

# PHYSICS B.A. - PHYSICS EDUCATION

- This concentration contains additional course requirements designed to meet state standards. Those interested in teaching in K-12 schools must complete the education/teaching concentration of a major in a teaching content area plus the Teacher Education Program through the Department of Teaching and Learning. Additional teaching areas can be added through completion of the education/teaching concentration of a major or education/teaching minor in that content area.
  - Secondary Education Licensure Program (<http://www.coehs.umt.edu/departments/currinst/undergradprograms/seced/default.php>)
  - Licensure Degree Requirements (<http://catalog.umt.edu/colleges-schools-programs/education/teaching-learning/lic-secondary-licensure/>)
- To complete this concentration, you need to contact the Teaching and Learning Department. Approvals for this concentration must come from the Teaching and Learning Department.
- This major and concentration do not qualify as a single-field endorsement. The demand for teaching in this field is limited. The required second endorsement (either a teaching major or a teaching minor) should be in a field in high demand.

## Bachelor of Arts - Physics; Concentration in Physics Education

### 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

Code	Title	Hours
	Lower-Division Physics	10
	Upper-Division Physics	30
	Physics Electives	6
	Math Requirements	16
	Computer Science Requirements	3
	Advanced College Writing Requirement	3
	Physics Education Concentration Requirements	23-24
<b>Total Hours</b>		<b>91-92</b>

**Degree Specific Credits:** 91-92

**Required Cumulative GPA:** 2.0

### Lower-Division Physics

Code	Title	Hours
<b>Complete one of the following Physics sequences:</b>		<b>10</b>
<b>Algebra- and Trigonometry-based Physics:</b>		
PHSX 205N & PHSX 206N	College Physics I and College Physics I Laboratory	

PHSX 207N & PHSX 208N	College Physics II and College Physics II Laboratory
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#### Calculus-based Physics (strongly recommended):

PHSX 215N & PHSX 216N	Fundamentals of Physics with Calculus I and Physics Laboratory I with Calculus
PHSX 217N & PHSX 218N	Fundamentals of Physics with Calculus II and Physics Laboratory II with Calculus

**Total Hours** 10

Minimum Required Grade: C-

### Upper-Division Physics

Code	Title	Hours
<b>Complete all of the following courses:</b>		
PHSX 301	Intro Theoretical Physics	3
PHSX 311	Oscillations and Waves	2
PHSX 320	Classical Mechanics	3
PHSX 323	Intermediate Physics Lab	3
PHSX 343	Modern Physics	3
PHSX 423	Electricity & Magnetism I	3
PHSX 444	Advanced Physics Lab	3
PHSX 461	Quantum Mechanics I	3
PHSX 499	Senior Capstone Seminar	1
<b>Complete two of the following courses:</b>		<b>6</b>
PHSX 425	Electricity & Magnetism II	
PHSX 446	Thermodynamics & Statistical Mechanics	
PHSX 462	Quantum Mechanics II	
<b>Total Hours</b>		<b>30</b>

Minimum Required Grade: C-

### Physics Electives

**Note:** Other PHSX courses may be substituted with adviser approval.

Code	Title	Hours
<b>Complete two of the following courses:</b>		<b>6</b>
PHSX 141N or ASTR 142	Einstein's Relativity The Evolving Universe	
PHSX 327	Optics	
PHSX 330	Communicating Physics	
PHSX 333	Computational Physics	
PHSX 425	Electricity & Magnetism II (2 of these 3 courses must be taken in the physics core, the remaining course can be used as an elective)	
	or PHSX 446 Thermodynamics & Statistical Mechanics or PHSX 462 Quantum Mechanics II	
<b>Total Hours</b>		<b>6</b>

Minimum Required Grade: C-

### Math Requirements

**Note:** M 412 and M 418 are recommended as well

Code	Title	Hours
<b>Complete all of the following courses:</b>		
M 171	Calculus I	4
M 172	Calculus II	4
M 221	Introduction to Linear Algebra	4
M 273	Multivariable Calculus	4
<b>Total Hours</b>		<b>16</b>

Minimum Required Grade: C-

## Computer Science Requirements

Code	Title	Hours
<b>Complete one of the following courses:</b>		
CSCI 150	Introduction to Computer Science	3
CSCI 151	Interdisciplinary Computer Science I	
PHSX 333	Computational Physics (strongly recommended)	
<b>Total Hours</b>		<b>3</b>

Minimum Required Grade: C-

## Advanced College Writing Requirement

**Note:** May substitute another advanced writing course as approved by the department chair.

Code	Title	Hours
<b>Complete the following course:</b>		
PHSX 330	Communicating Physics	3
<b>Total Hours</b>		<b>3</b>

Minimum Required Grade: C-

## Physics Education Concentration Requirements

### Additional Science Requirements

Code	Title	Hours
<b>Complete all of the following courses:</b>		
ASTR 131N	Planetary Astronomy	3
ASTR 132N	Stars, Galaxies, and the Universe	3
CHMY 121N	Introduction to General Chemistry	4
CHMY 485	Laboratory Safety	1
GEO 101N	Introduction to Physical Geology	3
or ERTH 101N	Earth Systems Science	
GEO 102N	Introduction to Physical Geology Lab	1
or ERTH 103N	Earth Systems Science Lab	
<b>Complete one of the following courses:</b>		<b>3-4</b>
BIOB 160N	Principles of Living Systems	
BIOB 170N	Principles of Biological Diversity	
BIOE 172N	Introductory Ecology	
BIOO 105N	Introduction to Botany	
<b>Complete one of the following courses:</b>		<b>3</b>
GEO 105N	Oceanography	
ENSC 105N	Environmental Science	

Code	Title	Hours
ENST 472	General Science: Conservation Education	21-22
<b>Total Hours</b>		<b>21-22</b>

Minimum Required Grade: C-

### Teaching Science Methods Course

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

Code	Title	Hours
<b>Complete the following course:</b>		
EDU 497	Teaching and Assessing	3
<b>Total Hours</b>		<b>3</b>

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 (<http://catalog.umt.edu/colleges-schools-programs/education/teaching-learning/lic-secondary-licensure/>). For more information, see the Teaching and Learning Department (<http://catalog.umt.edu/colleges-schools-programs/education/teaching-learning/>).