

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 |
| | Total Hours | 91-92 |

Degree Specific Credits: 91-92

Required Cumulative GPA: 2.0

Lower-Division Physics

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

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

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| 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 |
|----------|---|-----------|
| | Complete all of the following courses: | |
| 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 |
| | Complete two of the following courses: | 6 |
| PHSX 425 | Electricity & Magnetism II | |
| PHSX 446 | Thermodynamics & Statistical Mechanics | |
| PHSX 462 | Quantum Mechanics II | |
| | Total Hours | 30 |

Minimum Required Grade: C-

Physics Electives

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

| Code | Title | Hours |
|-----------|--|----------|
| | Complete two of the following courses: | 6 |
| PHSX 141N | Einstein's Relativity | |
| | or ASTR 142 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 | |
| | Total Hours | 6 |

Minimum Required Grade: C-

Math Requirements

Note: M 412 and M 418 are recommended as well

| Code | Title | Hours |
|---|--------------------------------|-------|
| Complete all of the following courses: | | |
| M 171 | Calculus I | 4 |
| M 172 | Calculus II | 4 |
| M 221 | Introduction to Linear Algebra | 4 |
| M 273 | Multivariable Calculus | 4 |

Total Hours 16

Minimum Required Grade: C-

Computer Science Requirements

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

Total Hours 3

Minimum Required Grade: C-

Advanced College Writing Requirement

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

| Code | Title | Hours |
|---------------------------------------|-----------------------|-------|
| Complete the following course: | | |
| PHSX 330 | Communicating Physics | 3 |

Total Hours 3

Minimum Required Grade: C-

Physics Education Concentration Requirements

Additional Science Requirements

| Code | Title | Hours |
|---|--------------------------------------|-------|
| Complete all of the following courses: | | |
| 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 | |

Complete one of the following courses: 3-4

| | | |
|-----------|------------------------------------|--|
| BIOB 160N | Principles of Living Systems | |
| BIOB 170N | Principles of Biological Diversity | |
| BIOE 172N | Introductory Ecology | |
| BIOO 105N | Introduction to Botany | |

Complete one of the following courses: 3

| | | |
|-----------|-----------------------|--|
| GEO 105N | Oceanography | |
| ENSC 105N | Environmental Science | |

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| ENST 472 | General Science: Conservation Education | |
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Total Hours 21-22

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 |
|------|-------|-------|
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Complete the following course:

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| EDU 497 | Teaching and Assessing | 3 |
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Total Hours 3

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/>).