

MATHEMATICS B.A. - COMBINATORICS AND OPTIMIZATION

This degree concentration differs from the BA in Mathematics without a concentration only in the Concentration Requirements.

Bachelor of Arts - Mathematics; Combinatorics & Optimization Concentration

General Education Requirements

Summary

Code	Title	Hours
	Mathematics Core Courses	23
	Mathematics Electives	23
	Science Requirement	18
	Language/Computer Science Requirement	3
Requirements for the Combinatorics & Optimization Concentration (usually fulfilled with courses that count towards the Upper-Division Mathematics Requirement)		
Total Hours		67

Degree Specific Credits: 67

Required Cumulative GPA: 2.0

Note on degree specific credits: The degree specific credits are much lower for double-majors and for students completing an additional minor (in another subject):

- 41 credits for students completing a second major, and
- 46 credits for students completing a minor.

Notes on the GPA requirement:

1. A cumulative GPA of 2.0 is required for all courses used to fulfill major requirements.
2. In addition, a cumulative GPA of 2.0 is required for all mathematical sciences courses used to fulfill major requirements. (Mathematical sciences courses are those with a prefix of M or STAT.)

Mathematics Core Courses

Code	Title	Hours
Complete all of the following courses:		
M 171 or M 181	Calculus I Honors Calculus I	4
M 172 or M 182	Calculus II Honors Calculus II	4
M 210	Introduction to Mathematical Software	3
M 221	Introduction to Linear Algebra	4

M 273	Multivariable Calculus	4
M 300	Undergraduate Mathematics Seminar	1
M 307	Introduction to Abstract Mathematics	3
Total Hours		23

Minimum Required Grade: C-

Mathematics Electives

Rule: Complete 23 credits in this category.

Notes:

1. Students completing a minor (in another subject) need take only 20 credits.
2. Students completing a second major need take only 18 credits.

Elective Courses

Notes:

1. Students completing a minor in another subject or a second major need take only 6 courses.
2. Residency Requirement: At least 4 of the courses in this category must be taken at UM-Missoula (only 3 if M 307 is taken at UM-Missoula).
3. Note that STAT 451 does not count toward this requirement.
4. In addition to counting towards this requirement, M 429 (History of Mathematics) is also an advanced college writing course. Most Mathematics majors use M 429 to meet the advanced college writing general education requirement.

Code	Title	Hours
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Complete 7 courses from the following list; at least 3 of them must be at the 400 level

M 274	Introduction to Differential Equations	
M 301	Teaching Mathematics with Technology	
M 325	Discrete Mathematics	
M 326	Number Theory	
M 361	Discrete Optimization	
M 362	Linear Optimization	
M 381	Advanced Calculus I	
M 412	Partial Differential Equations	
M 414	Deterministic Models	
M 429	History of Mathematics	
M 431	Abstract Algebra I	
M 432	Abstract Algebra II	
M 439	Euclidean and NonEuclidean Geometry	
M 440	Numerical Analysis	
M 445	Statistical, Dynamical, and Computational Modeling	
M 461	Data Science Analytics	
M 462	Theoretical Basics of Big Data Analytics and Real Time Computation Algorithms	
M 472	Introduction to Complex Analysis	
M 473	Introduction to Real Analysis	
M 485	Graph Theory	
STAT 341	Introduction to Probability and Statistics	

or STAT 342 Probability and Simulation	
STAT 421	Probability Theory
STAT 422	Mathematical Statistics
STAT 452	Statistical Methods II

Minimum Required Grade: C-

Elective Computer Labs and Independent Study Courses

Rule: Computer labs and independent study courses from the following list are optional; if taken (0-2 credits), they count toward the total number of credits required for the Mathematics Elective requirement.

Code	Title	Hours
M 275	Differential Equations Computer Lab	1
M 363	Linear Optimization Laboratory	1
M 392	Independent Study	1-9
M 418	Partial Differential Equations Computer Lab	1
M 492	Independent Study	1-9
STAT 457	Computer Data Analysis I	1
STAT 458	Computer Data Analysis II	1

Minimum Required Grade: C-

Science Requirement

Notes:

1. Students completing a minor (in another subject) or a second major are exempt from this requirement.
2. Transfer courses listed on the transcript as CSCI TR* may include course work in other areas such as Computer Applications (CAPP) and therefore do not count towards this requirement unless a student successfully petitions the Department of Mathematical Sciences.

Code	Title	Hours
Complete 18 credits in at most 3 areas selected from astronomy (ASTR), biology (BIO*), chemistry (CHMY), computer science (CSCI, except CSCI TR*), economics (ECNS), forestry (FORS, WILD), geosciences (GEO), management information systems (BMIS), and physics (PHSX).		18
Total Hours		18

Minimum Required Grade: C-

Language/Computer Science Requirement

Rule: Either complete the General Education Requirement Group III: Modern and Classical Language or take one course from the following list.

Note: Students completing a second major are exempt from this requirement.

Code	Title	Hours
Complete one of the following courses:		3
CSCI 126	Computation in the Sciences with Calculus	
CSCI 150	Introduction to Computer Science	
CSCI 151	Interdisciplinary Computer Science I	

CSCI 152	Interdisciplinary Computer Science II	
Total Hours		3

Minimum Required Grade: C-

Requirements for the Combinatorics & Optimization Concentration

Rule: Complete the following subcategories. 12-13 total credits required.

Combinatorics & Optimization Concentration: Core Courses

Code	Title	Hours
Complete all of the following courses:		
M 361	Discrete Optimization	3
M 362	Linear Optimization	3
M 485	Graph Theory	3
Total Hours		9

Minimum Required Grade: C-

Combinatorics & Optimization Concentration: Elective Courses

Code	Title	Hours
Complete one of the following courses:		3-4
CSCI 332	Advanced Data Structures and Algorithms	
M 414	Deterministic Models	
M 440	Numerical Analysis	
STAT 341	Introduction to Probability and Statistics	
STAT 342	Probability and Simulation	
Total Hours		3-4

Minimum Required Grade: C-