MATHEMATICAL SCIENCES-COMPUTER SCIENCE (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 60 credits in the two disciplines:

- 30 of these credits in Computer Science courses and
- 30 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 Sci

College Humanities & Sciences

Degree Specific Credits: 73

Required Cumulative GPA: 2.0

Catalog Year: 2017-2018

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
Mathematical Sciences 31
Computer Science 30
Science Requirement 9-10

Mathematical Sciences

Rule: Complete the following subcategories.

31 Total Credits Required

Mathematical Sciences Core

Rule: Complete all of the following courses.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 171</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>or M 181</td>
<td>Honors Calculus I</td>
<td></td>
</tr>
<tr>
<td>M 172</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>or M 182</td>
<td>Honors Calculus II</td>
<td></td>
</tr>
<tr>
<td>M 221</td>
<td>Introduction to Linear Algebra</td>
<td>4</td>
</tr>
</tbody>
</table>

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).

Complete 12 credits from the following courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 311</td>
<td>Ordinary Differential Equations and Systems</td>
<td>3</td>
</tr>
<tr>
<td>M 325</td>
<td>Discrete Mathematics</td>
<td></td>
</tr>
<tr>
<td>M 326</td>
<td>Number Theory</td>
<td></td>
</tr>
<tr>
<td>M 361</td>
<td>Discrete Optimization</td>
<td></td>
</tr>
<tr>
<td>M 362</td>
<td>Linear Optimization</td>
<td></td>
</tr>
<tr>
<td>M 381</td>
<td>Advanced Calculus I</td>
<td></td>
</tr>
<tr>
<td>M 412</td>
<td>Partial Differential Equations</td>
<td></td>
</tr>
<tr>
<td>M 414</td>
<td>Deterministic Models</td>
<td></td>
</tr>
<tr>
<td>M 429</td>
<td>History of Mathematics</td>
<td></td>
</tr>
<tr>
<td>M 431</td>
<td>Abstract Algebra I</td>
<td></td>
</tr>
<tr>
<td>M 432</td>
<td>Abstract Algebra II</td>
<td></td>
</tr>
<tr>
<td>M 439</td>
<td>Euclidean and Non-Euclidean Geometry</td>
<td></td>
</tr>
<tr>
<td>M 440</td>
<td>Numerical Analysis</td>
<td></td>
</tr>
<tr>
<td>M 445</td>
<td>Statistical, Dynamical, and Computational Modeling</td>
<td></td>
</tr>
<tr>
<td>M 461</td>
<td>Practical Big Data Analytics</td>
<td></td>
</tr>
<tr>
<td>M 462</td>
<td>Theoretical Basics of Big Data Analytics and Real Time Computation Algorithms</td>
<td></td>
</tr>
<tr>
<td>M 472</td>
<td>Introduction to Complex Analysis</td>
<td></td>
</tr>
<tr>
<td>M 473</td>
<td>Introduction to Real Analysis</td>
<td></td>
</tr>
<tr>
<td>M 485</td>
<td>Graph Theory</td>
<td></td>
</tr>
<tr>
<td>STAT 341</td>
<td>Introduction to Probability and Statistics</td>
<td></td>
</tr>
<tr>
<td>STAT 421</td>
<td>Probability Theory</td>
<td></td>
</tr>
<tr>
<td>STAT 422</td>
<td>Mathematical Statistics</td>
<td></td>
</tr>
<tr>
<td>STAT 451</td>
<td>Statistical Methods I</td>
<td></td>
</tr>
<tr>
<td>STAT 452</td>
<td>Statistical Methods II</td>
<td></td>
</tr>
</tbody>
</table>

Total Hours 12

Minimum Required Grade: C-

Computer Science

Rule: Complete the following subcategories.

30 Total Credits Required

Computer Science Core

Rule: Complete all of the following courses.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSCI 106</td>
<td>Careers in Computer Science</td>
<td>1</td>
</tr>
<tr>
<td>CSCI 135</td>
<td>Fund of Computer Science I</td>
<td>3</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Credits</td>
</tr>
<tr>
<td>-------------</td>
<td>------------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>CSCI 136</td>
<td>Fund of Computer Science II</td>
<td>3</td>
</tr>
<tr>
<td>CSCI 205</td>
<td>Programming Languages w/ C/C++</td>
<td>4</td>
</tr>
<tr>
<td>CSCI 232</td>
<td>Data Structures and Algorithms</td>
<td>4</td>
</tr>
<tr>
<td>CSCI 332</td>
<td>Design/Analysis of Algorithms</td>
<td>3</td>
</tr>
<tr>
<td>CSCI 361</td>
<td>Computer Architecture</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>Total Hours</strong></td>
<td><strong>21</strong></td>
</tr>
</tbody>
</table>

Minimum Required Grade: C-

**Computer Science Electives**

**Rule**: Complete 9 credits from the following courses.

**Note:**

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 from the following

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSCI 315E</td>
<td>Computers, Ethics, and Society</td>
<td></td>
</tr>
<tr>
<td>CSCI 323</td>
<td>Software Science</td>
<td></td>
</tr>
<tr>
<td>CSCI 340</td>
<td>Database Design</td>
<td></td>
</tr>
<tr>
<td>CSCI 390</td>
<td>Research</td>
<td></td>
</tr>
<tr>
<td>CSCI 391</td>
<td>Special Topics</td>
<td></td>
</tr>
<tr>
<td>CSCI 394</td>
<td>Seminar</td>
<td></td>
</tr>
<tr>
<td>CSCI 398</td>
<td>Internship</td>
<td></td>
</tr>
<tr>
<td>CSCI 411</td>
<td>Advanced Web Programming</td>
<td></td>
</tr>
<tr>
<td>CSCI 412</td>
<td>Game and Mobile App</td>
<td></td>
</tr>
<tr>
<td>CSCI 426</td>
<td>Adv Prgrmm Theory/Practice I</td>
<td></td>
</tr>
<tr>
<td>CSCI 427</td>
<td>Adv Prgrmm Theory/Practice II</td>
<td></td>
</tr>
<tr>
<td>CSCI 441</td>
<td>Computer Graphics Programming</td>
<td></td>
</tr>
<tr>
<td>CSCI 443</td>
<td>User Interface Design</td>
<td></td>
</tr>
<tr>
<td>CSCI 444</td>
<td>Data Visualization</td>
<td></td>
</tr>
<tr>
<td>CSCI 446</td>
<td>Artificial Intelligence</td>
<td></td>
</tr>
<tr>
<td>CSCI 447</td>
<td>Machine Learning</td>
<td></td>
</tr>
<tr>
<td>CSCI 448</td>
<td>Pattern Recognition</td>
<td></td>
</tr>
<tr>
<td>CSCI 451</td>
<td>Computational Biology</td>
<td></td>
</tr>
<tr>
<td>CSCI 460</td>
<td>Operating Systems</td>
<td></td>
</tr>
<tr>
<td>CSCI 464</td>
<td>Applications of Mining Big Data</td>
<td></td>
</tr>
<tr>
<td>CSCI 466</td>
<td>Networks</td>
<td></td>
</tr>
<tr>
<td>CSCI 477</td>
<td>Simulation</td>
<td></td>
</tr>
<tr>
<td>CSCI 480</td>
<td>Applied Parallel Computing Techniques</td>
<td></td>
</tr>
<tr>
<td>CSCI 490</td>
<td>Research</td>
<td></td>
</tr>
<tr>
<td>CSCI 491</td>
<td>Special Topics</td>
<td></td>
</tr>
<tr>
<td>CSCI 494</td>
<td>Seminar</td>
<td></td>
</tr>
<tr>
<td>CSCI 498</td>
<td>Internship</td>
<td></td>
</tr>
<tr>
<td>CSCI 499</td>
<td>Senior Thesis/Capstone</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total Hours</strong></td>
<td><strong>9</strong></td>
</tr>
</tbody>
</table>

Minimum Required Grade: C-

**Science Requirement**

**Rule**: Complete the course work from 1 of the following subcategories.

**9-10 Total Credits Required**

**Biology**

**Rule**: If you choose biology, complete all of the following courses.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOB 160N</td>
<td>Principles of Living Systems</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 161N</td>
<td>Prncpls of Living Systems Lab</td>
<td>1</td>
</tr>
<tr>
<td>BIOB 170N</td>
<td>Prncpls Biological Diversity</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 171N</td>
<td>Princpls Biological Dvrsty Lab</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td><strong>Total Hours</strong></td>
<td><strong>9</strong></td>
</tr>
</tbody>
</table>

Minimum Required Grade: C-

**Chemistry**

**Rule**: If you choose chemistry, complete all of the following courses.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 141N</td>
<td>College Chemistry I</td>
<td></td>
</tr>
<tr>
<td>&amp; CHMY 142N</td>
<td>and College Chemistry I Lab</td>
<td></td>
</tr>
<tr>
<td>CHMY 143N</td>
<td>College Chemistry II</td>
<td></td>
</tr>
<tr>
<td>&amp; CHMY 144N</td>
<td>and College Chemistry II Lab</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total Hours</strong></td>
<td><strong>10</strong></td>
</tr>
</tbody>
</table>

Minimum Required Grade: C-

**Physics**

**Rule**: If you choose physics, complete all of the following courses.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHSX 215N</td>
<td>Fund of Physics w/Calc I</td>
<td>4</td>
</tr>
<tr>
<td>PHSX 216N</td>
<td>Physics Laboratory I w/Calc</td>
<td>1</td>
</tr>
<tr>
<td>PHSX 217N</td>
<td>Fund of Physics w/Calc II</td>
<td>4</td>
</tr>
<tr>
<td>PHSX 218N</td>
<td>Physics Laboratory II w/Calc</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><strong>Total Hours</strong></td>
<td><strong>10</strong></td>
</tr>
</tbody>
</table>

Minimum Required Grade: C-

**Public Speaking Requirement**

**Rule**: Complete 1 of the following courses.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMX 111A</td>
<td>Intro to Public Speaking</td>
<td>3</td>
</tr>
<tr>
<td>or COMX 242</td>
<td>Argumentation</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total Hours</strong></td>
<td><strong>3</strong></td>
</tr>
</tbody>
</table>

Minimum Required Grade: C-

**Advanced College Writing Requirement**

**Note**: Any other approved Advanced College Writing course will also fulfill this requirement.

Select 3 credits from the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSCI 315E</td>
<td>Computers, Ethics, and Society</td>
<td></td>
</tr>
<tr>
<td>CSCI 499</td>
<td>Senior Thesis/Capstone</td>
<td></td>
</tr>
<tr>
<td>M 429</td>
<td>History of Mathematics</td>
<td></td>
</tr>
<tr>
<td>M 499</td>
<td>Senior Thesis</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total Hours</strong></td>
<td><strong>3</strong></td>
</tr>
</tbody>
</table>
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**

- M 311 Ordinary Differential Equations and Systems 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
- Select three of the following: 9
  - CSCI 441 Computer Graphics Programming
  - CSCI 444 Data Visualization
  - CSCI 460 Operating Systems
  - CSCI 477 Simulation

Total Hours 21-22

**Combinatorics and Optimization–Artificial Intelligence**

- 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
  - CSCI 447 Machine Learning
  - CSCI 460 Operating Systems

Total Hours 21

**Data Science (Big Data Analytics)**

- M 461 Practical Big Data Analytics 3
- M 462 Theoretical Basics of Big Data Analytics and Real Time Computation Algorithms 3
- STAT 341 Introduction to Probability and Statistics 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

Total Hours 21

**Statistics–Machine Learning**

- STAT 341 Introduction to Probability and Statistics 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

Total Hours 21

**Algebra–Analysis**

- 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 Adv Prgrmng Theory/Practice I
  - CSCI 460 Operating Systems
  - CSCI Elective

Total Hours 23-24