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

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mathematical Sciences</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>Computer Science</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>Science Requirement</td>
<td>9-10</td>
</tr>
<tr>
<td></td>
<td>Biology</td>
<td></td>
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<tr>
<td></td>
<td>Chemistry</td>
<td></td>
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<tr>
<td></td>
<td>Public Speaking Requirement</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>Total Hours</strong></td>
<td><strong>74-75</strong></td>
</tr>
</tbody>
</table>

Degree Specific Credits: 74-75

Required Cumulative GPA: 2.0

Mathematical Sciences

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

Mathematical Sciences Core

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

M 307 Introduction to Abstract Mathematics or M 225 Introduction to Discrete Mathematics

Total Hours 19

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).

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Complete 12 credits of the following courses:</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>M 274 Introduction to Differential Equations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M 325 Discrete Mathematics</td>
<td></td>
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<tr>
<td></td>
<td>M 326 Number Theory</td>
<td></td>
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<tr>
<td></td>
<td>M 361 Discrete Optimization</td>
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<tr>
<td></td>
<td>M 362 Linear Optimization</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M 381 Advanced Calculus I</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M 412 Partial Differential Equations</td>
<td></td>
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<tr>
<td></td>
<td>M 414 Deterministic Models</td>
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<tr>
<td></td>
<td>M 429 History of Mathematics</td>
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<tr>
<td></td>
<td>M 431 Abstract Algebra I</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M 432 Abstract Algebra II</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M 439 Euclidean and NonEuclidean Geometry</td>
<td></td>
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<tr>
<td></td>
<td>M 440 Numerical Analysis</td>
<td></td>
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<tr>
<td></td>
<td>M 445 Statistical, Dynamical, and Computational Modeling</td>
<td></td>
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<tr>
<td></td>
<td>M 461 Data Science Analytics</td>
<td></td>
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<tr>
<td></td>
<td>M 462 Theoretical Basics of Big Data Analytics and Real Time Computation Algorithms</td>
<td></td>
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<tr>
<td></td>
<td>M 472 Introduction to Complex Analysis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M 473 Introduction to Real Analysis</td>
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<tr>
<td></td>
<td>M 485 Graph Theory</td>
<td></td>
</tr>
<tr>
<td></td>
<td>STAT 341 Introduction to Probability and Statistics or STAT 342 Probability and Simulation</td>
<td></td>
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<tr>
<td></td>
<td>STAT 421 Probability Theory</td>
<td></td>
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<tr>
<td></td>
<td>STAT 422 Mathematical Statistics</td>
<td></td>
</tr>
<tr>
<td></td>
<td>STAT 451 Statistical Methods I</td>
<td></td>
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<tr>
<td></td>
<td>STAT 452 Statistical Methods II</td>
<td></td>
</tr>
</tbody>
</table>

Total Hours 12

Minimum Required Grade: C-

Computer Science

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

Computer Science Core

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Complete all of the following courses:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CSCI 106 Careers in Computer Science</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>CSCI 150 Introduction to Computer Science</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>CSCI 151 Interdisciplinary Computer Science I</td>
<td>3</td>
</tr>
</tbody>
</table>
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
Total Hours    23

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).

Complete 9 credits of upper-division (300-level or higher) CSCI courses.

Total Hours    9

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
If you choose biology, complete all of the following courses:
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
Total Hours    9

Minimum Required Grade: C-

Chemistry

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

Minimum Required Grade: C-

Physics

Code    Title    Hours
If you choose physics, complete all of the following courses:
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
Total Hours    10

Minimum Required Grade: C-

Public Speaking Requirement

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

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 curriculum do not include an advanced College Writing Course.

Applied Math–Scientific Programming

Code    Title    Hours
Select one of the following:    3-4
M 274  Introduction to Differential Equations    3
M 412  Partial Differential Equations    3
M 414  Deterministic Models    3
Select three of the following:    9
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
Total Hours    21-22

Combinatorics and Optimization–Artificial Intelligence

Code    Title    Hours
Select two of the following:    6
M 361  Discrete Optimization    3
M 362  Linear Optimization    3
M 325  Discrete Mathematics
M 414  Deterministic Models
M 485  Graph Theory
### Mathematical Sciences-Computer Science B.S. (Combined Major)

**STAT 341**  
Introduction to Probability and Statistics  

**CSCI 446**  
Artificial Intelligence  

**CSCI 447**  
Machine Learning  

**CSCI 460**  
Operating Systems  

**Total Hours**  
21  

### Data Science (Big Data Analytics)

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 461</td>
<td>Data Science Analytics</td>
<td>3</td>
</tr>
<tr>
<td>M 462</td>
<td>Theoretical Basics of Big Data Analytics and Real Time Computation Algorithms</td>
<td>3</td>
</tr>
<tr>
<td>STAT 341</td>
<td>Introduction to Probability and Statistics</td>
<td>3</td>
</tr>
<tr>
<td>or STAT 342</td>
<td>Probability and Simulation</td>
<td></td>
</tr>
<tr>
<td>STAT 451</td>
<td>Statistical Methods I</td>
<td>3</td>
</tr>
<tr>
<td>STAT 452</td>
<td>Statistical Methods II</td>
<td>3</td>
</tr>
</tbody>
</table>

Select three of the following:  
- 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  

**Total Hours**  
24  

### Statistics–Machine Learning

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT 341</td>
<td>Introduction to Probability and Statistics</td>
<td>3</td>
</tr>
<tr>
<td>or STAT 342</td>
<td>Probability and Simulation</td>
<td></td>
</tr>
<tr>
<td>STAT 421</td>
<td>Probability Theory</td>
<td>3</td>
</tr>
</tbody>
</table>

Select two of the following:  
- M 325  
- Discrete Mathematics  
- M 362  
- Linear Optimization  
- M 485  
- Graph Theory  
- STAT 422  
- Mathematical Statistics  

Select three of the following:  
- CSCI 340  
- Database Design  
- CSCI 444  
- Data Visualization  
- CSCI 446  
- Artificial Intelligence  
- CSCI 447  
- Machine Learning  
- CSCI 451  
- Computational Biology  

**Total Hours**  
21  

### Algebra–Analysis

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 381</td>
<td>Advanced Calculus I</td>
<td>3</td>
</tr>
<tr>
<td>M 431</td>
<td>Abstract Algebra I</td>
<td>4</td>
</tr>
</tbody>
</table>

Select two of the following:  
- 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  
- CSCI 460  
- Operating Systems  

**Total Hours**  
23-24