

# MATHEMATICAL SCIENCES- COMPUTER SCIENCE B.S. (COMBINED MAJOR)

The purpose of the combined program is to provide a thorough background in both allied disciplines and to inculcate a deeper understanding of their goals and methods. A student must complete 62 credits in the two disciplines:

- 31 of these credits in Computer Science courses and
- 31 of these credits in Mathematical Sciences courses.

Each student plans a program in consultation with both a Computer Science and a Mathematical Sciences advisor. Students planning to attend graduate school in computer science or the mathematical sciences should consult with their respective advisors.

## Bachelor of Science - Mathematical Science-Computer Science

### General Education Requirements

Information regarding these requirements can be found in the General Education Section (<http://catalog.umt.edu/academics/general-education-requirements/>) of the catalog.

### Summary

Code	Title	Hours
	Mathematical Sciences	31
	Computer Science	31
	Science Requirement	9-10
	Biology	
	Chemistry	
	Physics	
	Public Speaking Requirement	3
	<b>Total Hours</b>	<b>74-75</b>

**Degree Specific Credits:** 74-75

**Required Cumulative GPA:** 2.0

### Mathematical Sciences

**Rule:** Complete the following subcategories. 31 total credits required.

#### Mathematical Sciences Core

Code	Title	Hours
<b>Complete all of the following courses:</b>		
M 171 or M 181	Calculus I Honors Calculus I	4
M 172 or M 182	Calculus II Honors Calculus II	4
M 221	Introduction to Linear Algebra	4
M 273	Multivariable Calculus	4

M 307 or M 225	Introduction to Abstract Mathematics Introduction to Discrete Mathematics	3
<b>Total Hours</b>		<b>19</b>

Minimum Required Grade: C-

#### Mathematical Sciences Electives

**Note:** The combined nine credits of Computer Science Electives and twelve credits of Mathematical Sciences Electives must include at least three 3- or 4-credit courses numbered 400 or above, with at least one chosen from each department (not including M 429 and STAT 451, STAT 452).

Code	Title	Hours
<b>Complete 12 credits of the following courses:</b>		
M 274	Introduction to Differential Equations	12
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 or STAT 342	Introduction to Probability and Statistics Probability and Simulation	
STAT 421	Probability Theory	
STAT 422	Mathematical Statistics	
STAT 451	Statistical Methods I	
STAT 452	Statistical Methods II	
<b>Total Hours</b>		<b>12</b>

Minimum Required Grade: C-

### Computer Science

**Rule:** Complete the following subcategories. 31 total credits required.

#### Computer Science Core

Code	Title	Hours
<b>Complete all of the following courses:</b>		
CSCI 106	Careers in Computer Science	1
CSCI 150	Introduction to Computer Science	3
CSCI 151	Interdisciplinary Computer Science I	3

CSCI 152	Interdisciplinary Computer Science II	3
CSCI 232	Intermediate Data Structures and Algorithms	4
CSCI 258	Web Application Development	3
CSCI 332	Advanced Data Structures and Algorithms	3
CSCI 340	Database Design	3
<b>Total Hours</b>		<b>23</b>

Minimum Required Grade: C-

### Computer Science Electives

**Note:** In addition to the 22 credits in the Computer Science core, students must take an additional 9 upper division (three hundred level or higher) Computer Science credits.

1. A total of at most three of the nine credits of Computer Science Electives may be in CSCI 398 or CSCI 498.
2. The combined nine credits of Computer Science Electives and twelve credits of Mathematical Sciences Electives must include at least three 3- or 4-credit courses numbered 400 or above, with at least one chosen from each department (not including M 429 and STAT 451, STAT 452).

Code	Title	Hours
<b>Complete 9 credits of upper-division (300-level or higher) CSCI courses.</b>		<b>9</b>
<b>Total Hours</b>		<b>9</b>

Minimum Required Grade: C-

### Science Requirement

**Rule:** Complete the course work from 1 of the following subcategories. 9-10 total credits required.

#### Biology

Code	Title	Hours
<b>If you choose biology, complete all of the following courses:</b>		
BIOB 160N	Principles of Living Systems	3
BIOB 161N	Principles of Living Systems Lab	1
BIOB 170N	Principles of Biological Diversity	3
BIOB 171N	Principles of Biological Diversity Lab	2
<b>Total Hours</b>		<b>9</b>

Minimum Required Grade: C-

#### Chemistry

Code	Title	Hours
<b>If you choose chemistry, complete all of the following courses:</b>		
CHMY 141N & CHMY 142N	College Chemistry I and College Chemistry I Lab	5
CHMY 143N & CHMY 144N	College Chemistry II and College Chemistry II Lab	5
<b>Total Hours</b>		<b>10</b>

Minimum Required Grade: C-

### Physics

Code	Title	Hours
<b>If you choose physics, complete all of the following courses:</b>		
PHSX 215N	Fundamentals of Physics with Calculus I	4
PHSX 216N	Physics Laboratory I with Calculus	1
PHSX 217N	Fundamentals of Physics with Calculus II	4
PHSX 218N	Physics Laboratory II with Calculus	1
<b>Total Hours</b>		<b>10</b>

Minimum Required Grade: C-

### Public Speaking Requirement

Code	Title	Hours
<b>Complete one of the following courses:</b>		
COMX 111A	Introduction to Public Speaking	3
or COMX 242	Argumentation	
<b>Total Hours</b>		<b>3</b>

Minimum Required Grade: C-

### Suggested Curricula

**Note:** Students are encouraged to choose their Computer Science and Mathematical Sciences Electives according to one of the following curricula; these tracks are suggestions only and, as such, optional. Note that the suggested curricula do not include an advanced College Writing Course.

#### Applied Math–Scientific Programming

Code	Title	Hours
M 274	Introduction to Differential Equations	3
M 412	Partial Differential Equations	3
M 414	Deterministic Models	3
Select one of the following:		3-4
M 381	Advanced Calculus I	
M 440	Numerical Analysis	
M 472	Introduction to Complex Analysis	
M 473	Introduction to Real Analysis	
STAT 341	Introduction to Probability and Statistics	
or STAT 342	Probability and Simulation	
Select three of the following:		9
CSCI 441	Computer Graphics Programming	
CSCI 444	Data Visualization	
CSCI 460	Operating Systems	
CSCI 477	Simulation	
<b>Total Hours</b>		<b>21-22</b>

#### Combinatorics and Optimization–Artificial Intelligence

Code	Title	Hours
M 361	Discrete Optimization	3
M 362	Linear Optimization	3
Select two of the following:		6
M 325	Discrete Mathematics	
M 414	Deterministic Models	
M 485	Graph Theory	

STAT 341	Introduction to Probability and Statistics	
CSCI 446	Artificial Intelligence	3
CSCI 447	Machine Learning	3
CSCI 460	Operating Systems	3
<b>Total Hours</b>		<b>21</b>

CSCI Elective	3
<b>Total Hours</b>	<b>23-24</b>

### Data Science (Big Data Analytics)

Code	Title	Hours
M 461	Data Science Analytics	3
M 462	Theoretical Basics of Big Data Analytics and Real Time Computation Algorithms	3
STAT 341 or STAT 342	Introduction to Probability and Statistics Probability and Simulation	3
STAT 451	Statistical Methods I	3
STAT 452	Statistical Methods II	3
Select three of the following:		9
CSCI 444	Data Visualization	
CSCI 447	Machine Learning	
CSCI 448	Pattern Recognition	
CSCI 464	Applications of Mining Big Data	
CSCI 480	Applied Parallel Computing Techniques	
<b>Total Hours</b>		<b>24</b>

### Statistics–Machine Learning

Code	Title	Hours
STAT 341 or STAT 342	Introduction to Probability and Statistics Probability and Simulation	3
STAT 421	Probability Theory	3
Select two of the following:		6
M 325	Discrete Mathematics	
M 362	Linear Optimization	
M 485	Graph Theory	
STAT 422	Mathematical Statistics	
Select three of the following:		9
CSCI 340	Database Design	
CSCI 444	Data Visualization	
CSCI 446	Artificial Intelligence	
CSCI 447	Machine Learning	
CSCI 451	Computational Biology	
<b>Total Hours</b>		<b>21</b>

### Algebra–Analysis

Code	Title	Hours
M 381	Advanced Calculus I	3
M 431	Abstract Algebra I	4
Select two of the following:		7-8
M 326	Number Theory	
M 432	Abstract Algebra II	
M 472	Introduction to Complex Analysis	
M 473	Introduction to Real Analysis	
CSCI 426	Software Design & Development I	3
CSCI 460	Operating Systems	3