COMPUTER SCIENCE-MATHEMATICAL SCIENCES (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 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 - Computer Science-Mathematical Sciences

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

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematical Sciences</td>
<td>31</td>
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<td>Computer Science</td>
<td>30</td>
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<tr>
<td>Science Requirement</td>
<td>9-10</td>
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<tr>
<td>Biology</td>
<td></td>
</tr>
<tr>
<td>Chemistry</td>
<td></td>
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<td>Physics</td>
<td></td>
</tr>
<tr>
<td>Public Speaking Requirement</td>
<td>3</td>
</tr>
<tr>
<td>Advanced College Writing Requirement</td>
<td>3</td>
</tr>
<tr>
<td>Total Hours</td>
<td>76-77</td>
</tr>
</tbody>
</table>

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>
<tr>
<td>M 273</td>
<td>Multivariable Calculus</td>
<td>4</td>
</tr>
<tr>
<td>M 307</td>
<td>Introduction to Abstract Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>or M 225</td>
<td>Introduction to Discrete Mathematics</td>
<td></td>
</tr>
</tbody>
</table>

Total Hours: 19

Minimum Required Grade: C-

Mathematical Sciences Electives

Rule: Complete 12 credits from the following courses.

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

CSCI 106 Careers in Computer Science 1
CSCI 135 Fund of Computer Science I 3
CSCI 136 Fund of Computer Science II 3
CSCI 205 Programming Languages w/ C/C++ 4
CSCI 232 Data Structures and Algorithms 4
CSCI 332 Design/Analysis of Algorithms 3
CSCI 361 Computer Architecture 3
Total Hours 21

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 9

CSCI 315E Computers, Ethics, and Society
CSCI 323 Software Science
CSCI 340 Database Design
CSCI 390 Research
CSCI 391 Special Topics
CSCI 394 Seminar
CSCI 398 Internship
CSCI 411 Advanced Web Programming
CSCI 412 Game and Mobile App
CSCI 426 Adv Prgrmng Theory/Practice I
CSCI 427 Adv Prgrmng Theory/Practice II
CSCI 441 Computer Graphics Programming
CSCI 443 User Interface Design
CSCI 444 Data Visualization
CSCI 446 Artificial Intelligence
CSCI 447 Machine Learning
CSCI 448 Pattern Recognition
CSCI 451 Computational Biology
CSCI 460 Operating Systems
CSCI 464 Applications of Mining Big Data
CSCI 466 Networks
CSCI 477 Simulation
CSCI 480 Applied Parallel Computing Techniques
CSCI 490 Research
CSCI 491 Special Topics
CSCI 494 Seminar
CSCI 498 Internship
CSCI 499 Senior Thesis/Capstone
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
Rule: If you choose biology, complete all of the following courses.

BIOB 160N Principles of Living Systems 3
BIOB 161N Prncpls of Living Systems Lab 1
BIOB 170N Prncpls Biological Dvrsty 3
BIOB 171N Prncpls Biological Dvrsty Lab 2
Total Hours 9

Minimum Required Grade: C-

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

PHSX 215N Fund of Physics w/Calc I 4
PHSX 216N Physics Laboratory I w/Calc 1
PHSX 217N Fund of Physics w/Calc II 4
PHSX 218N Physics Laboratory II w/Calc 1
Total Hours 10

Minimum Required Grade: C-

Public Speaking Requirement
Rule: Complete 1 of the following courses.

COMX 111A Intro to Public Speaking 3
or COMX 242 Argumentation
Total Hours 3

Minimum Required Grade: C-

Advanced College Writing Requirement
Rule: Complete 1 of the following courses.

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

Select 3 credits from the following:

CSCI 315E Computers, Ethics, and Society
CSCI 499 Senior Thesis/Capstone
M 429 History of Mathematics

Select 3 credits from the following:

Total Hours 9
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
  CSCI 480 Applied Parallel Computing Techniques

Total Hours 24

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