

# PHYSICS EDUCATION MINOR

- This minor contains 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 track must come from the Teaching and Learning Department.
- Individuals completing this minor must also complete the education/teaching concentration of a major in another teaching content area.

## Minor - Physics Education

### Summary

| Code                                | Title | Hours        |
|-------------------------------------|-------|--------------|
| Required Lower-Division Courses     |       | 10           |
| Upper-Division Core Course          |       | 12           |
| Mathematics and Statistics          |       | 18-19        |
| Additional Science Courses          |       | 13-14        |
| Physics Education Minor Requirement |       | 3            |
| <b>Total Hours</b>                  |       | <b>56-58</b> |

**Degree Specific Credits:** 56-58

**Required Cumulative GPA:** 2.0

**Note:** Mathematics prerequisites for the physics minor are M 171, M 172, M 273, (and M 221 if needed).

### Required Lower-Division Courses

**Note:** The Physics with Calculus series (PHSX 215N - PHSX 218N) is strongly recommended.

| 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                           |           |
| <b>Calculus-based Physics (strongly recommended):</b>   |  |           |
| 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 Core Course

| Code  | Title                     | Hours     |
|---|---------------------------|-----------|
| <b>Complete all of the following courses:</b> |                           |           |
| PHSX 301                                      | Intro Theoretical Physics | 3         |
| PHSX 320                                      | Classical Mechanics       | 3         |
| PHSX 330                                      | Communicating Physics     | 3         |
| PHSX 343                                      | Modern Physics            | 3         |
| <b>Total Hours</b>                            |                           | <b>12</b> |

Minimum Required Grade: C-

### Mathematics and Statistics

| Code  | Title   | Hours        |
|---|---|--------------|
| <b>Complete all of the following courses:</b> |   |              |
| M 171   | Calculus I  | 4            |
| M 172   | Calculus II   | 4            |
| STAT 216 or STAT 341                          | Introduction to Statistics and Introduction to Probability and Statistics | 3-4          |
| M 273   | Multivariable Calculus  | 4            |
| M 274   | Introduction to Differential Equations                                    | 3            |
| <b>Total Hours</b>                            |   | <b>18-19</b> |

Minimum Required Grade: C-

### Additional Science Courses

| Code   | Title   | Hours     |
|--|---|-----------|
| <b>Complete all of the following:</b>            |   |           |
| ASTR 131N or ASTR 132N                           | Planetary Astronomy and Stars, Galaxies, and the Universe   | 3         |
| BIOB 160N or BIOB 170N or BIOE 172N or BIOO 105N | Principles of Living Systems and Principles of Biological Diversity and Introductory Ecology and Introduction to Botany | 3         |
| CHMY 121N  | Introduction to General Chemistry   | 4         |
| CHMY 485   | Laboratory Safety   | 1         |
| CSCI 150 or CSCI 151                             | Introduction to Computer Science and Interdisciplinary Computer Science I   | 3         |
| <b>Total Hours</b>                               |   | <b>14</b> |

Minimum Required Grade: C-

### Physics Education Requirement

**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-

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