:// catalog.csudh.edu/general-information/baccalaureate-degrees-undergraduate-studies/gwar-certifying-courses/)" 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 (38 units) <br> Code <br> Litle |  |  |
| :--- | :--- | ---: |
| Lower Division | Required Courses |  |$\quad$ Hours


| Upper Division Required Courses |  |  |
| :--- | :--- | ---: |
| MAT 331 | Linear Algebra | 3 |
| MAT 333 | Abstract Algebra | 3 |
| MAT 401 | Advanced Analysis I | 3 |
| Total Hours |  | $\mathbf{3 8}$ |


| Mathematics Option $-(22$ units $)$ <br> Code Title | Hours |  |
| :--- | ---: | ---: |
| Lower Division Required Courses |  |  |
| CSC 121 | Introduction to Computer Science and | 4 |

## Upper Division Required Courses

| MAT 321 | Probability and Statistics | 3 |
| :--- | :--- | ---: |
| MAT 403 | Advanced Analysis II | 3 |
| MAT 421 | Complex Analysis | 3 |
| Electives |  | $\mathbf{3}$ |
| A. Select one of the following |  |  |
| MAT 447 | Number Theory | $\mathbf{6}$ |
| MAT 448 | Cryptography |  |
| B. Select two of the following: |  |  |
| MAT 311 | Differential Equations |  |
| MAT 323 | Statistical Inference |  |
| MAT 327 | Introduction to Machine Learning with Software |  |
| MAT 411 | Mathematical Modeling |  |
| MAT 460 | Graph Theory and Algorithms |  |
| Total Hours |  | $\mathbf{2 2}$ |

## Mathematics Education Option - (28 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 <br>  | 3 |

Upper Division Required Courses

| MAT 347 | Modern Geometry | 3 |
| :--- | :--- | ---: |
| MAT 443 | History Of Mathematics | 3 |
| MAT 489 | Fundamental Mathematics and Teaching in | 4 |
|  | Secondary Schools |  |
| MAT 490 | Seminar in Mathematics Education | 3 |
| Electives |  |  |

A. Select one of the following courses: 3

| MAT 311 | Differential Equations |  |
| :---: | :---: | :---: |
| MAT 327 | Introduction to Machine Learning with Software |  |
| MAT 411 | Mathematical Modeling |  |
| MAT 460 | Graph Theory and Algorithms |  |
| B. Select one of the following |  | 3 |
| MAT 447 | Number Theory |  |
| MAT 448 | Cryptography |  |
| Total Hours |  | 28 |

## Program Learning Outcomes

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

## Mathematics Option Roadmaps

| 4- Year Roadmap |  |  |
| :--- | :--- | ---: |
| Course | Title | Hours |
| First Year |  |  |
| Fall | Calculus I | 3 |
| GE Area A2 Composition I | $\mathbf{5}$ |  |
| MAT 191 | History Of United States | 3 |
| HIS 101 | American Institutions | 3 |
| POL 101 | Hours | $\mathbf{1 4}$ |


| Spring |  |
| :--- | ---: |
| GE Area A2 Composition II | 3 |
| GE Area A1 Oral Communication | 3 |
| MAT 193 | Calculus II |
| CSC 115 | Introduction to Programming Concepts |
|  | Hours |


| Second Year |  |
| :--- | ---: |
| Fall |  |
| GE Area A3 Logic/Critical Thinking | 3 |
| GE Area B2 Life Science |  |
| GE Area C1 Arts Courses | Calculus III |
| MAT 211 | Foundations Of Higher Math |
| MAT 271 | Hours |
|  |  |
| Spring | Elements of Linear Alegbra |
| GE Area D1 Perspectives on Individuals, Groups, and Society | $\mathbf{5}$ |
| MAT 247 | Discrete Mathematics |
| MAT 281 | General Physics I |
| PHY 130 | Hours |


| Third Year |  |  |
| :--- | :--- | ---: |
| Fall |  |  |
| MAT 321 | Probability and Statistics | 3 |
| MAT 331 | Linear Algebra | 3 |
| GE Area C2 Letters Course | Introduction to Computer Science and Programming I | 3 |
| CSC 121 | 4 |  |
| Additional GE in Area C1 or C2 | $\mathbf{4}$ |  |
|  | Hours | $\mathbf{1 6}$ |


| Spring |  |  |
| :---: | :---: | :---: |
| GE Area C3 Integrative Studies in the Humanities |  | 3 |
| GE Area D2 Global and Historical Perspectives |  | 3 |
| MAT 311 | Differential Equations | 3 |
| MAT 323 | Statistical Inference | 3 |
| MAT 447 | Number Theory | 3 |
|  | Hours | 15 |


| Fourth Year |  |
| :--- | ---: |
| Fall |  |
| GE Area B5 Integrative Studies in Natural Sciences | 3 |
| GE Area E Lifelong Learning and Self-Development | 3 |
| GE Area F Ethnic Studies | 3 |
| MAT 333 | Abstract Algebra |
| MAT 401 | Advanced Analysis I |
|  | Hours |

Spring

| GE Area D3 Integrative Studies in the Social Sciences | 3 |  |
| :--- | :--- | :--- |
| MAT 403 | Advanced Analysis II | 3 |
| MAT 421 | Complex Analysis | 3 |


| Elective to meet 120 units |  | 3 |
| :--- | :--- | ---: |
|  | Hours | $\mathbf{1 2}$ |
| Total Hours | 117 |  |

## 2-Year Roadmap (transfer students)

| Course | Title | Hours |
| :---: | :---: | :---: |
| First Year |  |  |
| Fall |  |  |
| MAT 271 | Foundations Of Higher Math | 3 |
| CSC 115 | Introduction to Programming Concepts | 3 |
| GWAR satisfying course |  | 3 |
| GE Area B5 Integrative Studies in Natural Sciences |  | 3 |
| Elective to meet 120 units |  | 3 |
|  | Hours | 15 |
| Spring |  |  |
| MAT 321 | Probability and Statistics | 3 |
| MAT 331 | Linear Algebra | 3 |
| MAT 447 | Number Theory | 3 |
| CSC 121 | Introduction to Computer Science and Programming I | 4 |
| GE Area C3 Integrative Studies in the Humanities |  | 3 |
|  | Hours | 16 |
| Second Year |  |  |
| Fall |  |  |
| MAT 333 | Abstract Algebra | 3 |
| MAT 401 | Advanced Analysis I | 3 |
| MAT 323 | Statistical Inference | 3 |
| GE Area D3 Integrative Studies in the Social Sciences |  | 3 |
| $\underline{\text { Elective to meet } 120 \text { units }}$ |  | 3 |
|  | Hours | 15 |
| Spring |  |  |
| MAT 403 | Advanced Analysis II | 3 |
| MAT 421 | Complex Analysis | 3 |
| MAT 311 | Differential Equations (Elective B Course) | 3 |
| Elective to meet 120 units |  | 3 |
| Elective to meet 120 units |  | 3 |
|  | Hours | 15 |
|  | Total Hours | 61 |

## Mathematics Education Option Roadmaps <br> 4-Year Roadmap

| Course | Title | Hours |
| :---: | :---: | :---: |
| First Year |  |  |
| Fall |  |  |
| GE Area A2 Composition I |  | 3 |
| MAT 191 | Calculus I | 5 |
| GE Area C or D |  | 3 |
| HIS 101 | History Of United States | 3 |
|  | Hours | 14 |
| Spring |  |  |
| GE Area A2 Composition II |  | 3 |
| MAT 193 | Calculus II | 5 |
| MAT 131 | Elementary Statistics and Probability | 3 |
| GE Area A1 Oral Communication |  | 3 |
| POL 101 | American Institutions | 3 |
|  | Hours | 17 |
| Second Year |  |  |
| Fall |  |  |
| MAT 211 | Calculus III | 5 |
| MAT 271 | Foundations Of Higher Math | 3 |
| MAT 143 | Problem Solving in Mathematics | 3 |


| GE Area A3 Logic/Critical Thinking | 3 |  |
| :--- | :--- | ---: |
| Spring | Hours | $\mathbf{1 4}$ |
| MAT 247 |  |  |
| MAT 241 | Elements of Linear Alegbra |  |
|  | Programming and Technology for Teaching Secondary |  |
| PHY 130 | School Mathematics | 3 |
| GE Area C or D | General Physics I | 3 |
|  |  | $\mathbf{5}$ |
|  | Hours | $\mathbf{3}$ |


| Third Year |  |  |
| :--- | :--- | ---: |
| Fall |  | 3 |
| MAT 281 | Discrete Mathematics | 3 |
| MAT 331 | Linear Algebra | 3 |
| GWAR satisfying course |  | 3 |
| GE Area C or D |  | 3 |
| GE Area C or D |  | $\mathbf{1 5}$ |
|  | Hours |  |


| Spring |  |  |
| :--- | :--- | :---: |
| MAT 411 | Mathematical Modeling | 3 |
| MAT 443 | History Of Mathematics | 3 |
| MAT 447 | Number Theory | 3 |
| GE Area C or D |  | 3 |
| GE Area C3 Integrative Studies in the Humanities | 3 |  |
|  | Hours | $\mathbf{1 5}$ |


| Fourth Year |  |  |
| :---: | :---: | :---: |
| Fall |  |  |
| MAT 333 | Abstract Algebra | 3 |
| MAT 401 | Advanced Analysis I | 3 |
| MAT 489 | Fundamental Mathematics and Teaching in Secondary Schools | 4 |
| GE Area B2 Life Science |  | 3 |
| GE Area E Lifelong Learning and Self-Development |  | 3 |
|  | Hours | 16 |
| Spring |  |  |
| MAT 490 | Seminar in Mathematics Education | 3 |
| MAT 347 | Modern Geometry | 3 |
| GE Area D3 Integrative Studies in the Social Sciences |  | 3 |
| GE Area B5 Integrative Studies in Natural Sciences |  | 3 |
| GE Area F Ethnic Studies |  | 3 |
|  | Hours | 15 |
|  | Total Hours | 120 |

## 2-Year Roadmap (transfer students)

| Course | Title | Hours |
| :--- | :--- | ---: |
| First Year |  |  |
| Fall | Foundations Of Higher Math | 3 |
| MAT 271 | Discrete Mathematics | 3 |
| MAT 281 | Advanced Composition | 3 |
| ENG 350 | Programming and Technology for Teaching Secondary |  |
| MAT 241 | School Mathematics | 3 |
| GE Area B5 Integrative Studies in Natural Sciences | 3 |  |
|  | Hours | $\mathbf{1 5}$ |
| Spring | Linear Algebra | 3 |
| MAT 331 | Mathematical Modeling | 3 |
| MAT 411 | History Of Mathematics | 3 |
| MAT 443 | GE Area C3 Integrative Studies in the Humanities | 3 |
| Elective to meet 120 units | Hours | 3 |
|  |  | $\mathbf{1 5}$ |


| Second Year |  |  |
| :---: | :---: | :---: |
| Fall |  |  |
| MAT 401 | Advanced Analysis I | 3 |
| MAT 447 | Number Theory | 3 |
| MAT 489 | Fundamental Mathematics and Teaching in Secondary Schools | 4 |
| GE Area D3 Integrative Studies in the Social Sciences |  | 3 |
| Elective to meet 120 units |  | 3 |
|  | Hours | 16 |
| Spring |  |  |
| MAT 490 | Seminar in Mathematics Education | 3 |
| MAT 347 | Modern Geometry | 3 |
| MAT 333 | Abstract Algebra | 3 |
| Elective to meet 120 units |  | 3 |
| Elective to meet 120 units |  | 3 |
|  | Hours | 15 |
|  | Total Hours | 61 |

