**APPLIED MATHEMATICS**

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

**Bachelor of Arts - Mathematics; Applied Mathematics Concentration**

**College Humanities & Sciences**

**Degree Specific Credits:** 67

**Required Cumulative GPA:** 2.0

**Catalog Year:** 2017-2018

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

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

**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>Mathematics Core Courses</th>
<th>23</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper-Division Mathematics Requirement</td>
<td>23</td>
</tr>
<tr>
<td>Upper-Division Elective Courses</td>
<td></td>
</tr>
<tr>
<td>Upper-Division Elective Computer Labs</td>
<td></td>
</tr>
<tr>
<td>Science Requirement</td>
<td>18</td>
</tr>
<tr>
<td>Advanced College Writing Requirement (usually fulfilled with courses that count towards the Upper-Division Mathematics Requirement)</td>
<td></td>
</tr>
<tr>
<td>Foreign Language/Computer Science Requirement</td>
<td>3</td>
</tr>
<tr>
<td>Requirements for the Applied Mathematics Concentration (usually fulfilled with courses that count towards the Upper-Division Mathematics Requirement)</td>
<td></td>
</tr>
<tr>
<td>Total Hours</td>
<td>67</td>
</tr>
</tbody>
</table>

**Mathematics Core Courses**

**Rule:** Take all of the following courses.

- M 171 Calculus I 4
  - or M 181 Honors Calculus I
- M 172 Calculus II 4
  - or M 182 Honors Calculus II
- 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

**Minimum Required Grade:** C-

**Upper-Division Mathematics Requirement**

**Rule:** Take 23 credits in this category.

**Note:**

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

**Minimum Required Grade:** C-

23 Total Credits Required

**Upper-Division Elective Courses**

**Note:**

1. Students completing a minor (in another subject) or a second major need take only 6 courses (totaling 18 credits or more).
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.

Take 7 courses from the following list; at least 3 of them must be at the 400 level:

- M 301 Mathematics Technology for Teachers
- M 311 Ordinary Differential Equations and Systems
- 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 Non-Euclidean Geometry
- M 440 Numerical Analysis
- M 445 Statistical, Dynamical, and Computational Modeling
- M 461 Practical Big Data 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
- STAT 421 Probability Theory
- STAT 422 Mathematical Statistics
- STAT 452 Statistical Methods II

**Minimum Required Grade:** C-
**Upper-Division Elective Computer Labs**

**Rule:** Computer labs from the following list are optional; if taken (0-2 credits), they count toward the total number of credits required for the Upper-Division Mathematics Requirement.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 317</td>
<td>Ordinary Differential Equations Computer Lab</td>
<td>1</td>
</tr>
<tr>
<td>M 363</td>
<td>Linear Optimization Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>M 418</td>
<td>Partial Differential Equations Computer Lab</td>
<td>1</td>
</tr>
<tr>
<td>STAT 457</td>
<td>Computer Data Analysis I</td>
<td>1</td>
</tr>
<tr>
<td>STAT 458</td>
<td>Computer Data Analysis II</td>
<td>1</td>
</tr>
</tbody>
</table>

Minimum Required Grade: C-

**Science Requirement**

**Rule:** Take 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).

**Note:**
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.

Minimum Required Grade: C-

18 Total Credits Required

**Advanced College Writing Requirement**

**Rule:** Take 1 of the following 2 courses, or any other approved Advanced College Writing course.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 429</td>
<td>History of Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>or M 499</td>
<td>Senior Thesis</td>
<td></td>
</tr>
</tbody>
</table>

Minimum Required Grade: C-

Total Hours: 3

**GPA Requirement**

**Note:**
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.)

**Foreign Language/Computer Science Requirement**

**Rule:** Either complete the General Education Requirement "Group III: Modern and Classical Language" (not the symbolic systems exception), or take one course from the following list.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSCI 100</td>
<td>Intro to Programming</td>
<td>3</td>
</tr>
<tr>
<td>CSCI 135</td>
<td>Fund of Computer Science I</td>
<td></td>
</tr>
<tr>
<td>CSCI 136</td>
<td>Fund of Computer Science II</td>
<td></td>
</tr>
<tr>
<td>CSCI 250</td>
<td>Computer Mdlng/Science Majors</td>
<td></td>
</tr>
</tbody>
</table>

Total Hours: 3

Minimum Required Grade: C-

**Requirements for the Applied Mathematics Concentration**

**Rule:** Complete the following subcategories

Minimum Required Grade: C-

13-14 Total Credits Required

**Applied Mathematics Option: Core Courses**

**Rule:** Take all of 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 412</td>
<td>Partial Differential Equations</td>
<td>3</td>
</tr>
</tbody>
</table>

Minimum Required Grade: C-

Total Hours: 6

**Applied Mathematics Option: Elective Courses**

**Rule:** Take 2 of the following courses.

**Note:** In addition, M 381 and M 485 are also recommended.

Select two of the following: 7-8

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 414</td>
<td>Deterministic Models</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 472</td>
<td>Introduction to Complex Analysis</td>
<td></td>
</tr>
</tbody>
</table>

Total Hours: 7-8

Minimum Required Grade: C-

**GPA Requirement**

**Note:**
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.)

**Foreign Language/Computer Science Requirement**

**Rule:** Either complete the General Education Requirement "Group III: Modern and Classical Language" (not the symbolic systems exception), or take one course from the following list.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSCI 100</td>
<td>Intro to Programming</td>
<td>3</td>
</tr>
<tr>
<td>CSCI 135</td>
<td>Fund of Computer Science I</td>
<td></td>
</tr>
<tr>
<td>CSCI 136</td>
<td>Fund of Computer Science II</td>
<td></td>
</tr>
<tr>
<td>CSCI 250</td>
<td>Computer Mdlng/Science Majors</td>
<td></td>
</tr>
</tbody>
</table>

Total Hours: 3

Minimum Required Grade: C-