# Physics (BA/BS)

Explore the laws of nature and the relationship between energy and matter with the Department of Physics. You will have the opportunity to research with award-winning faculty, participate in practical applications such as labs and demonstrations, and develop career skills through internships. We encourage physics majors to study across disciplines, pairing their work with chemistry, biology, or anything else of interest—at the University of Oregon, you have the freedom to choose your own path.

A degree in physics will give you a solid foundation to pursue careers and graduate studies in astrophysics, engineering, teaching, astronomy, medicine, technology, communication, and a host of other disciplines.

## Program Learning Outcomes

Upon successful completion of this program, students will be able to:

- Have knowledge of principles and concepts for specific core subject areas listed above.
- Apply principles and concepts to analyze problems within specific core areas.
- Have capability with quantitative methods appropriate for the core areas.
- Analyze and interpret quantitative results.
- Have experience with integration of concepts: analysis of complex problems cutting across multiple core areas.
- Collect and appropriately analyze data working independently and in collaboration with others (experimentation; data collection, reduction and analysis; model-based computation including simulations and inversion of observations; and literature research using basic and state-of-the-art technology).
- Communicate orally and in writing by making appropriate use of current presentation technology.
- Have familiarity with current developments in physics.

## Physics Major Requirements

| Code | Title | Credits |
|---|---|---|
| **Physics Core Courses** | | |
| MATH 251–253<br>or MATH 261–263 | Calculus I-III<br>Calculus with Theory I-III | 12 |
| MATH 256 | Introduction to Differential Equations | 4 |
| MATH 281–282 | Several-Variable Calculus I-II | 8 |
| PHYS 251–253 | Foundations of Physics I | 12 |
| PHYS 290 | Foundations of Physics Laboratory [1] | 2 |
| PHYS 351–353 | Foundations of Physics II | 12 |
| PHYS 391 | Physics Experimentation Data Analysis Laboratory | 4 |
| **Interdisciplinary Science Core** | | |
| Two from the following: [2] | | 8 |
| CH 221 | General Chemistry I | |
| CH 222 | General Chemistry II | |
| CH 224H | Advanced General Chemistry I | |
| CH 225H | Advanced General Chemistry II | |
| BI 211 | General Biology I: Cells | |
| BI 212 | General Biology II: Organisms | |
| BI 213 | General Biology III: Ecology and Evolution | |
| CS 210 | Computer Science I | |
| CS 211 | Computer Science II | |
| CS 212 | Computer Science III | |
| ERTH 201 | Dynamic Planet Earth | |
| HPHY 212 | Scientific Investigation in Physiology | |
| **Physics Upper-Division Courses** | | **24** |
| Three upper-division laboratory courses [3] | | 6 |
| **Total Credits** | | **92** |

1. To be repeated, totaling 2 credits.
2. Students are strongly urged to complete this requirement in the first two years.
3. Any combination of PHYS 424-425 or PHYS 431-432 or PHYS 491-493 or PHYS 401, to total 6 credits.

## Honors

To be recommended by the faculty for graduation with honors in physics, a student must complete at least 46 credits in upper-division physics courses, of which at least 40 credits must be taken for letter grades, and earn at least a 3.50 grade point average in these courses.

As an alternative, undergraduate research leading to the defense of a thesis accompanied by at least a 3.30 grade point average can lead to recommendation for graduation with honors. Contact the director of undergraduate studies for more information.

## Four-Year Degree Plan

### Bachelor of Arts in Physics

| Course | Title | Credits Milestones |
|---|---|---|
| **First Year** | | |
| **Fall** | | |
| PHYS 251<br>or PHYS 201 | Foundations of Physics I<br>or General Physics | 4 |
| PHYS 290 | Foundations of Physics Laboratory | 1 |
| CH 221 | General Chemistry I | 4 |
| MATH 251<br>or MATH 111Z<br>or MATH 112Z | Calculus I<br>or Precalculus I: Functions<br>or Precalculus II: Trigonometry | 4 |
| WR 121Z | Composition I | 4 |
| | **Credits** | **17** |
| **Winter** | | |
| PHYS 252<br>or MATH 251<br>or MATH 112Z | Foundations of Physics I<br>or Calculus I<br>or Precalculus II: Trigonometry | 4 |
| PHYS 290 | Foundations of Physics Laboratory | 1 |
| CH 222 | General Chemistry II | 4 |
| MATH 252 | Calculus II | 4 |

| | | |
|---|---|---|
| WR 122Z | Composition II | 4 |
| | **Credits** | **17** |
| **Spring** | | |
| PHYS 253<br>or MATH 251 | Foundations of Physics I<br>or Calculus I | 4 |
| PHYS 290 | Foundations of Physics Laboratory | 1 |
| MATH 253<br>or MATH 251 | Calculus III<br>or Calculus I | 4 |
| CS 210 | Computer Science I | 4 |
| Core-education course in arts and letters | | 4 |
| | **Credits** | **17** |
| | **Total Credits** | **51** |

| Course | Title | Credits | Milestones |
|---|---|---|---|
| **Second Year** | | | |
| **Fall** | | | |
| PHYS 351 | Foundations of Physics II | 4 | |
| MATH 281<br>or MATH 253 | Several-Variable Calculus I<br>or Calculus III | 4 | |
| PHYS 391 | Physics Experimentation Data Analysis Laboratory | 4 | |
| Core-education course in arts and letters | | 4 | |
| | **Credits** | **16** | |
| **Winter** | | | |
| PHYS 353 | Foundations of Physics II | 4 | |
| MATH 282<br>or MATH 281 | Several-Variable Calculus II<br>or Several-Variable Calculus I | 4 | |
| Core-education course in social science | | 4 | |
| Core-education course that also satisfies a cultural literacy requirement | | 4 | |
| | **Credits** | **16** | |
| **Spring** | | | |
| PHYS 353 | Foundations of Physics II | 4 | |
| MATH 256<br>or MATH 282 | Introduction to Differential Equations<br>or Several-Variable Calculus II | 4 | |
| Core-education course in arts and letters | | 4 | |
| Core-education course in social science | | 4 | |
| | **Credits** | **16** | |
| | **Total Credits** | **48** | |

| Course | Title | Credits | Milestones |
|---|---|---|---|
| **Third Year** | | | |
| **Fall** | | | |
| PHYS 412 | Mechanics, Electricity, and Magnetism | 4 | |
| Core-education course in arts and letters | | 4 | |
| Core-education course that also satisfies a cultural literacy requirement | | 4 | |
| First term of first-year second-language sequence | | 4 | |
| | **Credits** | **16** | |
| **Winter** | | | |
| PHYS 411 | Mechanics, Electricity, and Magnetism | 4 | |
| PHYS 413 | Mechanics, Electricity, and Magnetism | 4 | |
| Core-education course in social science | | 4 | |
| Second term of first-year second-language sequence | | 4 | |
| | **Credits** | **16** | |
| **Spring** | | | |
| PHYS 422 | Electromagnetism | 4 | |
| Third term of first-year second-language sequence | | 4 | |
| Core-education course in social science | | 4 | |
| Elective course | | 4 | |
| | **Credits** | **16** | |
| | **Total Credits** | **48** | |

| Course | Title | Credits | Milestones |
|---|---|---|---|
| **Fourth Year** | | | |
| **Fall** | | | |
| PHYS 414 | Quantum Physics | 4 | |
| First term of second-year second-language sequence | | 4 | |
| Elective courses | | 8 | |
| | **Credits** | **16** | |
| **Winter** | | | |
| PHYS 415 | Quantum Physics | 4 | |
| PHYS 431 | Analog Electronics | 4 | |
| Second term of second-year second-language sequence | | 4 | |
| Elective course | | 4 | |
| | **Credits** | **16** | |
| **Spring** | | | |
| PHYS 417 | Topics in Quantum Physics | 4 | |
| PHYS 432 | Digital Electronics | 4 | |
| Third term of second-year second-language sequence | | 4 | |
| Elective course | | 4 | |
| | **Credits** | **16** | |
| | **Total Credits** | **48** | |

## Bachelor of Science in Physics

| Course | Title | Credits | Milestones |
|---|---|---|---|
| **First Year** | | | |
| **Fall** | | | |
| PHYS 251 | Foundations of Physics I | 4 | |
| PHYS 290 | Foundations of Physics Laboratory | 1 | |
| CH 221 | General Chemistry I | 4 | |
| MATH 251 | Calculus I | 4 | |
| WR 121Z | Composition I | 4 | |
| | **Credits** | **17** | |
| **Winter** | | | |
| PHYS 252 | Foundations of Physics I | 4 | |
| PHYS 290 | Foundations of Physics Laboratory | 1 | |
| CH 222 | General Chemistry II | 4 | |
| MATH 252 | Calculus II | 4 | |

| | | |
|---|---|---|
| WR 122Z | Composition II | 4 |
| | **Credits** | **17** |
| **Spring** | | |
| PHYS 253 | Foundations of Physics I | 4 |
| PHYS 290 | Foundations of Physics Laboratory | 1 |
| MATH 253 | Calculus III | 4 |
| CS 210 | Computer Science I | 4 |
| Core-education course in arts and letters | | 4 |
| | **Credits** | **17** |
| | **Total Credits** | **51** |

| Course | Title | Credits | Milestones |
|---|---|---|---|
| **Second Year** | | | |
| **Fall** | | | |
| PHYS 351 | Foundations of Physics II | 4 | |
| PHYS 391 | Physics Experimentation Data Analysis Laboratory | 4 | |
| MATH 281 | Several-Variable Calculus I | 4 | |
| Core-education course in arts and letters | | 4 | |
| | **Credits** | **16** | |
| **Winter** | | | |
| PHYS 352 | Foundations of Physics II | 4 | |
| MATH 282 | Several-Variable Calculus II | 4 | |
| Core-education course in social science | | 4 | |
| Core-education course that also satisfies a cultural literacy requirement | | 4 | |
| | **Credits** | **16** | |
| **Spring** | | | |
| PHYS 353 | Foundations of Physics II | 4 | |
| MATH 256 | Introduction to Differential Equations | 4 | |
| Core-education course in arts and letters | | 4 | |
| Core-education course in social science | | 4 | |
| | **Credits** | **16** | |
| | **Total Credits** | **48** | |

| Course | Title | Credits | Milestones |
|---|---|---|---|
| **Third Year** | | | |
| **Fall** | | | |
| PHYS 412 | Mechanics, Electricity, and Magnetism | 4 | |
| Core-education course in arts and letters | | 4 | |
| Core-education course in social science | | 4 | |
| Core-education course that also satisfies a cultural literacy requirement | | 4 | |
| | **Credits** | **16** | |
| **Winter** | | | |
| PHYS 411 | Mechanics, Electricity, and Magnetism | 4 | |
| PHYS 413 | Mechanics, Electricity, and Magnetism | 4 | |
| Core-education course in social science | | 4 | |
| Elective course | | 4 | |
| | **Credits** | **16** | |
| **Spring** | | | |
| PHYS 422 | Electromagnetism | 4 | |
| Elective courses | | 12 | |
| | **Credits** | **16** | |
| | **Total Credits** | **48** | |

| Course | Title | Credits | Milestones |
|---|---|---|---|
| **Fourth Year** | | | |
| **Fall** | | | |
| PHYS 414 | Quantum Physics | 4 | |
| Elective courses | | 12 | |
| | **Credits** | **16** | |
| **Winter** | | | |
| PHYS 415 | Quantum Physics | 4 | |
| PHYS 431 | Analog Electronics | 4 | |
| Elective courses | | 8 | |
| | **Credits** | **16** | |
| **Spring** | | | |
| PHYS 417 | Topics in Quantum Physics | 4 | |
| PHYS 432 | Digital Electronics | 4 | |
| Elective courses | | 8 | |
| | **Credits** | **16** | |
| | **Total Credits** | **48** | |