**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**

- **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

  **Total Hours**  23

- **Upper-Division Mathematics Requirement**
  - Rule: Take 23 credits in this category.

  **Minimum Required Grade:** C-

- **Upper-Division Elective Courses**
  - Note:
    1. Students completing a minor (in another subject) or a second major need take only 18 credits.
    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>

Total Hours 3

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.)

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>

Total Hours 6

Minimum Required Grade: C-

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-

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.