

Two Years:

CHMY 141N	College Chemistry I
CHMY 142N	College Chemistry I Lab
CHMY 143N	College Chemistry II
CHMY 144N	College Chemistry II Lab
CHMY 221 & CHMY 222	Organic Chemistry I and Organic Chemistry I Lab
CHMY 223 & CHMY 224	Organic Chemistry II and Organic Chemistry II Lab

Total Hours 8-20

Minimum Required Grade: C-

**Physics****Rule:** All of the following courses are required

Select one of the following physics sequences: 10

Algebra- and Trigonometry-based:

PHSX 205N & PHSX 206N	College Physics I and College Physics I Laboratory
PHSX 207N & PHSX 208N	College Physics II and College Physics II Laboratory

Calculus-based:

PHSX 215N & PHSX 216N	Fund of Physics w/Calc I and Physics Laboratory I w/Calc
PHSX 217N & PHSX 218N	Fund of Physics w/Calc II and Physics Laboratory II w/Calc

Total Hours 10

Minimum Required Grade: C-

**Advanced College Writing Requirement****Rule:** Complete the equivalent of a full writing course (either three 1/3 writing courses or one 2/3 writing course + one 1/3 writing course or one complete writing course)**Note:** To meet the Advanced College Writing Requirement, Biology students take 2 or 3 partial writing courses (either three 1/3 writing courses or one 1/3 writing course and one 2/3 writing course) or one complete writing course. The Genetics & Evolution concentration requires one 2/3 writing course: BIOE 371. The Advanced College Writing Requirement is completed with one additional course, chosen from any of the following.

Minimum Required Grade: C-

**1/3 Advanced Writing Courses**

BCH 482	Advanced Biochemistry II	3
BIOB 410	Immunology	3
BIOB 425	Adv Cell & Molecular Biology	3
BIOB 483	Phylogenics and Evolution	3
BIOE 403	Vert Design & Evolution	5
BIOE 409	Behavior & Evolution Discussion	1
BIOE 428	Freshwater Ecology	5
BIOL 484	Plant Evolution	3
BIOM 402	Medical Bacteriology & Mycology	3
BIOO 320	General Botany	5

BIOO 434	Plant Physiology Lab	1
BIOO 470	Ornithology	4
BIOO 475	Mammalogy	4

Minimum Required Grade: C-

**2/3 Advanced Writing Courses**

BCH 486	Biochemistry Research Lab	3
BCH 499	Senior Thesis/Capstone	3-6
BIOB 411	Immunology Laboratory	2
BIOB 499	Undergraduate Thesis	3-6
BIOE 342	Field Ecology	5
BIOE 371	Gen Ecology Lab (equiv to 271)	2
BIOM 411	Exprmntl Microbial Genetcs Lab	1
BIOM 499	Undergraduate Thesis	3-6

Minimum Required Grade: C-

**Complete Advanced Writing Course**

BIOH 462	Principles Medical Physiology	3
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**Exception to the Modern/Classical Languages Requirement****Rule:** Choose one of the following Math courses**Note:** The Division of Biological Sciences has been granted an exception to the Modern/Classical Language Requirement. Either of these Calculus courses (required by the major) will satisfy this requirement.

M 162	Applied Calculus	4
or M 171	Calculus I	

Total Hours 4

Minimum Required Grade: C-

**Biology - Human Biological Sciences Bachelor of Science - Biology; Human Biological Sciences Concentration****College Humanities & Sciences****Degree Specific Credits:** 73**Required Cumulative GPA:** 2.0**Catalog Year: 2017-2018****Note:** The Human Biological Sciences concentration is a pre-professional program for students planning careers in a health-related field. The following is a partial list of possible professions: physical therapy, medicine, dentistry, physician's assistant, alternative medicine, nutrition, and public health.**General Education Requirements**Information regarding these requirements can be found in the General Education Section (<http://catalog.umd.edu/academics/general-education-requirements>) of the catalog.

## Summary

Biology/Microbiology Lower Division Core	17
Upper Division Core Courses Required by Human Biological Sciences Concentration	14
Additional Upper Division Major Courses Required for the Human Biological Sciences Concentration	13-20
Biochemistry Requirement	
Microbiology Requirement	
Additional Depth in Human Biological Sciences	
Required Courses Outside of the Major	30-42
Mathematics and Psychology	
Chemistry	
Physics	
Upper Division Writing Expectation for the Major	3-15
Total Hours	77-108

### Biology/Microbiology Lower Division Core

**Rule:** All of the following courses are required.

**Note:** The lower division core should be completed before attempting most upper division major courses.

AP Biology credit may be substituted for either BIOB 160N/BIOB 161N or BIOB 170N/BIOB 171N.

BIOB 160N	Principles of Living Systems	3
BIOB 161N	Prncpls of Living Systems Lab	1
BIOB 170N	Princpls Biological Diversity	3
BIOB 171N	Princpls Biological Dvrsty Lab	2
BIOB 260	Cellular and Molecular Biology	4
BIOB 272	Genetics and Evolution	4
Total Hours		17

Minimum Required Grade: C-

### Upper Division Core Courses Required by Human Biological Sciences Concentration

**Rule:** All of the following courses are required.

BIOB 301	Developmental Biology	3
BIOB 375	General Genetics	3
BIOH 365	Human AP I for Health Profsns	4
BIOH 370	Human AP II for Health Profsns	4
Total Hours		14

Minimum Required Grade: C-

### Additional Upper Division Major Courses Required for the Human Biological Sciences Concentration

Minimum Required Grade: C-

#### Biochemistry Requirement

Select one of the following: 4-6

One Semester:	
BCH 380	Biochemistry

Full Year:	
BCH 480	Advanced Biochemistry I
BCH 482	Advanced Biochemistry II
Total Hours	4-6

Minimum Required Grade: C-

#### Microbiology Requirement

Select one of the following: 3-5

BIOB 360 & BIOM 361	General Microbiology and General Microbiology Lab (equiv to 260 & 261)
BIOM 400	Medical Microbiology
Total Hours	3-5

Minimum Required Grade: C-

#### Additional Depth in Human Biological Sciences

Complete at least two courses from the following: 6-9

BCH 486	Biochemistry Research Lab
BIOB 410	Immunology
BIOB 425	Adv Cell & Molecular Biology
BIOB 468	Endocrinology
BIOB 483	Phylogenics and Evolution
BIOB 486	Genomics
BIOB 499	Undergraduate Thesis
BIOE 403	Vert Design & Evolution
BIOE 406	Behavior & Evolution
BIOH 462	Principles Medical Physiology
BIOL 435	Comparative Animal Physiology
BIOM 402	Medical Bacteriology & Mycology
BIOM 410	Microbial Genetics
BIOM 427 & BIOM 428	General Parasitology and General Parasitology Lab
BIOM 435	Virology
BIOM 450	Microbial Physiology
Total Hours	6-9

Minimum Required Grade: C-

### Required Courses Outside of the Major

Minimum Required Grade: C-

#### Mathematics and Psychology

**Rule:** All of the following courses are required

M 162	Applied Calculus	4
or M 171	Calculus I	
PSYX 100S	Intro to Psychology	3
STAT 216	Introduction to Statistics	4
Total Hours		11

Minimum Required Grade: C-

#### Chemistry

**Note:** If you plan to apply to a graduate or professional school such as medical or dental, you should plan to complete the advanced chemistry

sequence. If you plan to pursue nursing or a graduate program in physical therapy, the introductory chemistry sequence is sufficient. The advanced chemistry option is more flexible, and keeps more options open for future careers. Check the requirements of your intended professional program to help determine which sequence is right for you.

Select either one or two years of chemistry from the following: 8-20

#### One Year:

CHMY 121N	Introduction to General Chemistry
CHMY 123 & CHMY 124	Introduction to Organic and Biochemistry and Introduction to Organic and Biochemistry Lab

#### Two Years:

CHMY 141N	College Chemistry I
CHMY 142N	College Chemistry I Lab
CHMY 143N	College Chemistry II
CHMY 144N	College Chemistry II Lab
CHMY 221 & CHMY 222	Organic Chemistry I and Organic Chemistry I Lab
CHMY 223 & CHMY 224	Organic Chemistry II and Organic Chemistry II Lab

Total Hours 8-20

Minimum Required Grade: C-

### Physics

**Rule:** All of the following courses are required.

Select one of the following physics sequences: 10

#### Algebra- and Trigonometry-based:

PHSX 205N & PHSX 206N	College Physics I and College Physics I Laboratory
PHSX 207N & PHSX 208N	College Physics II and College Physics II Laboratory

#### Calculus-based:

PHSX 215N & PHSX 216N	Fund of Physics w/Calc I and Physics Laboratory I w/Calc
PHSX 217N & PHSX 218N	Fund of Physics w/Calc II and Physics Laboratory II w/Calc

Total Hours 10

Minimum Required Grade: C-

### Advanced College Writing Requirement

**Rule:** Complete the equivalent of a full writing course (either three 1/3 writing courses or one 2/3 writing course + one 1/3 writing course or one complete writing course)

**Note:** To meet the Advanced College Writing Requirement, Biology students take 2 or 3 partial writing courses (either three 1/3 writing courses or one 1/3 writing course and one 2/3 writing course) or one complete writing course. The Human Biological Sciences concentration does not require a specific advanced writing course.

Minimum Required Grade: C-

#### 1/3 Advanced Writing Courses

BCH 482	Advanced Biochemistry II	3
BIOB 410	Immunology	3

BIOB 425	Adv Cell & Molecular Biology	3
BIOB 483	Phylogenics and Evolution	3
BIOE 403	Vert Design & Evolution	5
BIOE 409	Behavior & Evolution Discussion	1
BIOE 428	Freshwater Ecology	5
BIOL 484	Plant Evolution	3
BIOM 402	Medical Bacteriology & Mycology	3
BIOO 320	General Botany	5
BIOO 434	Plant Physiology Lab	1
BIOO 470	Ornithology	4
BIOO 475	Mammalogy	4

Minimum Required Grade: C-

#### 2/3 Advanced Writing Courses

BCH 486	Biochemistry Research Lab	3
BCH 499	Senior Thesis/Capstone	3-6
BIOB 411	Immunology Laboratory	2
BIOB 499	Undergraduate Thesis	3-6
BIOE 342	Field Ecology	5
BIOE 371	Gen Ecology Lab (equiv to 271)	2
BIOM 411	Exprmntl Microbial Genetcs Lab	1
BIOM 499	Undergraduate Thesis	3-6

Minimum Required Grade: C-

#### Complete UD Writing Course

BIOH 462	Principles Medical Physiology	3
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### Exception to the Modern/Classical Languages Requirement

**Rule:** Choose one of the following Math courses

**Note:** The Division of Biological Sciences has been granted an exception to the Modern/Classical Language Requirement. Either of these Calculus courses (required by the major) will satisfy this requirement.

M 162 or M 171	Applied Calculus Calculus I	4
Total Hours		4

Minimum Required Grade: C-

## Biology - Natural History

### Bachelor of Arts - Biology; Natural History Concentration

#### College Humanities & Sciences

**Degree Specific Credits:** 73

**Required Cumulative GPA:** 2.0

#### Catalog Year: 2017-2018

**Note:** The natural history concentration is designed for students who seek an interdisciplinary science program. This concentration is not

research-oriented, and is not considered a preparatory program for traditional research-based graduate programs. It is, however, designed for students seeking careers in environmental education, science writing or illustration, natural history or wildlife film-making, or natural history centers or museums. There is enough latitude in the requirements to allow for a minor or even a double major in a related field of interest (e.g. journalism, art, media arts, etc.).

## 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

Biology/Microbiology Lower Division Core	17
Upper Division Core Courses Required by Natural History Concentration	20
Additional Upper Division Major Courses Required for Natural History Concentration	4
Required Courses Outside of the Major	32
Chemistry and Geology	
Cognate Electives	
Upper Division Writing Expectation for the Major	6-7
<b>Total Hours</b>	<b>79-80</b>

## Biology/Microbiology Lower Division Core

**Rule:** All of the following courses are required.

**Note:** The lower division core should be completed before attempting most upper division major courses.

AP Biology credit may be substituted for either BIOB 160N/BIOB 161N or BIOB 170N/BIOB 171N.

BIOB 160N	Principles of Living Systems	3
BIOB 161N	Prncpls of Living Systems Lab	1
BIOB 170N	Prncpls Biological Diversity	3
BIOB 171N	Prncpls Biological Dvrsty Lab	2
BIOB 260	Cellular and Molecular Biology	4
BIOB 272	Genetics and Evolution	4
<b>Total Hours</b>		<b>17</b>

Minimum Required Grade: C-

## Upper Division Core Courses Required by Natural History Concentration

**Rule:** All of the following courses are required.

Select one of the following:	5	
BIOE 370 & BIOE 371	General Ecology and Gen Ecology Lab (equiv to 271)	
BIOE 342	Field Ecology (taken at the Flathead Lake Biological Station)	
BIOE 406	Behavior & Evolution	3
BIOO 320	General Botany	5
BIOO 335	Rocky Mountain Flora	3

BIOO 462	Entomology	4
<b>Total Hours</b>		<b>20</b>

Minimum Required Grade: C-

## Additional Upper Division Major Courses Required for Natural History Concentration

**Rule:** Complete one of the following courses

BIOO 470 or BIOO 475	Ornithology Mammalogy	4
<b>Total Hours</b>		<b>4</b>

Minimum Required Grade: C-

## Required Courses Outside of the Major

Minimum Required Grade: C-

### Chemistry and Geology

**Rule:** Complete all of the following courses

CHMY 121N	Introduction to General Chemistry	3
CHMY 123	Introduction to Organic and Biochemistry	3
CHMY 124	Introduction to Organic and Biochemistry Lab	2
GEO 101N	Introduction to Physical Geology	3
GEO 102N	Introduction to Physical Geology Lab	1
<b>Total Hours</b>		<b>12</b>

Minimum Required Grade: C-

### Cognate Electives

**Rule:** Complete 20 credits from the following disciplines (maximum of 10 credits/discipline): ANTY, ASTR, CHMY (excluding CHMY 121N, CHMY 123, CHMY 124), GPHY, GEO (excluding GEO 101N, GEO 102N), FORS, M, PHSX, STAT, or WILD

**Note:** Students should plan on taking M 121 or higher level M course (prerequisite for BIOB 272 and GER math requirement) and STAT 216 (pre- or co-requisite for BIOE 371).

Students interested in combining the Natural History concentration with another subject area may, with the advisor's permission, substitute 20 credits in English - writing, journalism, photography, art, foreign language, business management, or other appropriate field.

## Advanced College Writing Requirement for the Major

**Rule:** Complete the equivalent of a full writing course (either three 1/3 writing courses or one 2/3 writing course + one 1/3 writing course or one complete writing course).

**Note:** To meet the Advanced College Writing Requirement, Biology students take 2 or 3 partial writing courses (either three 1/3 writing courses or one 1/3 writing course and one 2/3 writing course) or one complete writing course. The Natural History concentration requires one 2/3 writing course (BIOE 371) and several 1/3 writing courses (BIOO 320, BIOO 470 or BIOO 475). No additional writing courses must be taken to meet this requirement.

Minimum Required Grade: C-

## Exception to the Modern/Classical Languages Requirement

**Rule:** Choose one of the following Math courses

**Note:** The Division of Biological Sciences has been granted an exception to the Modern/Classical Language Requirement. Either of these Calculus courses will satisfy this requirement. The Natural History concentration does not require a calculus course; the Natural History student may choose to take one year of a modern or classical language, or they may take one of these calculus courses (which will count towards a cognate elective).

M 162	Applied Calculus	4
or M 171	Calculus I	
Total Hours		4

Minimum Required Grade: C-

## Biology - Teacher Preparation General Science Broadfield

### Bachelor of Arts - Biology - General Science Broadfield

#### College Humanities & Sciences

Degree Specific Credits: 72

Required Cumulative GPA: 2.75

Catalog Year: 2017-2018

## General Education Requirements

Information regarding these requirements can be found in the General Education Section (<http://catalog.umn.edu/academics/general-education-requirements>) of the catalog.

## Summary

Lower Division Courses in the Content Areas	52
Biology Content Courses	
Chemistry Content Courses	
Earth Sciences Content Courses	
Earth Sciences Content Courses - Environmental Geosciences	
Physics Content Courses	
Upper Division Content Courses	5
Required Content Courses Outside of the Major	8
Mathematics - Calculus	
Mathematics - Statistics	
Upper Division Writing Expectation for the Major	6
Total Hours	71

## Lower Division Courses in the Content Areas - Biology, Chemistry, Earth Sciences, and Physics

**Note:** A minimum of 10 credits is required in each of the four content areas.

### Biology Content Courses

**Rule:** All of the following courses are required

**Note:** AP Biology will substitute for either BIOB 160N/BIOB 161N or BIOB 170N/BIOB 171N.

BIOB 160N	Principles of Living Systems	3
BIOB 161N	Prncpls of Living Systems Lab	1
BIOB 170N	Prncpls Biological Diversity	3
BIOB 171N	Prncpls Biological Dvrsty Lab	2
BIOB 260	Cellular and Molecular Biology	4
BIOB 272	Genetics and Evolution	4
Total Hours		17

Minimum Required Grade: C-

### Chemistry Content Courses

**Rule:** All of the following courses are required.

**Note:** CHMY 141N/CHMY 142N & CHMY 143N/CHMY 144N should be completed before attempting CHMY 123.

CHMY 123	Introduction to Organic and Biochemistry	3.000
CHMY 141N	College Chemistry I	4
CHMY 142N	College Chemistry I Lab	1
CHMY 143N	College Chemistry II	4
CHMY 144N	College Chemistry II Lab	1
CHMY 485	Laboratory Safety	1
Total Hours		14

Minimum Required Grade: C-

### Earth Sciences Content Courses

**Rule:** All of the following courses are required

**Note:** ASTR 132N/ASTR 135N are NOT acceptable substitutes for ASTR 131N/ASTR 134N.

ASTR 131N	Planetary Astronomy	3
ASTR 134N	Planetary Astronomy Lab	1
GEO 101N	Introduction to Physical Geology	3
GEO 102N	Introduction to Physical Geology Lab	1
Total Hours		8

Minimum Required Grade: C-

### Earth Sciences Content Courses - Environmental Geosciences

**Rule:** Complete at least one of the following courses

GEO 105N	Oceanography	3
or GEO 103N	Introduction to Environmental Geology	

Minimum Required Grade: C-

**Physics Content Courses**

Select one of the following physics sequences: 10

**Algebra- and Trigonometry-based:**

PHSX 205N College Physics I  
& PHSX 206N and College Physics I Laboratory

PHSX 207N College Physics II  
& PHSX 208N and College Physics II Laboratory

**Calculus-based:**

PHSX 215N Fund of Physics w/Calc I  
& PHSX 216N and Physics Laboratory I w/Calc

PHSX 217N Fund of Physics w/Calc II  
& PHSX 218N and Physics Laboratory II w/Calc (require  
M 171 and M 172)

Total Hours 10

Minimum Required Grade: C-

**Upper Division Content Courses**

**Rule:** All of the following courses are required.

BIOE 370 General Ecology 3

BIOE 371 Gen Ecology Lab (equiv to 271) 2

Total Hours 5

Minimum Required Grade: C-

**Required Content Courses Outside of the Major**

Minimum Required Grade: C-

**Mathematics - Calculus**

**Rule:** Complete one of the following calculus courses

**Note:** Choose M 171, if you plan to take additional calculus courses, or if you plan a double major or minor in a field that requires more calculus (e.g. math, physics, biochemistry, computer science).

M 162 Applied Calculus 4

or M 171 Calculus I

Total Hours 4

Minimum Required Grade: C-

**Mathematics - Statistics**

**Rule:** The following course is required

STAT 216 Introduction to Statistics 4

Total Hours 4

Minimum Required Grade: C-

**Advanced College Writing Requirement**

**Rule:** Complete the equivalent of a full writing course (either three 1/3 writing courses or one 2/3 writing course + one 1/3 writing course or one complete writing course).

**Note:** To meet the Advanced College Writing Requirement, Biology students take 2 or 3 partial writing courses (either three 1/3 writing courses or one 1/3 writing course and one 2/3 writing course) or one

complete writing course. The General Science Broadfield requires one 2/3 writing course (BIOE 371). The Advanced College Writing Requirement is completed with one additional course, chosen from any of the following. The recommended course is B100 434 (taken with B100 433), which are required for the Teaching Biology endorsement.

Minimum Required Grade: C-

**1/3 Advanced Writing Courses**

BCH 482 Advanced Biochemistry II 3

BIOB 410 Immunology 3

BIOB 425 Adv Cell & Molecular Biology 3

BIOB 483 Phylogenics and Evolution 3

BIOE 403 Vert Design & Evolution 5

BIOE 409 Behavior & Evolution Discussion 1

BIOE 428 Freshwater Ecology 5

BIOL 484 Plant Evolution 3

BIOM 402 Medical Bacteriology& Mycology 3

BIOO 320 General Botany 5

BIOO 434 Plant Physiology Lab 1

BIOO 470 Ornithology 4

BIOO 475 Mammalogy 4

Minimum Required Grade: C-

**2/3 Advanced Writing Courses**

BCH 486 Biochemistry Research Lab 3

BCH 499 Senior Thesis/Capstone 3-6

BIOB 411 Immunology Laboratory 2

BIOB 499 Undergraduate Thesis 3-6

BIOE 342 Field Ecology 5

BIOE 371 Gen Ecology Lab (equiv to 271) 2

BIOM 411 Exprmntl Microbial Genetcs Lab 1

BIOM 499 Undergraduate Thesis 3-6

Minimum Required Grade: C-

**Complete Advanced Writing Course**

BIOH 462 Principles Medical Physiology 3

**Exception to the Modern/Classical Languages Requirement**

**Rule:** Choose one of the following Math courses

**Note:** The Division of Biological Sciences has been granted an exception to the Modern/Classical Language Requirement. Either of these Calculus courses (required by the major) will satisfy this requirement.

M 162 Applied Calculus 4

or M 171 Calculus I

Total Hours 4

Minimum Required Grade: C-

## Teaching General Science Broadfield Track

Individuals interested in teaching in K-12 schools must complete a degree in the content area they want to teach plus the teacher preparation program through the Department of Curriculum and Instruction.

Individuals must complete the teaching major/teaching track within that degree program, which may contain different course requirements than the academic major since the sequence of courses is designed to meet state standards. Upon completion of the degree program with the teaching track and the secondary licensure program, one will be eligible for a standard Montana teaching license in this content area.

- Secondary Education Licensure Program (<http://www.coehs.umt.edu/departments/currinst/undergradprograms/seced/default.php>)
- Licensure Degree Requirements (p. 101)

This is an advising track only and not an official program as recognized by the University of Montana (UM) or the Montana University System. This information will not appear on your UM transcript, diploma, university lists, student data system, or university publication. You do not fill out a major change for a track.

**Note:** This option provides students with coursework in biology, chemistry, physics, earth sciences and mathematics needed to be certified by the State of Montana in broad-field science. This allows students to teach secondary sciences—biology, chemistry, physics, and earth science (in middle and high schools). This option is appropriate for students interested in teaching science in smaller, more rural schools. In order to be licensed to teach secondary science, students must be admitted to the Teacher Education Program through the Phyllis J. Washington College of Education and Human Sciences.

### Education

**Rule:** The following course is required

**Note:** The course number EDU 497 covers many different teaching methods courses. The section of EDU 497 entitled "Methods: 5 - 12 Science" is required for the General Science Broadfield.

EDU 497	Teaching and Assessing	4
Total Hours		4

Minimum Required Grade: C-

### Secondary Teaching Licensure

**Note:** For endorsement to teach general science, a student also must gain admission to the Teacher Education Program and meet all the requirements for secondary teaching licensure (see the College of Education & Human Sciences (p. 83))

## Biology Minor

### Minor - Biology

### College Humanities & Sciences

**Degree Specific Credits:** 25

**Required Cumulative GPA:** 2.0

## Catalog Year: 2017-2018

### Summary

Biology/Microbiology Lower Division Core	17
Upper Division Biology Requirement for the Minor	8
Total Hours	25

### Biology/Microbiology Lower Division Core

**Rule:** All of the following courses are required.

**Note:** The lower division core should be completed before attempting most upper division BIO- courses.

AP Biology may be substituted for either BIOB 160N/BIOB 161N or BIOB 170N/BIOB 171N.

BIOB 160N	Principles of Living Systems	3
BIOB 161N	Prncpls of Living Systems Lab	1
BIOB 170N	Prncpls Biological Diversity	3
BIOB 171N	Prncpls Biological Dvrsty Lab	2
BIOB 260	Cellular and Molecular Biology	4
BIOB 272	Genetics and Evolution	4
Total Hours		17

Minimum Required Grade: C-

### Upper Division Biology Requirement for the Minor

**Rule:** Complete 8 credits of Upper Division in Biology (BIOB, BIOE, BIOH, BIOL, or B100)

**Note:** These eight credits may not include BIOG, BCH, or BIOM courses.

Minimum Required Grade: C-

8 Total Credits Required

### Teaching Biology Track

A teaching minor is an academic minor which may contain different course requirements designed to meet state standards. Those interested in teaching in K-12 schools must complete a teaching major in a content area plus the teacher preparation program through the Department of Curriculum and Instruction. Additional teaching areas can be added through completion of either a teaching major or a teaching minor in that content area.

- Secondary Education Licensure Program (<http://www.coehs.umt.edu/departments/currinst/undergradprograms/seced/default.php>)
- Licensure Degree Requirements (p. 101)

To sign up for this option, you need to contact the Curriculum and Instruction Department. Do not fill out a major/minor form for graduation or the major/minor/concentration section of the major change form. Approvals for this option must come from the Curriculum and Instruction Department.

Tracks will not appear on your UM transcript, diploma, university lists, student data system, or university publication and are used for advising purposes only. You do not fill out a major change for a track.

**Note:** In order to be licensed to teach secondary biology, students must be admitted to the Teacher Education Program through the Phyllis J. Washington College of Education and Human Sciences.

### Upper Division Core Courses Required by the Biology Teaching Minor

**Rule:** All of the following courses are required.

BIOM 360	General Microbiology	3
BIOM 361	General Microbiology Lab	2
Total Hours		5

Minimum Required Grade: C-

### Required Content Courses Outside of the Major

Minimum Required Grade: C-

#### Mathematics - Calculus

**Rule:** Complete one of the following calculus courses

**Note:** Choose M 171, if you plan to take additional calculus courses, or if you plan a double major or minor in a field that requires more calculus (e.g. math, physics, biochemistry, computer science).

M 162	Applied Calculus	4
or M 171	Calculus I	
Total Hours		4

Minimum Required Grade: C-

#### Mathematics - Statistics

**Rule:** The following course is required

STAT 216	Introduction to Statistics	4
Total Hours		4

Minimum Required Grade: C-

#### Chemistry

**Rule:** All of the following courses are required

CHMY 121N	Introduction to General Chemistry	3
CHMY 123	Introduction to Organic and Biochemistry	3.000
CHMY 485	Laboratory Safety	1
Total Hours		7

Minimum Required Grade: C-

#### Environmental Geosciences

**Rule:** Complete one of the following courses

GEO 105N	Oceanography	3
or GEO 103N	Introduction to Environmental Geology	
Total Hours		3

Minimum Required Grade: C-

#### Education

**Rule:** The following course is required

**Note:** The course number EDU 497 covers many different teaching method courses. The section of EDU 497 entitled "Methods: 5 - 12 Science" is required for the Teaching Biology minor.

EDU 497	Teaching and Assessing	4
Total Hours		4

Minimum Required Grade: C-

#### Secondary Teaching Licensure

**Note:** For endorsement to teach biology, a student also must gain admission to the Teacher Education Program and meet all the requirements for secondary teaching licensure (see the College of Education & Human Sciences (p. 83))

## Medical Laboratory Science

### Bachelor of Science - Medical Laboratory Science

#### College Humanities & Sciences

**Degree Specific Credits:** 86 - 93

**Required Cumulative GPA:** 2.0

#### Catalog Year: 2017-2018

**Note:** A Medical Laboratory Science degree prepares students to perform various chemical, histological, and microbial laboratory procedures used in the diagnosis, study, and treatment of disease. Students with this degree seek employment in hospital laboratories, physicians' offices, and health departments. For clinical practice, a student must be certified through the Board of Registry by completing a one year clinical practicum.

### General Education Requirement

Information regarding these requirements can be found in the General Education Section (<http://catalog.umd.edu/academics/general-education-requirements>) of the catalog.

### Summary

Lower Division Biology Courses	8
Required Major Courses for Medical Technology 4 + 1 or 3 + 1	31-38
Required Courses Outside the Major	42
Mathematics - Calculus	
Mathematics - Statistics	
Chemistry	
Physics	
Upper Division Writing Expectation for the Major	5
Total Hours	86-93

#### Lower Division Biology Courses

**Rule:** All of the following courses are required.



**Note:** Either BIOB 160N (C- or better) or BCH 110/BCH 111 (C- or better) or BIOH 112 (B- or better) must be taken as a prerequisite for BIOB 260, unless a student has AP Biology credit.

BIOB 260	Cellular and Molecular Biology	4
BIOB 272	Genetics and Evolution	4
Total Hours		8

Minimum Required Grade: C-

## Required Courses Outside the Major

### Mathematics - Calculus

**Rule:** Complete one of the following calculus courses

M 162	Applied Calculus	4
or M 171	Calculus I	
Total Hours		4

Minimum Required Grade: C-

### Mathematics - Statistics

**Rule:** The following course is required

STAT 216	Introduction to Statistics	4
Total Hours		4

Minimum Required Grade: C-

### Physics

**Rule:** All of the following courses are required

Select one of the following physics sequences: 10

Algebra- and Trigonometry-based:

PHSX 205N College Physics I  
& PHSX 206N and College Physics I Laboratory

PHSX 207N College Physics II  
& PHSX 208N and College Physics II Laboratory

Calculus-based:

PHSX 215N Fund of Physics w/Calc I  
& PHSX 216N and Physics Laboratory I w/Calc

PHSX 217N Fund of Physics w/Calc II  
& PHSX 218N and Physics Laboratory II w/Calc

Total Hours 10

## Advanced College Writing Requirement

**Rule:** Complete the equivalent of a full writing course (either three 1/3 writing courses or one 2/3 writing course + one 1/3 writing course or one complete writing course).

**Note:** To meet the Advanced College Writing Requirement, Medical Laboratory Science 4+1 students take BIOB 410 (a 1/3 writing course) and BIOB 411 (a 2/3 writing course).

**Note:** To meet the Advanced College Writing Requirement, Medical Laboratory Science 3+1 students take two 1/3 writing courses (BIOB 410 and BIOM 402). The Advanced College Writing Requirement is completed with one more course, chosen from any of the following. (BIOB 411 is recommended by many of the clinical practicum affiliates).

Minimum Required Grade: C-

## 1/3 Advanced Writing Courses

BCH 482	Advanced Biochemistry II	3
BIOB 410	Immunology	3
BIOB 425	Adv Cell & Molecular Biology	3
BIOB 483	Phylogenics and Evolution	3
BIOE 403	Vert Design & Evolution	5
BIOE 409	Behavior & Evolution Discussion	1
BIOE 428	Freshwater Ecology	5
BIOL 484	Plant Evolution	3
BIOM 402	Medical Bacteriology& Mycology	3
BIOO 320	General Botany	5
BIOO 434	Plant Physiology Lab	1
BIOO 470	Ornithology	4
BIOO 475	Mammalogy	4

## 2/3 Advanced Writing Courses

BCH 486	Biochemistry Research Lab	3
BCH 499	Senior Thesis/Capstone	3-6
BIOB 411	Immunology Laboratory (recommended)	2
BIOB 499	Undergraduate Thesis	3-6
BIOE 342	Field Ecology	5
BIOE 371	Gen Ecology Lab (equiv to 271)	2
BIOM 411	Exprmntl Microbial Genetcs Lab	1
BIOM 499	Undergraduate Thesis	3-6

## Complete Advanced Writing Course

BIOH 462	Principles Medical Physiology	3
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## Exception to the Modern/Classical Languages Requirement

**Rule:** Choose one of the following Math courses

**Note:** The Division of Biological Sciences has been granted an exception to the Modern/Classical Languages Requirement. Either of these calculus courses (required by the major) will satisfy this requirement.

M 162	Applied Calculus	4
or M 171	Calculus I	
Total Hours		4

Minimum Required Grade: C-

## Bachelor of Science - Medical Laboratory Science; Track: 4 + 1

The 4+1 track is the more flexible option, in which students complete the four years of the Bachelor's degree on the UM campus. Students may apply to a clinical practicum program anywhere in the country.

## Required Major Courses for Medical Laboratory Science 4 + 1

**Rule:** All of the following courses are required

Select one of the following:

BCH 380	Biochemistry	4
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or BCH 480 & BCH 482	Advanced Biochemistry I and Advanced Biochemistry II	
BIOB 410	Immunology	3
BIOB 411	Immunology Laboratory	2
BIOH 365	Human AP I for Health Profsns	4
BIOH 405	Hematology	3
BIOM 360	General Microbiology	3
BIOM 361	General Microbiology Lab	2
BIOM 402	Medical Bacteriology & Mycology	3
BIOM 403	Medicl Bacteriology & Myclgy Lb	2
BIOM 407	Clinical Diagnosis	2
BIOM 408	Clinical Diagnosis Lab	1
BIOM 427	General Parasitology	2
BIOM 428	General Parasitology Lab	2
BIOM 435	Virology	3

### Chemistry

**Rule:** All of the following courses are required

CHMY 141N	College Chemistry I	4
CHMY 142N	College Chemistry I Lab	1
CHMY 143N	College Chemistry II	4
CHMY 144N	College Chemistry II Lab	1
CHMY 221	Organic Chemistry I	3
CHMY 222	Organic Chemistry I Lab	2
CHMY 223	Organic Chemistry II	3
CHMY 224	Organic Chemistry II Lab	2
CHMY 311	Analytical Chem-Quant Analysis	4
Total Hours		24

## Bachelor of Science - Medical Laboratory Science; Track: 3 + 1

The 3+1 track is the faster option, as the clinical practicum year is part of the degree. Three years are spent on the UM campus, and then the clinical practicum year with the MUS CLS program (or with one of our affiliated programs) is the fourth year of the Bachelor's degree. Note: this degree requires a total of 130 credits.

### Required Major Courses for Medical Laboratory Science 3 + 1

**Rule:** All of the following courses are required

BCH 380	Biochemistry	4
BIOB 410	Immunology	3
BIOH 365	Human AP I for Health Profsns	4
BIOH 405	Hematology	3
BIOM 360	General Microbiology	3
BIOM 361	General Microbiology Lab	2
BIOM 402	Medical Bacteriology & Mycology	3
BIOM 403	Medicl Bacteriology & Myclgy Lb	2
BIOM 427	General Parasitology	2
BIOM 428	General Parasitology Lab	2
BIOM 435	Virology	3
Total Hours		31

Minimum Required Grade: C-

### Required Professional Practicum

**Rule:** All of the following courses are required

**Note:** You must apply for the professional practicum to one of our affiliated programs during the autumn prior to enrollment. To be competitive for this practicum, you must be in good academic standing with a minimum GPA of ~3.0, and demonstrate a commitment to the clinical laboratory profession. For more information, visit the Medical Laboratory Sciences website (<http://hs.umt.edu/medtech>). Contact Dr. Mike Minnick to apply for the practicum.

BIOH 470	Summer Clinical Laboratory	12
BIOH 471	Professional Training I	13
BIOH 472	Professional Training II	12
Total Hours		37

Minimum Required Grade: C-

### Chemistry

**Rule:** All of the following courses are required

CHMY 141N	College Chemistry I	4
CHMY 142N	College Chemistry I Lab	1
CHMY 143N	College Chemistry II	4
CHMY 144N	College Chemistry II Lab	1
CHMY 221	Organic Chemistry I	3
CHMY 222	Organic Chemistry I Lab	2
Total Hours		15

Minimum Required Grade: C-

## Microbiology - Microbial Ecology

### Bachelor of Science - Microbiology; Microbial Ecology Concentration

#### College Humanities & Sciences

Degree Specific Credits: 76

Required Cumulative GPA: 2.0

### Catalog Year: 2017-2018

**Note:** Microbiology is the study of microorganisms including bacteria, fungi, viruses, and protozoa. The concentration in Microbial Ecology emphasizes microbial structure and function as well as interactions and relationships with the environment and other organisms. Students may continue their studies at the graduate level and seek research careers in government, or private laboratories.

### 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

Biology/Microbiology Lower Division Core	17
Upper Division Microbiology Core Courses	19
Additional UD Major Courses Required for Microbial Ecology Concentration	11-15
<b>Biochemistry</b>	
Additional UD Depth Courses in Microbiology	
Required Courses Outside of the Major	27-39
Mathematics - Calculus	
Mathematics - Statistics	
Chemistry	
Physics	
Additional Science Requirement	
Upper Division Writing Expectation for the Major	2-7
Total Hours	76-97

### Biology/Microbiology Lower Division Core

**Rule:** All of the following courses are required.

**Note:** The lower division core should be completed before attempting most upper division major courses.

AP Biology credit may be substituted for either BIOB 160N/BIOB 161N or BIOB 170N/BIOB 171N.

BIOB 160N	Principles of Living Systems	3
BIOB 161N	Prncpls of Living Systems Lab	1
BIOB 170N	Prncpls Biological Diversity	3
BIOB 171N	Prncpls Biological Dvrsty Lab	2
BIOB 260	Cellular and Molecular Biology	4
BIOB 272	Genetics and Evolution	4
Total Hours		17

Minimum Required Grade: C-

### Upper Division Microbiology Core Courses

**Rule:** All of the following courses are required.

BIOE 370	General Ecology	3
BIOM 360	General Microbiology (equiv to 260)	3
BIOM 361	General Microbiology Lab (equiv to 261)	2
BIOM 410	Microbial Genetics	3
BIOM 411	Exprmntl Microbial Genetcs Lab	1
BIOM 415	Microbial Dvrsty Eclgy & Evltn	3
BIOM 450	Microbial Physiology	3
BIOM 451	Microbial Physiology Lab	1
Total Hours		19

Minimum Required Grade: C-

### Additional UD Major Courses Required for Microbial Ecology Concentration

Minimum Required Grade: C-

### Biochemistry

Select either one semester or one year of biochemistry from the following: 4-6

<b>One Semester:</b>	
BCH 380	Biochemistry
<b>One Year:</b>	
BCH 480	Advanced Biochemistry I
BCH 482	Advanced Biochemistry II
Total Hours	4-6

Minimum Required Grade: C-

### Additional UD Depth Courses in Microbiology

Select 7-9 credits from the following (labs must be taken if available): 7-9

BIOB 410 & BIOB 411	Immunology and Immunology Laboratory
BIOB 440	Biological Electron Microscopy
BIOE 371	Gen Ecology Lab (equiv to 271)
BIOE 428	Freshwater Ecology
BIOE 439	Stream Ecology
BIOE 453	Ecology of Small & Large Lakes
BIOM 427 & BIOM 428	General Parasitology and General Parasitology Lab
BIOM 435	Virology
BIOM 490	Adv Undergrad Research
BIOO 433 & BIOO 434	Plant Physiology and Plant Physiology Lab
Total Hours	7-9

Minimum Required Grade: C-

### Required Courses Outside of the Major

Minimum Required Grade: C-

#### Mathematics - Calculus

**Rule:** Complete one of the following calculus courses

M 162	Applied Calculus	4
or M 171	Calculus I	
Total Hours		4

Minimum Required Grade: C-

#### Mathematics - Statistics

**Rule:** The following course is required

STAT 216	Introduction to Statistics	4
Total Hours		4

Minimum Required Grade: C-

### Chemistry

Select either one or two years of chemistry from the following: 8-20

<b>One Year:</b>	
CHMY 121N	Introduction to General Chemistry

CHMY 123 & CHMY 124	Introduction to Organic and Biochemistry and Introduction to Organic and Biochemistry Lab
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Two Years:

CHMY 141N	College Chemistry I
CHMY 142N	College Chemistry I Lab
CHMY 143N	College Chemistry II
CHMY 144N	College Chemistry II Lab
CHMY 221 & CHMY 222	Organic Chemistry I and Organic Chemistry I Lab
CHMY 223 & CHMY 224	Organic Chemistry II and Organic Chemistry II Lab

Total Hours 8-20

Minimum Required Grade: C-

**Physics****Rule:** The following courses are required.

Select one of the following physics sequences: 5

Algebra- and Trigonometry-based:	
PHSX 205N & PHSX 206N	College Physics I and College Physics I Laboratory

Calculus-based:	
PHSX 215N & PHSX 216N	Fund of Physics w/Calc I and Physics Laboratory I w/Calc

Total Hours 5

Minimum Required Grade: C-

**Additional Science Requirement**

Select at least 6 credits from the following: 6

CHMY 311	Analytical Chem-Quant Analysis
CSCI 135	Fund of Computer Science I
NRSM 210N	Soils, Water and Climate
GEO 420	Hydrogeology
GEO 482	Global Change
M 172	Calculus II
M 273	Multivariable Calculus
PHSX 207N	College Physics II
PHSX 208N	College Physics II Laboratory
STAT 451	Statistical Methods I
STAT 452	Statistical Methods II
STAT 457	Computer Data Analysis I
STAT 458	Computer Data Analysis II

Total Hours 6

Minimum Required Grade: C-

**Advanced College Writing Requirement****Rule:** Complete the equivalent of a full writing course (either three 1/3 writing courses or one 2/3 writing course + one 1/3 writing course or one complete writing course).**Note:** To meet the Advanced College Writing Requirement, Microbiology students take at least 2 partial writing courses. The Microbiology degree requires one 2/3 writing course (BIOM 411). The Advanced College

Writing Requirement is completed with one more course, chosen from any of the following.

Minimum Required Grade: C-

**1/3 Advanced Writing Courses**

BCH 482	Advanced Biochemistry II	3
BIOB 410	Immunology	3
BIOB 425	Adv Cell & Molecular Biology	3
BIOB 483	Phylogenics and Evolution	3
BIOE 403	Vert Design & Evolution	5
BIOE 409	Behavior & Evolution Discussion	1
BIOE 428	Freshwater Ecology	5
BIOL 484	Plant Evolution	3
BIOM 402	Medical Bacteriology & Mycology	3
BIOO 320	General Botany	5
BIOO 434	Plant Physiology Lab	1
BIOO 470	Ornithology	4
BIOO 475	Mammalogy	4

Minimum Required Grade: C-

**2/3 Advanced Writing Courses**

BCH 486	Biochemistry Research Lab	3
BCH 499	Senior Thesis/Capstone	3-6
BIOB 411	Immunology Laboratory	2
BIOB 499	Undergraduate Thesis	3-6
BIOE 342	Field Ecology	5
BIOE 371	Gen Ecology Lab (equiv to 271)	2
BIOM 411	Exprmntl Microbial Genetics Lab	1
BIOM 499	Undergraduate Thesis	3-6

Minimum Required Grade: C-

**Complete Advanced Writing Course**

BIOH 462	Principles Medical Physiology	3
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**Exception to the Modern/Classical Languages Requirement****Rule:** Choose one of the following Math courses**Note:** The Division of Biological Sciences has been granted an exception to the Modern/Classical Language Requirement. Either of these Calculus courses (required by the major) will satisfy this requirement.

M 162 or M 171	Applied Calculus Calculus I	4
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Total Hours 4

Minimum Required Grade: C-

**Microbiology B.S.**

# Bachelor of Science - Microbiology

## College Humanities & Sciences

Degree Specific Credits: 91

Required Cumulative GPA: 2.0

### Catalog Year: 2017-2018

**Note:** Microbiology is the study of microorganisms including bacteria, fungi, viruses, and protozoa. This general microbiology concentration emphasizes microbial structure and function, as well as interactions with humans. This is a graduate prep program, and is appropriate for students interested in research careers in academia or private or government laboratories. It is also an excellent concentration for pre-medical sciences students.

## 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

Biology/Microbiology Lower Division Core	17
Upper Division Microbiology Core Courses	19
Additional UD Major Courses Required for Microbiology	11-15
Biochemistry	
Additional UD Depth Courses in Microbiology	
Required Courses Outside of the Major	42
Mathematics	
Chemistry	
Physics	
Upper Division Writing Expectation for the Major	2-7
Total Hours	91-100

### Biology/Microbiology Lower Division Core

**Rule:** All of the following courses are required.

**Note:** The lower division core should be completed before attempting most upper division major courses.

AP Biology credit may be substituted for either BIOB 160N/BIOB 161N or BIOB 170N/BIOB 171N.

BIOB 160N	Principles of Living Systems	3
BIOB 161N	Prncpls of Living Systems Lab	1
BIOB 170N	Prncpls Biological Diversity	3
BIOB 171N	Prncpls Biological Dvrsty Lab	2
BIOB 260	Cellular and Molecular Biology	4
BIOB 272	Genetics and Evolution	4
Total Hours		17

Minimum Required Grade: C-

### Upper Division Microbiology Core Courses

**Rule:** All of the following courses are required.

BIOM 360	General Microbiology	3
BIOM 361	General Microbiology Lab	2
BIOM 410	Microbial Genetics	3
BIOM 411	Exprmntl Microbial Genetcs Lab	1
BIOM 415	Microbial Dvrsty Eclgy & Evltn	3
BIOM 450	Microbial Physiology	3
BIOM 451	Microbial Physiology Lab	1
Total Hours		16

Minimum Required Grade: C-

### Additional UD Major Courses Required for Microbiology

Minimum Required Grade: C-

#### Biochemistry

Select either one semester or one year of biochemistry from the following: 4-6

One Semester:		
BCH 380	Biochemistry	
One Year:		
BCH 480	Advanced Biochemistry I	
BCH 482	Advanced Biochemistry II	
Total Hours		4-6

Minimum Required Grade: C-

#### Additional UD Depth Courses in Microbiology

Select 10-12 credits from the following (labs must be taken if available): 10-12

BIOB 410 & BIOB 411	Immunology and Immunology Laboratory	
BIOB 483	Phylogenics and Evolution	
BIOE 370	General Ecology	
BIOH 405	Hematology	
BIOM 402 & BIOM 403	Medical Bacteriology & Mycology and Medicl Bacteriolgy & Myclgy Lb	
BIOM 407 & BIOM 408	Clinical Diagnosis and Clinical Diagnosis Lab	
BIOM 427 & BIOM 428	General Parasitology and General Parasitology Lab	
BIOM 435	Virology	
BIOM 490	Adv Undergrad Research	
Total Hours		10-12

Minimum Required Grade: C-

### Required Courses Outside of the Major

Minimum Required Grade: C-

#### Mathematics

**Rule:** All of the following courses are required.

M 162	Applied Calculus	4
or M 171	Calculus I	
STAT 216	Introduction to Statistics	4
Total Hours		8

Minimum Required Grade: C-

### Chemistry

**Rule:** All of the following courses are required.

CHMY 141N	College Chemistry I	4
CHMY 142N	College Chemistry I Lab	1
CHMY 143N	College Chemistry II	4
CHMY 144N	College Chemistry II Lab	1
CHMY 221	Organic Chemistry I	3
CHMY 222	Organic Chemistry I Lab	2
CHMY 223	Organic Chemistry II	3
CHMY 224	Organic Chemistry II Lab	2
CHMY 311	Analytical Chem-Quant Analysis	4
Total Hours		24

Minimum Required Grade: C-

### Physics

**Rule:** All of the following courses are required.

Select one of the following physics sequences:	10	
Algebra- and Trigonometry-based:		
PHSX 205N	College Physics I	
& PHSX 206N	and College Physics I Laboratory	
PHSX 207N	College Physics II	
& PHSX 208N	and College Physics II Laboratory	
Calculus-based:		
PHSX 215N	Fund of Physics w/Calc I	
& PHSX 216N	and Physics Laboratory I w/Calc	
PHSX 217N	Fund of Physics w/Calc II	
& PHSX 218N	and Physics Laboratory II w/Calc	
Total Hours		10

Minimum Required Grade: C-

## Advanced College Writing Requirement

**Rule:** Complete the equivalent of a full writing course (either three 1/3 writing courses or one 2/3 writing course + one 1/3 writing course or one complete writing course)

**Note:** To meet the Advanced College Writing Requirement, Microbiology students take at least 2 partial writing courses. The Microbiology degree requires one 2/3 writing course (BIOM 411). The Advanced College Writing Requirement is completed with one more course, chosen from any of the following.

Minimum Required Grade: C-

### 1/3 Advanced Writing Courses

BCH 482	Advanced Biochemistry II	3
BIOB 410	Immunology	3
BIOB 425	Adv Cell & Molecular Biology	3

BIOB 483	Phylogenics and Evolution	3
BIOE 403	Vert Design & Evolution	5
BIOE 409	Behavior & Evolution Discussion	1
BIOE 428	Freshwater Ecology	5
BIOL 484	Plant Evolution	3
BIOM 402	Medical Bacteriology& Mycology	3
BIOO 320	General Botany	5
BIOO 434	Plant Physiology Lab	1
BIOO 470	Ornithology	4
BIOO 475	Mammalogy	4

Minimum Required Grade: C-

### 2/3 Advanced Writing Courses

BCH 486	Biochemistry Research Lab	3
BCH 499	Senior Thesis/Capstone	3-6
BIOB 411	Immunology Laboratory	2
BIOB 499	Undergraduate Thesis	3-6
BIOE 342	Field Ecology	5
BIOE 371	Gen Ecology Lab (equiv to 271)	2
BIOM 411	Exprmntl Microbial Genetcs Lab	1
BIOM 499	Undergraduate Thesis	3-6

Minimum Required Grade: C-

### Complete Advanced Writing Course

BIOH 462	Principles Medical Physiology	3
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## Exception to the Modern/Classical Languages Requirement

**Rule:** Choose one of the following Math courses

**Note:** The Division of Biological Sciences has been granted an exception to the Modern/Classical Language Requirement. Either of these Calculus courses (required by the major) will satisfy this requirement.

M 162	Applied Calculus	4
or M 171	Calculus I	
Total Hours		4

Minimum Required Grade: C-

## Microbiology Minor Minor - Microbiology

### College Humanities & Sciences

**Degree Specific Credits:** 19

**Required Cumulative GPA:** 2.0

**Catalog Year:** 2017-2018

## Summary

Microbiology Core Courses	16
Additional Upper Division Microbiology Requirement	3
Total Hours	19

### Microbiology Core Courses

**Rule:** All of the following courses are required.

BIOM 360	General Microbiology	3
BIOM 361	General Microbiology Lab	2
BIOM 410	Microbial Genetics	3
BIOM 411	Exprmntl Microbial Genetcs Lab	1
BIOM 415	Microbial Dvrsty Eclgy & Evltn	3
BIOM 450	Microbial Physiology	3
BIOM 451	Microbial Physiology Lab	1
Total Hours		16

Minimum Required Grade: C-

### Additional Upper Division Microbiology Requirement

**Rule:** Complete 3 additional upper division credits in BIOM

Minimum Required Grade: C-

3 Total Credits Required

## Central and Southwest Asian Studies

Dr. Ardi Kia, Advisor

The University of Montana has emerged as a national and international leader in recognizing the significance of Central and Southwest Asia, and translating that awareness into a major academic program. The program builds on significant faculty experience and expertise in the region, and includes scholars from a variety of academic disciplines. The program has also organized intensive summer language training programs at UM, as well as summer study tours for K-12 teachers to Central Asia, and also hosts an annual conference that brings leading scholars, diplomats, analysts, and journalists to the UM campus.

The University of Montana offers an undergraduate major as well as a Minor in Central and Southwest Asian Studies. Arabic, Chinese, Persian, Russian and Turkish language instruction are also offered. Faculty exchanges have been organized with universities in China, Egypt, Georgia, Kazakhstan, Kyrgyzstan, Morocco, Russia and Tajikistan.

### Undergraduate

- Central and Southwest Asian Studies B.A. (p. 195)

### Undergraduate Minors

- Central and Southwest Asian Studies (p. 196)

## Central and Southwest Asian Studies B.A.

## Bachelor of Arts - Central & Southwest Asian Stds

### College Humanities & Sciences

**Degree Specific Credits:** 42

**Required Cumulative GPA:** 2.0

### Catalog Year: 2017-2018

**Note:** Students are required to complete 12 credits of Lower-Division core courses, 9 credits of Upper-Division core courses, in addition to completing the Capstone requirement. Students also must complete the second year sequence (8-10 credits) of either Arabic OR Chinese OR Russian, for a combined total of 42-44 credits. Students are strongly recommended to take a third or fourth year of language study.

### 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

Lower Division Core Courses	12
Upper-Division Core Courses	9
Language Electives	18-20
Capstone Requirement	3
Total Hours	42-44

### Lower Division Core Courses

**Rule:** Must complete all of the following courses

ANTY 141H	The Silk Road	3
ANTY 241H	Central Asian Culture and Civ	3
CSWA 262H	Islamic Civil: Classical Age	3
Total Hours		9

Minimum Required Grade: C-

### Upper-Division Core Courses

Select three of the following:	9	
ANTY 347	Central Asia and Its Neighbors	
ANTY 444	Artistic Tradtns Central Asia	
HSTR 368	Iran Between Two Revolutions	
HSTR 386	Nationalism Modern Middle East	
HSTR 442	Cities/Landscps Central Asia	
Total Hours		9

Minimum Required Grade: C-

### Language Electives

**Rule:** Must complete 1 of the following subcategories

## 18-20 Total Credits Required

**Arabic****Rule:** May choose to complete the following courses

ARAB 101	Elementary Modern Standard Arabic I	5
ARAB 102	Elementary Modern Standard Arabic II	5
ARAB 201	Intermediate Modern Standard Arabic I	4
ARAB 202	Intermediate Modern Standard Arabic II	4
Total Hours		18

Minimum Required Grade: C-

**Chinese****Rule:** May choose to complete the following courses

CHIN 101	Elementary Chinese I	5
CHIN 102	Elementary Chinese II	5
CHIN 201	Intermediate Chinese I	5
CHIN 202	Intermediate Chinese II	5
Total Hours		20

Minimum Required Grade: C-

**Russian****Rule:** May choose to complete the following courses

RUSS 101	Elementary Russian I	4
RUSS 102	Elementary Russian II	4
RUSS 201	Intermediate Russian I	4
RUSS 202	Intermediate Russian II	4
Total Hours		16

Minimum Required Grade: C-

**Capstone Requirement****Rule:** Must complete 1 of the following courses

ANTY 494	Seminar/Workshop	3
Total Hours		3

Minimum Required Grade: C-

**Central and Southwest Asian Studies Minor**

The Central and Southwest Asian Studies Minor is available to all students. It consists of eighteen credits. Students selecting the minor are required to successfully complete HSTR 146H and six credits in foundational Central and Southwest Asian Studies courses (200-level courses). Students must then complete nine credits of additional course work at the 300- or 400- level. No language courses are required; however, students pursuing the minor are strongly encouraged to meet the University-wide general education foreign language competency requirement by completing at least the second semester of one of the following languages (100 level or higher): Chinese, Persian, Arabic, Turkish or Russian. Participation in a study-abroad program is strongly recommended.

**Minor - Central & Southwest Asian Stds****College Humanities & Sciences****Degree Specific Credits:** 18**Required Cumulative GPA:** 2.0**Catalog Year: 2017-2018**

**Note:** The Central and Southwest Asian Studies minor is available to all students. No language courses are required. Participation in a study-abroad program is strongly recommended.

**Summary**

Lower Division Core Courses	9
Introductory Course	
Foundational Courses	
Upper Division Core Courses	9
Total Hours	18

**Lower Division Core Courses****Rule:** Complete the following subcategories of courses

9 Total Credits Required

**Introductory Course****Rule:** Must complete the following course

ANTY 141H	The Silk Road	3
Total Hours		3

Minimum Required Grade: C-

**Foundational Courses****Rule:** Must complete the following courses

CSWA 262H	Islamic Civil: Classical Age	3
HSTR 241H	Central Asian Cult & Civ	3
Total Hours		6

Minimum Required Grade: C-

**Upper Division Core Courses**

**Note:** If an independent study course is selected it must be taken for 3 credits.

Select three of the following:	9
ANTY 347	Central Asia and Its Neighbors
ANTY 442	Cities/Landscapes Central Asia
ANTY 492	Independent Study
CSWA 441	Seminar: Central Asia
CSWA 457	Artistic Trad Cent & SW Asia
HSTR 368	Iran Between Two Revolutions
HSTR 386	Nationalism Modern Middle East
HSTR 492	Independent Study
Total Hours	9



Minimum Required Grade: C

## Chemistry and Biochemistry Department

Christopher P. Palmer, Chair

Chemistry is the central science that involves the study of molecules, their structures, their combinations, their interactions, and the energy changes accompanying chemical processes.

The Department offers the following degrees: B.S., B.A., M.S., M.A., and Ph.D.

Prospective students desiring further information on any program of the Department of Chemistry and Biochemistry should visit the Department of Chemistry and Biochemistry and Biochemistry Program websites.

**High School Preparation:** In addition to the general University admission requirements, it is strongly recommended that a student take four years of mathematics, four (or more) years of science (earth and space science, biology, chemistry, and physics), four years of a foreign language, and four years of English.

Refer to graduation requirements (p. 28) listed previously in the catalog. See index.

### Undergraduate

- Chemistry B.A. (p. 197)
- Chemistry B.S. (p. 199)
- Chemistry B.S., Pharmacology Concentration (p. 204)
- Chemistry B.S., Forensic Chemistry Concentration (p. 203)
- Chemistry B.S., Environmental Chemistry Concentration (p. 201)

### Undergraduate Minors

- Chemistry Minor (p. 200)

## Chemistry B.A.

The courses required for the B.A. degree provide a less extensive training in chemistry than do the courses required for the American Chemical Society certified B.S. degree. This is to allow the student to supplement his or her program with courses that meet his or her specific needs. Thus this degree provides the core of traditional preparation in chemistry together with latitude for combination with an interdisciplinary field or the Teacher Preparation program. It is strongly advised that students using this degree obtain faculty advice in planning their program.

## Bachelor of Arts - Chemistry

### College Humanities & Sciences

Degree Specific Credits: 95

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

Lower Core Courses	45
General Chemistry	
Organic Chemistry	
Physics	
Mathematics	
Computer Science	
Upper Core Courses	16
Analytical Chemistry	
Physical Chemistry	
Advanced Electives	21
Modern Foreign Language	10
Ethics	3
<b>Total Hours</b>	<b>95</b>

### Lower Core Courses

**Rule:** All subcategories must be completed

#### General Chemistry

**Rule:** Complete both courses

CHMY 141N	College Chemistry I	5
& CHMY 142N	and College Chemistry I Lab	
CHMY 143N	College Chemistry II	5
& CHMY 144N	and College Chemistry II Lab	
<b>Total Hours</b>		<b>10</b>

Minimum Required Grade: C-

#### Organic Chemistry

**Rule:** Complete all courses

CHMY 221	Organic Chemistry I	3
CHMY 222	Organic Chemistry I Lab	2
CHMY 223	Organic Chemistry II	3
CHMY 224	Organic Chemistry II Lab	2
<b>Total Hours</b>		<b>10</b>

Minimum Required Grade: C-

#### Physics

**Rule:** Complete either PHSX 205N-PHSX 206N and PHSX 207N-PHSX 208N or PHSX 215N-PHSX 216N and PHSX 217N-PHSX 218N

Select one of the following physics sequences:	10
PHSX 205N	College Physics I
& PHSX 206N	and College Physics I Laboratory
PHSX 207N	College Physics II
& PHSX 208N	and College Physics II Laboratory
<b>OR</b>	

PHSX 215N	Fund of Physics w/Calc I	
& PHSX 216N	and Physics Laboratory I w/Calc	
PHSX 217N	Fund of Physics w/Calc II	
& PHSX 218N	and Physics Laboratory II w/Calc	

Total Hours 10

Minimum Required Grade: C-

### Mathematics

**Rule:** Complete all courses

M 171	Calculus I	4
M 172	Calculus II	4
M 273	Multivariable Calculus	4

Total Hours 12

Minimum Required Grade: C-

### Computer Science

**Rule:** Complete course

CSCI 250	Computer Mdlng/Science Majors	3
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Total Hours 3

Minimum Required Grade: C-

## Upper Core Courses

**Rule:** All subcategories must be completed

### Analytical Chemistry

**Rule:** Complete all of the following courses

CHMY 311	Analytical Chem-Quant Analysis	4
CHMY 421	Advanced Instrument Analysis	4

Total Hours 8

Minimum Required Grade: C-

### Physical Chemistry

**Rule:** Complete all of the following courses

CHMY 371	Phys Chem-Qntm Chm & Spctrscopy	4
CHMY 373	Phys Chem-Kntcs & Thrmdynmcs	4

Total Hours 8

Minimum Required Grade: C-

## Advanced Electives

**Rule:** Complete 9 credits of advanced electives in Chemistry or biochemistry approved by Chemistry adviser and 6 credits of advanced electives at the discretion of the student.

Minimum Required Grade: C-

21 Total Credits Required

## Modern Foreign Language

**Rule:** Complete 10 credits of modern foreign language

Minimum Required Grade: Pass

10 Total Credits Required

## Ethics

**Rule:** Complete the following course

CHMY 305E	Ethics, Literature and Writing in the Sciences	3
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Total Hours 3

Minimum Required Grade: C-

## Teaching Chemistry Concentration

To sign up for this option, you need to contact the Curriculum and Instruction Department. Do not fill out a major/minor form for graduation or the major/minor/concentration section of the major change form. Approvals for this option must come from the Curriculum and Instruction Department.

Concentrations will not appear on your UM transcript, diploma, university lists, student data system, or university publication and are used for advising purposes only. You do not fill out a major change for a concentration.

Individuals interested in teaching in K-12 schools must complete a degree in the content area they want to teach plus the teacher preparation program through the Department of Curriculum and Instruction. Individuals must complete the teaching major/teaching concentration within that degree program, which may contain different course requirements than the academic major since the sequence of courses is designed to meet state standards. Upon completion of the degree program with the teaching concentration and the secondary licensure program, one will be eligible for a standard Montana teaching license in this content area.

- Secondary Education Licensure Program (<http://www.coehs.umd.edu/departments/currinst/undergradprograms/seced/default.php>)
- Licensure Degree Requirements (p. 101)

## Teaching Preparation Requirements

**Rule:** Complete both of the following

**Note:** The EDU 497 course number is used for multiple courses. Students should register for EDU 497 Methods: 5-12 Science.

EDU 497	Teaching and Assessing	4
ENST 472	Gen Sci: Conservation Education	3

Total Hours 7

Minimum Required Grade: C-

## Teaching Licensure Requirements

**Note:** Students must be formally admitted to the Teacher Education Program and complete all of the professional education licensure requirements. See the Department of Curriculum & Instruction (p. 95) in the College of Education and Human Sciences (p. 83) for more

information. A major GPA of 2.75 is required to be eligible for student teaching.

## Chemistry B.S.

(American Chemical Society Certified)

The courses required for the B.S. degree provide a solid education in chemistry for the professional chemist and in preparation for graduate work in most areas of chemistry. These requirements meet the latest certification standards of the American Chemical Society.

## Bachelor of Science - Chemistry

### College Humanities & Sciences

Degree Specific Credits: 94

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

Lower Core Courses	45
General Chemistry	
Organic Chemistry	
Physics	
Mathematics	
Computer Science	
Upper Division Core Courses	33
Analytical Chemistry	
Physical Chemistry	
Inorganic Chemistry	
Biochemistry	
Mathematics	
Advanced Electives	3-9
Modern Foreign Language	10
Ethics	3
<b>Total Hours</b>	<b>94-100</b>

### Lower Core Courses

Rule: All courses in all subcategories listed are required

45 Total Credits Required

#### General Chemistry

CHMY 141N & CHMY 142N	College Chemistry I and College Chemistry I Lab	5
CHMY 143N & CHMY 144N	College Chemistry II and College Chemistry II Lab	5
<b>Total Hours</b>		<b>10</b>

Minimum Required Grade: C-

#### Organic Chemistry

CHMY 221	Organic Chemistry I	3
CHMY 222	Organic Chemistry I Lab	2
CHMY 223	Organic Chemistry II	3
CHMY 224	Organic Chemistry II Lab	2
<b>Total Hours</b>		<b>10</b>

Minimum Required Grade: C-

#### Physics

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
<b>Total Hours</b>		<b>10</b>

Minimum Required Grade: C-

#### Mathematics

M 171	Calculus I	4
M 172	Calculus II	4
M 273	Multivariable Calculus	4
<b>Total Hours</b>		<b>12</b>

Minimum Required Grade: C-

#### Computer Science

CSCI 250	Computer Mdlng/Science Majors	3
<b>Total Hours</b>		<b>3</b>

### Upper Division Core Courses

Rule: All courses in all subcategories listed are required

33 Total Credits Required

#### Analytical Chemistry

CHMY 311	Analytical Chem-Quant Analysis	4
CHMY 421	Advanced Instrument Analysis	4
<b>Total Hours</b>		<b>8</b>

Minimum Required Grade: C-

#### Physical Chemistry

CHMY 371	Phys Chem-Qntm Chm & Spctrscopy	4
CHMY 373	Phys Chem-Kntcs & Thrmodynms	4
<b>Total Hours</b>		<b>8</b>

Minimum Required Grade: C-

#### Inorganic Chemistry

CHMY 401	Advanced Inorganic Chemistry	3
CHMY 402	Advanced Inorganic Chem Lab	2
CHMY 403	Descriptive Inorganic Chem	3
<b>Total Hours</b>		<b>8</b>

Minimum Required Grade: C-

**Biochemistry**

BCH 480	Advanced Biochemistry I	3
BCH 486	Biochemistry Research Lab	3
Total Hours		6

Minimum Required Grade: C-

**Mathematics**

M 311	Ordinary Differential Equations and Systems	3
Total Hours		3

Minimum Required Grade: C-

**Advanced Electives****Rule:** Choose 3 to 9 credits from the listed courses.**Note:** 3 credits maximum of CHMY 492 or CHMY 499 may be applied toward degree requirements.

Other classes in chemistry, physics, geology, biochemistry, or mathematics may be used to meet the Advanced Electives requirement with approval of the Chemistry Adviser.

2 additional Advanced Electives of at least 3 credits each may be substituted for the Modern Language requirement with approval of the Chemistry Adviser.

Select 3-9 credits from the following:		3-9
CHMY 391	Special Topics/Expmntl Crse	
CHMY 442	Aquatic Chemistry	
CHMY 465	Organic Spectroscopy	
CHMY 491	Special Topics/Expmntl Crse	
CHMY 492	Independent Study	
CHMY 499	Senior Thesis/capstone	
Total Hours		3-9

Minimum Required Grade: C-

**Modern Foreign Language****Rule:** Complete 2 semesters (10 credits) of a modern language or 2 additional advanced elective courses**Note:** 2 Advanced Elective courses worth at least 3 credits each may be substituted for the Modern Foreign Language requirement with approval from the Chemistry Adviser.

Minimum Required Grade: Pass

10 Total Credits Required

**Ethics****Rule:** Complete the following course

CHMY 305E	Ethics, Literature and Writing in the Sciences	3
Total Hours		3

Minimum Required Grade: C-

**Chemistry Minor  
Minor - Chemistry (Minor)****College Humanities & Sciences****Degree Specific Credits: 31**

Required Cumulative GPA: 2.0

**Catalog Year: 2017-2018****Summary**

Lower Core Courses	18
Upper Core Courses	7-8
Physical Chemistry Requirement	3-4
Upper Division Electives	6-8
Total Hours	34-38

**Lower Core Courses****Rule:** Must complete all of the following:

CHMY 141N & CHMY 142N	College Chemistry I and College Chemistry I Lab	5
CHMY 143N & CHMY 144N	College Chemistry II and College Chemistry II Lab	5
CHMY 221	Organic Chemistry I	3
CHMY 222	Organic Chemistry I Lab	2
CHMY 223	Organic Chemistry II	3
Total Hours		18

Minimum Required Grade: C-

**Upper Core Courses****Rule:** Must complete the following:

CHMY 311	Analytical Chem-Quant Analysis	4
Total Hours		4

Minimum Required Grade: C-

**Physical Chemistry Requirement****Rule:** Must complete one of the following:

CHMY 360	Applied Physical Chemistry	3-4
or CHMY 373	Phys Chem-Kntcs & Thrmdynmcs	
Total Hours		3-4

Minimum Required Grade: C-

**Upper Division Electives****Rule:** Must complete two of the following:

**Note:** If the student's major requires biochemistry, BCH 380 or BCH 480 and BCH 482 may not be used to satisfy this requirement.

Select two of the following:	6-8
BCH 380	Biochemistry
BCH 480	Advanced Biochemistry I
BCH 482	Advanced Biochemistry II
CHMY 371	Phys Chem-Qntm Chm & Spctrscopy
CHMY 401	Advanced Inorganic Chemistry
CHMY 403	Descriptive Inorganic Chem
CHMY 442	Aquatic Chemistry
CHMY 465	Organic Spectroscopy
Total Hours	6-8

Minimum Required Grade: C-

## Teaching Chemistry Concentration

A teaching minor is an academic minor which may contain different course requirements designed to meet state standards. Those interested in teaching in K-12 schools must complete a teaching major in a content area plus the teacher preparation program through the Department of Curriculum and Instruction. Additional teaching areas can be added through completion of either a teaching major or a teaching minor in that content area.

- Secondary Education Licensure Program (<http://www.coehs.umt.edu/departments/currinst/undergradprograms/seced/default.php>)
- Licensure Degree Requirements (p. 101)

The term 'minor' for this teaching option refers to courses that need to be completed. To sign up for this option, you need to contact the Curriculum and Instruction Department. Do not fill out a minor form for graduation or the minor section of the major change form. Approvals for this option must come from the Curriculum and Instruction Department.

### Teaching Licensure Requirements

**Note:** Students must be formally admitted to the Teacher Education Program and complete all of the professional education licensure requirements. See the Department of Curriculum & Instruction (p. 95) in the College of Education and Human Sciences (p. 83) for more information. A minor GPA of 2.75 is required to be eligible for student teaching. Individuals completing a teaching minor must also complete a teaching major in another content area.

### Teaching Preparation Requirements

**Rule:** Must complete all of the following:

**Note:** The EDU 497 course number is used for multiple courses. Students should register for EDU 497 Methods: 5-12 Science.

EDU 497	Teaching and Assessing	4
ENST 472	Gen Sci: Conservation Education	3
Total Hours		7

Minimum Required Grade: C-

## Environmental Chemistry

## Bachelor of Science - Chemistry; Environmental Chemistry Concentration College Humanities & Sciences

**Degree Specific Credits:** 89

**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

Lower Core Courses	54
General Chemistry	
Organic Chemistry	
Physics	
Mathematics	
Geology	
Biochemistry Biology	
Upper Division Core Courses	25-26
Analytical Chemistry	
Physical Chemistry	
Inorganic Chemistry	
Biochemistry	
Statistics	
Geology	
Advanced Electives	8
Ethics	3
Total Hours	90-91

### Lower Core Courses

**Rule:** All courses in all subcategories listed are required

### General Chemistry

CHMY 141N	College Chemistry I	5
& CHMY 142N	and College Chemistry I Lab	
CHMY 143N	College Chemistry II	5
& CHMY 144N	and College Chemistry II Lab	
Total Hours		10

Minimum Required Grade: C-

### Organic Chemistry

CHMY 221	Organic Chemistry I	3
CHMY 222	Organic Chemistry I Lab	2
CHMY 223	Organic Chemistry II	3
CHMY 224	Organic Chemistry II Lab	2
Total Hours		10

Minimum Required Grade: C-

**Physics**

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-

**Mathematics**

M 171	Calculus I	4
M 172	Calculus II	4
Total Hours		8

Minimum Required Grade: C-

**Geology**

GEO 101N	Introduction to Physical Geology	3
GEO 102N	Introduction to Physical Geology Lab	1
Total Hours		4

Minimum Required Grade: C-

**Biochemistry Biology**

BCH 110	Intro Biology for Biochemists	3
BCH 111	Intro Biol for Biochemists Lab	1
BIOB 260	Cellular and Molecular Biology	4
BIOB 272	Genetics and Evolution	4
Total Hours		12

Minimum Required Grade: C-

**Upper Division Core Courses****Rule:** All subcategories must be completed**Analytical Chemistry****Rule:** Complete all of the following courses

CHMY 311	Analytical Chem-Quant Analysis	4
CHMY 421	Advanced Instrument Analysis	4
Total Hours		8

Minimum Required Grade: C-

**Physical Chemistry****Rule:** Choose 1 of the listed courses

CHMY 360	Applied Physical Chemistry	3-4
or CHMY 373	Phys Chem-Kntcs & Thrmdynmcs	
Total Hours		3-4

Minimum Required Grade: C-

**Inorganic Chemistry****Rule:** Complete the following course

CHMY 401	Advanced Inorganic Chemistry	3
Total Hours		3

Minimum Required Grade: C-

**Biochemistry****Rule:** Complete the following course

BCH 480	Advanced Biochemistry I	3
Total Hours		3

Minimum Required Grade: C-

**Statistics****Rule:** Complete the following courses

STAT 451	Statistical Methods I	3
STAT 457	Computer Data Analysis I	1
Total Hours		4

Minimum Required Grade: C-

**Geology****Rule:** Complete the following course

GEO 327	Geochemistry	4
Total Hours		4

Minimum Required Grade: C-

**Advanced Electives****Rule:** Choose at least 8 credits from the listed courses.**Note:**

- 3 credits maximum of CHMY 492.
- 3 credits maximum of BIOB 492.
- 3 credits maximum of GEO 492.
- A maximum of 5 credits of Modern Foreign Language may be applied to meet the Advanced Electives requirement.

Select at least 8 credits from the following: 8

BIOB 490	Adv Undergrad Research	
BIOB 492	Independent Study	
BIOE 370	General Ecology	
BIOE 439	Stream Ecology	
BIOE 453	Ecology of Small & Large Lakes	
BIOM 360	General Microbiology (equiv to BIOM 260)	
CHMY 373	Phys Chem-Kntcs & Thrmdynmcs	
CHMY 391	Special Topics/Expmntl Crse	
CHMY 402	Advanced Inorganic Chem Lab	
CHMY 403	Descriptive Inorganic Chem	
CHMY 442	Aquatic Chemistry	
CHMY 465	Organic Spectroscopy	
CHMY 466	FT-NMR Optn for Undrgrd Rsrch	
CHMY 491	Special Topics/Expmntl Crse	
CHMY 492	Independent Study	
GEO 320	Global Water	
GEO 420	Hydrogeology	
GEO 492	Independent Study	

STAT 452	Statistical Methods II	
Total Hours		8

Minimum Required Grade: C-

## Ethics

**Rule:** Complete the following course

CHMY 305E	Ethics, Literature and Writing in the Sciences	3
Total Hours		3

Minimum Required Grade: C-

## Forensic Chemistry

### Bachelor of Science - Chemistry; Forensic Chemistry Concentration

#### College Humanities & Sciences

Degree Specific Credits: 100

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

Lower Core Courses		52
General Chemistry		
Organic Chemistry		
Biochemistry and Biology		
Physics		
Mathematics		
Forensic Science and Criminal Justice		
Upper Division Core Courses		28-29
Analytical Chemistry		
Physical Chemistry		
Inorganic Chemistry		
Biochemistry		
Experiential Learning		
Seminar		
Statistics		
Advanced Electives		11
Expressive Art - Public Speaking		3
Social Science - Criminology		3
Ethics		3
Total Hours		100-101

## Lower Core Courses

**Rule:** All courses in all subcategories listed are required

### General Chemistry

CHMY 141N	College Chemistry I	5
& CHMY 142N	and College Chemistry I Lab	
CHMY 143N	College Chemistry II	5
& CHMY 144N	and College Chemistry II Lab	
Total Hours		10

Minimum Required Grade: C-

### Organic Chemistry

CHMY 221	Organic Chemistry I	3
CHMY 222	Organic Chemistry I Lab	2
CHMY 223	Organic Chemistry II	3
CHMY 224	Organic Chemistry II Lab	2
Total Hours		10

Minimum Required Grade: C-

### Biochemistry and Biology

BCH 110	Intro Biology for Biochemists	3
BCH 111	Intro Biol for Biochemists Lab	1
BIOB 260	Cellular and Molecular Biology	4
Total Hours		8

Minimum Required Grade: C-

### Physics

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-

### Mathematics

M 171	Calculus I	4
M 172	Calculus II	4
Total Hours		8

Minimum Required Grade: C-

### Forensic Science and Criminal Justice

CJUS 125N	Fund of Forensic Science	3
SOCI 221	Criminal Justice System	3
Total Hours		6

Minimum Required Grade: C-

## Upper Core Courses

**Rule:** All subcategories must be completed

### Analytical Chemistry

**Rule:** Complete all of the following courses

CHMY 311	Analytical Chem-Quant Analysis	4
CHMY 421	Advanced Instrument Analysis	4
Total Hours		8

Minimum Required Grade: C-

### Physical Chemistry

**Rule:** Choose 1 of the listed courses

CHMY 360	Applied Physical Chemistry	3-4
or CHMY 373	Phys Chem-Kntcs & Thrmdynmcs	
Total Hours		3-4

Minimum Required Grade: C-

### Inorganic Chemistry

**Rule:** Complete the following course

CHMY 401	Advanced Inorganic Chemistry	3
Total Hours		3

Minimum Required Grade: C-

### Biochemistry

**Rule:** Complete the following courses

BCH 480	Advanced Biochemistry I	3
BCH 482	Advanced Biochemistry II	3
Total Hours		6

Minimum Required Grade: C-

### Experiential Learning

**Rule:** Choose 1 of the listed courses for 3 credits

CHMY 488	Forensic Research	3
or CHMY 498	Internship/Cooperative Educ	
Total Hours		3

Minimum Required Grade: C-

### Seminar

**Rule:** Complete the following course

CHMY 489	Forensic Research Seminar	1
Total Hours		1

Minimum Required Grade: C-

### Statistics

**Rule:** Complete the following courses

STAT 451	Statistical Methods I	3
STAT 457	Computer Data Analysis I	1
Total Hours		4

Minimum Required Grade: C-

### Advanced Electives

**Rule:** Choose 11 credits from the listed courses. 8 of the credits must be numbered 300 or above

Select 11 credits from the following:		11
BIOB 440	Biological Electron Microscopy	
CHMY 465	Organic Spectroscopy	
CHMY 466	FT-NMR Optn for Undrgrd Rsrch	
CHMY 542	Separation Science	
CJUS 488	Forensic Science the Crime Lab and Beyond	
PHAR 110N	Use & Abuse of Drugs	
Total Hours		11

Minimum Required Grade: C-

### Expressive Art - Public Speaking

**Rule:** Complete the following course

COMX 111A	Intro to Public Speaking	3
Total Hours		3

Minimum Required Grade: C-

### Social Science - Criminology

**Rule:** Complete the following course

SOCI 211S	Introduction to Criminology	3
Total Hours		3

Minimum Required Grade: C-

### Ethics

**Rule:** Complete the following course

CHMY 305E	Ethics, Literature and Writing in the Sciences	3
Total Hours		3

Minimum Required Grade: C-

## Pharmacology

### Bachelor of Science - Chemistry; Pharmacology Concentration College Humanities & Sciences

Degree Specific Credits: 88

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.umd.edu/academics/general-education-requirements>) of the catalog.



## Summary

Lower Core Courses	45-46
General Chemistry	
Organic Chemistry	
Biochemistry and Biology	
Physics	
Mathematics	
Upper Core Courses	37-38
Analytical Chemistry	
Physical Chemistry	
Inorganic Chemistry	
Biochemistry	
Pharmacology	
Biology	
Advanced Electives	3
Ethics	3
<b>Total Hours</b>	<b>88-90</b>

### Lower Core Courses

**Rule:** All subcategories must be completed

#### General Chemistry

**Rule:** Complete both courses

CHMY 141N & CHMY 142N	College Chemistry I and College Chemistry I Lab	5
CHMY 143N & CHMY 144N	College Chemistry II and College Chemistry II Lab	5
<b>Total Hours</b>		<b>10</b>

Minimum Required Grade: C-

#### Organic Chemistry

**Rule:** Complete all courses listed

CHMY 221	Organic Chemistry I	3
CHMY 222	Organic Chemistry I Lab	2
CHMY 223	Organic Chemistry II	3
CHMY 224	Organic Chemistry II Lab	2
<b>Total Hours</b>		<b>10</b>

Minimum Required Grade: C-

#### Biochemistry and Biology

**Rule:** Complete both courses

BCH 110	Intro Biology for Biochemists	3
BCH 111	Intro Biol for Biochemists Lab	1
BIOB 260	Cellular and Molecular Biology	4
<b>Total Hours</b>		<b>8</b>

Minimum Required Grade: C-

#### Physics

Select one of the following physics sequences:	10
PHSX 205N & PHSX 206N	College Physics I and College Physics I Laboratory

PHSX 207N & PHSX 208N	College Physics II and College Physics II Laboratory	
<b>OR</b>		
PHSX 215N & PHSX 216N	Fund of Physics w/Calc I and Physics Laboratory I w/Calc	
PHSX 217N & PHSX 218N	Fund of Physics w/Calc II and Physics Laboratory II w/Calc	
<b>Total Hours</b>		<b>10</b>

Minimum Required Grade: C-

#### Mathematics

Select one of the following:	7-8
M 162 & M 263	Applied Calculus and Applied Differential Equations
M 171 & M 172	Calculus I and Calculus II
<b>Total Hours</b>	<b>7-8</b>

Minimum Required Grade: C-

### Upper Core Courses

**Rule:** All subcategories must be completed

#### Analytical Chemistry

**Rule:** Complete all of the following courses

CHMY 311	Analytical Chem-Quant Analysis	4
CHMY 421	Advanced Instrument Analysis	4
<b>Total Hours</b>		<b>8</b>

Minimum Required Grade: C-

#### Physical Chemistry

**Rule:** Choose 1 of the listed courses

CHMY 360 or CHMY 373	Applied Physical Chemistry Phys Chem-Kntcs & Thrmodynms	3-4
<b>Total Hours</b>		<b>3-4</b>

Minimum Required Grade: C-

#### Inorganic Chemistry

**Rule:** Complete the following course

CHMY 401	Advanced Inorganic Chemistry	3
<b>Total Hours</b>		<b>3</b>

Minimum Required Grade: C-

#### Biochemistry

**Rule:** Complete the following courses

BCH 480	Advanced Biochemistry I	3
BCH 482	Advanced Biochemistry II	3
<b>Total Hours</b>		<b>6</b>

Minimum Required Grade: C-

**Pharmacology****Rule:** Complete the following courses

PHAR 421	Medicinal Chem I	3
PHAR 422	Medicinal Chem II	3
PHAR 443	Pharmacol & Toxicol I	4
PHAR 444	Pharmacology & Toxicol II	4

Total Hours	14
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Minimum Required Grade: C-

**Biology****Rule:** Complete the following course

BIOM 400	Medical Microbiology	3
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Total Hours	3
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Minimum Required Grade: C-

**Advanced Electives****Rule:** Choose 3 credits from the listed courses

**Note:** 3 credits maximum of CHMY 492 may be applied toward degree requirements. 3 credits maximum of BIOB 490 may be applied toward degree requirements.

Select 3 credits from the following: 3

BIOB 490	Adv Undergrad Research	3
CHMY 373	Phys Chem-Kntcs & Thrmodynms	
CHMY 402	Advanced Inorganic Chem Lab	
CHMY 403	Descriptive Inorganic Chem	
CHMY 442	Aquatic Chemistry	
CHMY 465	Organic Spectroscopy	
CHMY 466	FT-NMR Optn for Undrgrd Rsrch	
CHMY 492	Independent Study	

Total Hours	3
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Minimum Required Grade: C-

**Ethics****Rule:** Complete the following course

CHMY 305E	Ethics, Literature and Writing in the Sciences	3
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Total Hours	3
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Minimum Required Grade: C-

**Communication Studies Department****Steve Schwarze, Chair**

Communication Studies engages in both social-scientific and humanistic approaches to the analysis, understanding and improvement of human communication. The discipline traces its roots to ancient Greek and Roman studies of the functions of public discourse in society, but in the twentieth century communication came to embrace the studies of interpersonal and small group interaction, human relations in organizations, media and society, and intercultural interaction. Although

interdisciplinary in spirit, the discipline has a core of knowledge, theory, and concepts concentrating on such things as symbols, messages, interactions, networks, audiences, and persuasive campaigns. Uniting the field is the belief that the role of communication in human experience is basic to comprehending complex situations and problems in the modern world. The discipline has roles in both the broad traditions of liberal arts education and in the development and refinement of practical skills.

The Department of Communication Studies at the University of Montana-Missoula focuses on three broad areas of study: interpersonal interaction and human relationships, organizational communication, and rhetoric and public discourse. The knowledge and skills the student may acquire in each of these areas are important to functioning effectively in one's personal life, at work, and as a citizen of the larger society in a rapidly changing world.

The program in Communication Studies helps to prepare students for such diverse professions as: public relations officer, marketing analyst, human resources or personnel manager, community mediator, political speech writer, health communication trainer, social services director, or student services coordinator. Also, undergraduate and graduate study can assist the student in pursuing advanced studies for law, the ministry, and higher education.

**Undergraduate**

- Communications Studies B.A., Communication & Human Relationships Concentration (p. 206)
- Communications Studies B.A., Organizational Communication Concentration (p. 208)

**Undergraduate Minors**

- Communication Studies (p. 208)

**Communication and Human Relationships****Bachelor of Arts - Communication Studies; Comm & Human Relationships Concentration****College Humanities & Sciences****Degree Specific Credits:** 48**Required Cumulative GPA:** 2.0**Catalog Year: 2017-2018**

**Note:** To graduate with a degree in Communication Studies, the student must complete 36 COMX credits with 18 of those credits in courses numbered 300 or above. Students must also complete an approved statistics course. For the Human Relationships concentration, students must complete an additional 12 credits in Allied courses to reach 48 total degree credits. A maximum of 6 credits in COMX 312 and a maximum of 6 credits in COMX 398 may count toward a major in communication studies.

## 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

Lower Division Core Courses	12
Upper Division Core Courses	6
Research	
Upper Division Writing	
Comm & Human Relationships Option	30
Major Courses	
Allied Courses	
Additional Major Electives	
Statistics	3-4
Total Hours	51-52

### Lower Division Core Courses

**Rule:** Must complete all of the following courses:

COMX 111A	Intro to Public Speaking	3
COMX 115S	Introduction to Interpersonal Communications	3
COMX 220S	Intro to Organizational Comm	3
COMX 240H	Intro to Rhetorical Theory	3
Total Hours		12

Minimum Required Grade: C-

### Upper Division Core Courses

**Rule:** Must complete the following subcategories

6 Total Credits Required

#### Research

**Rule:** Must complete the following course

**Note:** Students taking COMX 460 in the fall or spring semester will also be required to take COMX 461. Those taking COMX 460 in summer are exempt from this requirement.

COMX 460	Research Methods	3
Total Hours		3

Minimum Required Grade: C-

#### Upper Division Writing

**Note:** One of these courses is required to complete the upper division writing requirement in the major. This counts toward the total credits needed for the major.

Select one of the following:	3
COMX 347	Rhetoric Nature & Environmtlsm
COMX 413	Comm & Conflict-Writing
COMX 414	Comm in Personal Relationships
COMX 421	Comm in Non-Profit Organizatns
COMX 422	Communication and Technology

COMX 424	Risk Crisis & Comm
COMX 445	Rhetorical Criticism & Theory
COMX 447	Rhetorical Conctruction of Women
COMX 449	Rhetoric of Women's Activism
Total Hours	3

Minimum Required Grade: C-

### Comm & Human Relationships Option

**Rule:** Must complete the following subcategories

30 Total Credits Required

#### Major Courses

Select at least five of the following:	15
COMX 202S	Nonverbal Communication
COMX 311	Family Communication
COMX 380	Gender and Communication
COMX 412	Communication and Conflict
COMX 413	Comm & Conflict-Writing
COMX 414	Comm in Personal Relationships
COMX 415	Intercultural Communication
COMX 485	Communication and Health
Total Hours	15

Minimum Required Grade: C-

#### Allied Courses

Select at least four of the following:	12
ANTY 427	Anthropology of Gender
COUN 242S	Intimate Relationships
COUN 475	Forgiveness & Reconcilia
COUN 485	Counseling Theories
PSYX 230	Developmental Psychology
PSYX 233	Fund of Psychology of Aging
PSYX 345	Child & Adolescent Psych Dis
PSYX 348	Psychology of Family Violence
PSYX 360	Social Psychology
PSYX 385	Psychology of Personality
S W 420	Child Abuse/Child Welfare
S W 455	Social Gerontology
SOCI 220S	Race, Gender & Class
SOCI 275S	Gender and Society
SOCI 330	Juvenile Delinquency
SOCI 332	Sociology of the Family
SOCI 350	The Community
SOCI 382	Soc Psych and Social Structure
Total Hours	12

Minimum Required Grade: C-

#### Additional Major Electives

**Rule:** May take additional COMX courses to achieve 36 degree credits

**Statistics**

Select one of the following: 3-4

EDU 421	Statistical Procedures in Educ
PSYX 222	Psychological Statistics
SOCI 202	Social Statistics
STAT 216	Introduction to Statistics

Total Hours 3-4

Minimum Required Grade: C-

## Communication Studies Minor

### Minor - Communication Studies (Minor)

**College Humanities & Sciences**

Degree Specific Credits: 20

Required Cumulative GPA: 2.0

**Catalog Year: 2017-2018**

**Note:** Once admitted to earn a minor, the student must complete a minimum of 20 credits in COMX courses, with at least 9 credits in courses numbered 300 and above.

**Summary**

Lower Division Core Courses	3
Electives	17
Total Hours	20

**Lower Division Core Courses****Rule:** Must complete all of the following:

COMX 111A	Intro to Public Speaking	3
Total Hours		3

Minimum Required Grade: C-

**Electives**

**Note:** A maximum of 6 credits in COMX 312 may count toward a minor in communication studies.

Select 17 credits from the following: 17

COMX 115S	Introduction to Interpersonal Communications
COMX 140L	Intro to Visual Rhetoric
COMX 191	Special Topics
COMX 192	Independent Study
COMX 202S	Nonverbal Communication
COMX 204X	International & Dvlpmnt Comm
COMX 210	Communication in Small Groups
COMX 212X	Intro to Intercultural Com
COMX 217A	Oral Interpretation of Lit
COMX 219S	Survey of Children's Comm
COMX 220S	Intro to Organizational Comm

COMX 222	Professional Communication
COMX 240H	Intro to Rhetorical Theory
COMX 241	Persuasive Communication
COMX 242	Argumentation
COMX 250	Intro to Public Relations
COMX 291	Special Topics
COMX 292	Independent Study
COMX 311	Family Communication
COMX 312	Forensics/Honors
COMX 343	Persuasive Speaking and Critic
COMX 347	Rhetoric Nature & Environmtlsm
COMX 349	Comm Consump & Climate
COMX 351	Principles of Public Relations
COMX 352	Public Relations Portfolio
COMX 380	Gender and Communication
COMX 391	Special Topics
COMX 412	Communication and Conflict
COMX 413	Comm & Conflict-Writing
COMX 414	Comm in Personal Relationships
COMX 415	Intercultural Communication
COMX 421	Comm in Non-Profit Organizatns
COMX 422	Communication and Technology
COMX 423	Org Comm Consult & Train
COMX 424	Risk Crisis & Comm
COMX 425	Comm in Health Organizations
COMX 445	Rhetorical Criticism & Theory
COMX 447	Rhetorical Conctruction of Women
COMX 449	Rhetoric of Women's Activism
COMX 460	Research Methods
COMX 461	Communication Research Seminar
COMX 485	Communication and Health
COMX 491	Special Topics
COMX 492	Independent Study
Total Hours	17

Minimum Required Grade: C-

## Organizational Communication

### Bachelor of Arts - Communication Studies; Organizational Communication Concentration

**College Humanities & Sciences**

Degree Specific Credits: 48

Required Cumulative GPA: 2.0

**Catalog Year: 2017-2018**

**Note:** To graduate with a degree in Communication Studies, the student must complete 36 COMX credits with 18 of those credits in courses numbered 300 or above. Students must also complete an approved statistics course (3 credits). In the Organizational Communication option,

students must complete an additional 9 credits in Allied courses to reach 48 degree credits. A maximum of 6 credits in COMX 312 and a maximum of 6 credits in COMX 398 may count toward a major in communication studies.

## 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

Lower Division Core Courses	12
Upper Division Core Courses	6
Research	
Upper Division Writing	
Organizational Communication Concentration	27
Major Courses	
Allied Courses	
Additional Major Electives	
Statistics	3-4
<b>Total Hours</b>	<b>48-49</b>

### Lower Division Core Courses

**Rule:** Must complete all of the following courses:

COMX 111A	Intro to Public Speaking	3
COMX 115S	Introduction to Interpersonal Communications	3
COMX 220S	Intro to Organizational Comm	3
COMX 240H	Intro to Rhetorical Theory	3
<b>Total Hours</b>		<b>12</b>

Minimum Required Grade: C-

### Upper Division Core Courses

**Rule:** Must complete the following subcategories

Minimum Required Grade: C-

6 Total Credits Required

#### Research

**Rule:** Must complete an approved statistics course prior to taking COMX 460

**Note:** Students taking COMX 460 in the fall or spring semester will also be required to take COMX 461. Those taking COMX 460 in summer are exempt from this requirement.

COMX 460	Research Methods	3
<b>Total Hours</b>		<b>3</b>

Minimum Required Grade: C-

#### Upper Division Writing

**Note:** One of these courses is required to complete the upper division writing requirement in the major. This counts toward the total credits needed for the major.

Select one of the following: 3

COMX 347	Rhetoric Nature & Environmtlsm
COMX 413	Comm & Conflict-Writing
COMX 414	Comm in Personal Relationships
COMX 421	Comm in Non-Profit Organizatns
COMX 422	Communication and Technology
COMX 424	Risk Crisis & Comm
COMX 445	Rhetorical Criticism & Theory
COMX 447	Rhetorical Contruction of Women
COMX 449	Rhetoric of Women's Activism

**Total Hours** 3

Minimum Required Grade: C-

### Organizational Communication Option

**Rule:** Must complete the following subcategories

27 Total Credits Required

#### Major Courses

Select at least five of the following: 15

COMX 210	Communication in Small Groups
COMX 351	Principles of Public Relations
COMX 352	Public Relations Portfolio
COMX 412	Communication and Conflict
COMX 413	Comm & Conflict-Writing
COMX 415	Intercultural Communication
COMX 421	Comm in Non-Profit Organizatns
COMX 422	Communication and Technology
COMX 423	Org Comm Consult & Train
COMX 424	Risk Crisis & Comm
COMX 425	Comm in Health Organizations

**Total Hours** 15

Minimum Required Grade: C-

#### Allied Courses

Select at least three of the following: 9

BMGT 340	Mgmt & Organization Behavior
BMGT 444	Management Communications
BMGT 480	Cross-Cultural Mgmt
BMKT 325	Principles of Marketing
BMKT 343	Integrated Marketing Comm
BMKT 412	Non Profit Marketing
CHTH 355	Theory Practicum Community Health Education
CHTH 445	Program Plannig in Community Health
HTH 465	Leading Health and, Human Perform Orgs
PSCI 361	Public Administration
PSCI 462	Human Resource Management
PSCI 466	Nonprofit Adm & Pub Svc
PSCI 467	Adv Nonprofit Adm
SOCI 306	Sociology of Work
SOCI 345	Sociology of Organizations

SOCI 471	Gender and Global Development	
Total Hours		9

Minimum Required Grade: C-

### Additional Major Electives

**Rule:** May take any COMX courses to achieve 36 degree credits

### Statistics

Select one of the following: 3-4

EDU 421	Statistical Procedures in Educ
PSYX 222	Psychological Statistics
SOCI 202	Social Statistics
STAT 216	Introduction to Statistics

Total Hours 3-4

Minimum Required Grade: C-

## Computer Science Department

Andrew Ware, Chair

Travis Wheeler, Assistant Chair

The growing utility of computers in research and education, as well as the increased impact of computers on our modern society, strongly implies that knowledge of computers and their capabilities should be a part of the basic education of all students. The courses listed below are designed to provide the student with this knowledge and to prepare the student for a career in a field in which there is a growing need for trained personnel. The objective of the undergraduate curriculum in computer science is to develop professionally competent, broadly educated computer scientists who wish to pursue professional careers or graduate studies.

The B.S. program is accredited by the Computing Accreditation Commission of ABET (<http://www.abet.org>). For more information, access the Computer Science Department homepage (<http://hs.umn.edu/cs>) or email the chair Andrew Ware ([andrew.ware@umontana.edu](mailto:andrew.ware@umontana.edu)).

**High School Preparation:** In addition to general University admission requirements, pre-college preparation should include as many computer science courses as possible, and four years of high school mathematics, to include algebra, trigonometry and pre-calculus. Also recommended are physics, chemistry and biology.

## Admission Requirements

Admission to computer science courses varies according to course level and other departmental standards. However, students must have completed all prerequisite courses with a grade of at least a "C-".

### Lower-Division Courses

Most 100- and 200-level courses are open on a first-come, first-served basis to all students who have the prerequisites.

### Upper-Division Courses

Admission to 300-level or above courses requires successful completion of the prerequisites.

## Major-Minor Status

Completed change of major forms along with college transcripts must be turned in to the department when declaring computer science as a major or minor.

## Undergraduate

- Computer Science B.S. (p. 212)
- Computer Science-Mathematical Sciences Combined Major (p. 214)

## Undergraduate Minors

- Computer Applications (p. 211)
- Computer Science (p. 213)
- Computer Science Teaching Minor (p. 214)

## Undergraduate Certificates

- Bioinformatics Professional Certificate (p. 210)
- Computer Programming Professional Certificate (p. 211)

## Certificate in Bioinformatics

The Biological Sciences have become more and more data intensive. Many biological biochemistry experiments, including genomic sequencing, gene expression experiments, Nuclear Magnetic Resonance, Mass Spec, Etc., generate huge quantities of data. This certificate ensures that the student has the computational skills necessary to analyze and manipulate such large quantities of data.

## Professional Certificate - Bioinformatics

### College Humanities & Sciences

Degree Specific Credits: 12

Required Cumulative GPA: 2.0

### Catalog Year: 2017-2018

## Summary

Required Courses	6
Elective Courses	3
Total Hours	9

## Required Courses

**Rule:** 6 Credits

Select two of the following:	6
CSCI 135	Fund of Computer Science I
CSCI 250	Computer Mdlng/Science Majors
CSCI 451	Computational Biology
Total Hours	6

Minimum Required Grade: C-