CATALOG TERM: 2023-2024 **TOTAL UNITS REQUIRED = 120**

MATHEMATICS

General Option

- This worksheet is intended for supplemental use only. The University will use your Academic Requirements Report (ARR) to track your graduation requirements, including those for your major. Please continue to check your ARR for accuracy.
- If your ARR requires a correction, please submit an ARR Correction Form.
- Your Degree Planner (in mycsusm.edu) will display the following requirements in the University's recommended sequence.
- All courses used for the major, including preparation for the major must be completed with a grade of C (2.0) or better.
- A minimum of 21 upper-division units in MATH must be completed at CSUSM.
- No more than 3 units of either MATH 498 or 499 may be applied toward the major.
- No more than 3 units of MATH 495 may be applied toward the major.
- All non-articulated courses MUST be reviewed and approved in advanced by a Mathematics faculty advisor.

MATHEMATICS CORE COURSEWORK (33 UNITS)

Lower-division Calculus Courses (13 units):

✓	Course	Units
☐	MATH 160: Calculus with Applications I (*MATH 125, 126 or pass MATH Placement Exam)	5
☐	MATH 162: Calculus with Applications II (*MATH 160)	4
☐	MATH 260: Calculus with Applications III (*MATH 162)	4

Non-mathematics Supporting Courses (8 units):

✓	Course	Units
☐	CS 111: Computer Science I (^MATH 125 or 160)	4
☐	PHYS 201: Physics of Mechanics & Sound (*MATH 160)	4

Core Courses (12 units)

✓	Course	Units
☐	MATH 264: Introduction to Linear Algebra (*MATH 162)	3
☐	MATH 350: Foundations for Theoretical Mathematics (*MATH 160 with an A- or higher or MATH 162)	3
☐	MATH 378: Number Systems (*MATH 350)	3
☐	MATH 441: Introduction to Probability (*MATH 260; spring only)	3

GENERAL OPTION REQUIREMENTS (28-29 UNITS)

Select 1 of the following courses (4-5 units):

CHEM 150/150L: General Chemistry (5) (*CPE[C], CHEM 101 or 105 and MATH 101, 105 or MATH Cat 1 or 2)
CS 211: Computer Science II (4) (*CS 111, ^MATH 160)
PHYS 202: Physics of Electromagnetism and Optics (4) (*PHYS 201 or 205 and MATH 162)

✓	Course	Units
☐		4-5

Upper-division Option Requirements (12 units):

✓	Course	Units
☐	MATH 364: Intermediate Linear Algebra (*MATH 264, 350)	3
☐	MATH 430: Foundations of Analysis (*MATH 378)	3
☐	MATH 470: Introduction to Abstract Algebra (*MATH 378; fall only)	3

**prerequisite; ^co/prerequisite; [C] Score above 50% on the Chemistry Placement Exam*

MATHEMATICS

General Option

Select 1 course from the following:

MATH 490: Senior Seminar (fall only)
MATH 491: Senior Seminar with Lab
Approved MATH course numbered 505 or above

✓	Course	Units
☐		3

Upper-division Electives (12 units):

Select 12 units from the following:

MATH/CS 464: Numerical Analysis & Computing (*CS 111, MATH 162)
MATH/CS 480: Introduction to Optimization (*MATH 264 or 374)
MATH 330: Introduction to the History of Mathematics (*MATH 160)
MATH 362: Differential Equations (*MATH 162; spring only)
Any MATH course numbered 410-499 or 505+ not already used to fulfill a major requirement.

✓	Course	Units
☐		
☐		
☐		
☐		

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MATHEMATICS

Mathematics Education Option

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- A minimum of 21 upper-division units in MATH must be completed at CSUSM.
- No more than 3 units of either MATH 498 or 499 may be applied toward the major.
- No more than 3 units of MATH 495 may be applied toward the major.
- All non-articulated courses MUST be reviewed and approved in advanced by a Mathematics faculty advisor.

MATHEMATICS CORE COURSEWORK (33 UNITS)

Lower-division Calculus Courses (13 units):

✓	Course	Units
	MATH 160: Calculus with Applications I (*MATH 125, 126 or pass MATH Placement Exam)	5
	MATH 162: Calculus with Applications II (*MATH 160)	4
	MATH 260: Calculus with Applications III (*MATH 162)	4

Non-mathematics Supporting Courses (8 units):

✓	Course	Units
	CS 111: Computer Science I (^MATH 125 or 160)	4
	PHYS 201: Physics of Mechanics & Sound (*MATH 160)	4

Core Courses (12 units)

✓	Course	Units
	MATH 264: Introduction to Linear Algebra (*MATH 115)	3
	MATH 350: Foundations for Theoretical Mathematics (*MATH 160 with an A- or higher or MATH 162)	3
	MATH 378: Number Systems (*MATH 350)	3
	MATH 441: Introduction to Probability (*MATH 260; spring only)	3

MATHEMATICS EDUCATION OPTION REQUIREMENTS (32 UNITS)

Education Requirement (11 units):

✓	Course	Units
	EDUC 350: Foundations of Teaching as a Profession	3
	EDUC 364: The Role of Cultural Diversity in Schooling	3
	EDUC 422: Teaching, Learning, and Technology	3
	MATH 314: Workshop for Future Mathematics Educators (*MATH 162; ~EDUC 350)	2

Upper-division Option Requirements (15 units):

✓	Course	Units
	MATH 330: Introduction to the History of Mathematics (*MATH 160)	3
	MATH 410: Modern Geometry (*MATH 350)	3
	MATH 430: Foundations of Analysis (*MATH 378)	3
	MATH 470: Introduction to Abstract Algebra (*MATH 378; fall only)	3

**prerequisite; ^co/prerequisite; ~corequisite; [C] Score above 50% on the Chemistry Placement Exam*

MATHEMATICS

Mathematics Education Option

Select 1 course from the following:

MATH 442: Introduction to Mathematical Statistics (*MATH 441)
MATH 444: Regression Analysis (*MATH 264, 441)
MATH 242 **and** any MATH course numbered 411-499 or 505+ not already used to fulfill a major requirement.

✓	Course	Units
		3

Upper-division Electives (6 units):

Select 12 units from the following:

CS 464: Numerical Analysis & Computing (*CS 111, MATH 162)
MATH/CS 480: Introduction to Optimization (*MATH 264 or 374)
Any MATH course numbered 350-399, 410-499 or 505+ not already used to fulfill a major requirement.

✓	Course	Units

CATALOG TERM: 2023-2024 **TOTAL UNITS REQUIRED = 120**

MATHEMATICS

Algorithmic Option

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- A minimum of 21 upper-division units in MATH must be completed at CSUSM.
- No more than 3 units of either MATH 498 or 499 may be applied toward the major.
- No more than 3 units of MATH 495 may be applied toward the major.
- All non-articulated courses MUST be reviewed and approved in advanced by a Mathematics faculty advisor.

MATHEMATICS CORE COURSEWORK (33 UNITS)

Lower-division Calculus Courses (13 units):

✓	Course	Units
	MATH 160: Calculus with Applications I (*MATH 125, 126 or pass MATH Placement Exam)	5
	MATH 162: Calculus with Applications II (*MATH 160)	4
	MATH 260: Calculus with Applications III (*MATH 162)	4

Non-mathematics Supporting Courses (8 units):

✓	Course	Units
	CS 111: Computer Science I (^MATH 125 or 160)	4
	PHYS 201: Physics of Mechanics & Sound (*MATH 160)	4

Core Courses (12 units)

✓	Course	Units
	MATH 264: Introduction to Linear Algebra (*MATH 115)	3
	MATH 350: Foundations for Theoretical Mathematics (*MATH 160 with an A- or higher or MATH 162)	3
	MATH 378: Number Systems (*MATH 350)	3
	MATH 441: Introduction to Probability (*MATH 260; spring only)	3

ALGORITHMIC OPTION REQUIREMENTS (31 UNITS)

Computer Science Requirements:

✓	Course	Units
	CS 211: Computer Science II (*CS 111, ^MATH 160)	4
	CS 311: Data Structures and Algorithms (^MATH 270 or 350)	3

Upper-division Option Requirements:

Select 1 course from the following:

MATH 364: Intermediate Linear Algebra (*MATH 264 and MATH 270 with B or higher or MATH 350)
MATH 465: Introduction to Numerical Linear Algebra (*CS 111 and MATH 264 or 374)

✓	Course	Units
		3

MATHEMATICS

Algorithmic Option

Select 1 course from the following:

MATH 422: Introduction to Number Theory (*MATH 378)
MATH 424: Introduction to Cryptography (*MATH 270 with B or higher or MATH 350)

✓	Course	Units
☐		3

Select 1 course from the following:

MATH 442: Introduction to Mathematical Statistics (*MATH 441)
MATH 443: Applied Stochastic Processes with Simulation (*CS 111; MATH 264 or 364; MATH 342 or 441)
MATH 444: Regression Analysis (*MATH 441 and MATH 264 or 374)

✓	Course	Units
☐		3

Select 1 course from the following:

MATH 472: Introduction to Graph Theory (*MATH 378)
MATH 474: Introduction to Combinatorics (*MATH 374 and MATH 270 with B or higher or MATH 350)

✓	Course	Units
☐		3

✓	Course	Units
☐	MATH/CS 480: Introduction to Optimization (*MATH 264 or 374)	3

Capstone Course:
The Capstone Course requires faculty advisor approval prior to enrollment in the course.

Select 1 course from the following:

MATH 490: Senior Seminar (fall only)
MATH 495: Internship in Mathematics (*instructor consent)
Approved 505-level MATH course

✓	Course	Units
☐		3

Upper-division Electives:
Select 6 units from the following:

CS 440: Blockchain Technology (*CS 311)
CS 464: Numerical Analysis & Computing (*CS 111, MATH 162)
CS 471: Introduction to Artificial Intelligence (*CS 351; MATH 242, 440 or 442)
CS 473: Artificial Neural Networks (*CS 311)
CS 478: Introduction to Deep Learning (*CS 311, MATH 242)
Any MATH course numbered 410-499 or 505+ not already used to fulfill a major requirement.

✓	Course	Units
☐		3
☐		3

prerequisite; ^co/prerequisite; [C] Score above 50% on the Chemistry Placement Exam

CATALOG TERM: 2023-2024 **TOTAL UNITS REQUIRED = 120**

MATHEMATICS

Applied Option

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- All courses used for the major, including preparation for the major must be completed with a grade of C (2.0) or better.
- A minimum of 21 upper-division units in MATH must be completed at CSUSM.
- No more than 3 units of either MATH 498 or 499 may be applied toward the major.
- All non-articulated courses MUST be reviewed and approved in advanced by a Mathematics faculty advisor.

MATHEMATICS CORE COURSEWORK (33 UNITS)

Lower-division Calculus Courses (13 units):

✓	Course	Units
	MATH 160: Calculus with Applications I (*MATH 125, 126 or pass MATH Placement Exam)	5
	MATH 162: Calculus with Applications II (*MATH 160)	4
	MATH 260: Calculus with Applications III (*MATH 162)	4

Non-mathematics Supporting Courses (8 units):

✓	Course	Units
	CS 111: Computer Science I (^MATH 125 or 160)	4
	PHYS 201: Physics of Mechanics & Sound (*MATH 160)	4

Core Courses (12 units)

✓	Course	Units
	MATH 264: Introduction to Linear Algebra (*MATH 115)	3
	MATH 350: Foundations for Theoretical Mathematics (*MATH 160 with an A- or higher or MATH 162)	3
	MATH 378: Number Systems (*MATH 350)	3
	MATH 441: Introduction to Probability (*MATH 260)	3

APPLIED OPTION REQUIREMENTS (29-31 UNITS)

Science Requirement (11-13 units):

Select one Emphasis:

____ **Chemistry/Biology Emphasis**
____ **Physics Emphasis**

Chemistry/Biology Emphasis:

✓	Course	Units
	CHEM 150: General Chemistry (*CPE[C], CHEM 101 or 105 and MATH 101, 105 or MATH Cat 1 or 2)	4
	CHEM 150L: General Chemistry Lab (^CHEM 150)	1

prerequisite; ^co/prerequisite; [C] Score above 50% on the Chemistry Placement Exam

MATHEMATICS

Applied Option

Choose 6-8 units from the following:

BIOL 210: Introduction to Cellular & Molecular Biology (4) (+CHEM 150)
BIOL 211: Introduction to Organismal & Population Biology (4) (*BIOL 210)
BIOL 212: Evolution (4) (*BIOL 210)
BIOL 215: Experimental Design and Statistical Analysis (4)
CHEM 160: General Chemistry II (3) (*CHEM 150, 150L and +MATH 125, 126 or 132)
CHEM 201 and 201L: Organic Chemistry + lab (4) (*CHEM 160 or 162)

✓	Course	Units
☐		
☐		

Physics Emphasis:

✓	Course	Units
☐	PHYS 202: Physics of Electromagnetism and Optics (*PHYS 201 or 205 and MATH 162)	4

Choose 7-9 units from the following:

PHYS 203: Modern Physics (4) (*PHYS 202 or 206)
PHYS 270: Introduction to Computational Physics (3) (*PHYS 201, MATH 160, CS 111)
PHYS 320: Classical Mechanics (3) (*PHYS 203)
PHYS 321/EE 321: Electromagnetism (3) (*PHYS 202, MATH 260)
PHYS 323: Quantum Physics (3) (*PHYS 203)
PHYS 324: Statistical Mechanics & Thermodynamics (3) (*PHYS 203)

✓	Course	Units
☐		
☐		

Upper-division Option Requirements (18 units):

✓	Course	Units
☐	MATH 362: Differential Equations (*MATH 162; spring only)	3
☐	MATH 364: Intermediate Linear Algebra (*MATH 264 and MATH 270 with B or higher or MATH 350)	3
☐	MATH 430: Foundations of Analysis (*MATH 378)	3

Select 1 course from the following:

MATH 442: Introduction to Mathematical Statistics (*MATH 441)
MATH 444: Regression Analysis (*MATH 441 and MATH 264 or 374)

✓	Course	Units
☐		3

prerequisite; ^co/prerequisite; [C] Score above 50% on the Chemistry Placement Exam

MATHEMATICS

Applied Option

Select 1 course from the following:

MATH 443: Applied Stochastic Processes with Simulation (*CS 111; MATH 264 or 364; MATH 342 or 441)
MATH 448: Mathematical Models and Methods in Biology (*MATH 160)
MATH 464: Numerical Analysis and Computing (*CS 111; MATH 162)
MATH 465: Introduction to Numerical Linear Algebra (*CS 111; MATH 264 or 374)
MATH/CS 480: Introduction to Optimization (*MATH 264 or 374)

✓	Course	Units
☐		3

Upper-division Elective (3 units)

Select any MATH course numbered 410-499 or 505 and higher and not already used in the major.

- Physics Emphasis students may substitute a Physics course numbered 400 or higher with Mathematics faculty advisor approval.
- Chemistry/Biology emphasis students may substitute a Chemistry/Biology course numbered 400 or higher with Mathematics faculty advisor approval.

✓	Course	Units
☐		3