

PHYSICS UNDERGRADUATE MAJOR (BA, BS, HBA, HBS)

This major offers the following option(s):

- Applied Physics (<http://catalog.oregonstate.edu/college-departments/science/physics/physics-ba-bs-hba-hbs/applied-physics-option/>)
- Biological Physics (<http://catalog.oregonstate.edu/college-departments/science/physics/physics-ba-bs-hba-hbs/biological-physics-option/>)
- Chemical Physics (<http://catalog.oregonstate.edu/college-departments/science/physics/physics-ba-bs-hba-hbs/chemical-physics-option/>)
- Computational Physics (<http://catalog.oregonstate.edu/college-departments/science/physics/physics-ba-bs-hba-hbs/computational-physics-option/>)
- Geophysics (<http://catalog.oregonstate.edu/college-departments/science/physics/physics-ba-bs-hba-hbs/geophysics-option/>)
- Mathematical Physics (<http://catalog.oregonstate.edu/college-departments/science/physics/physics-ba-bs-hba-hbs/mathematical-physics-option/>)
- Optical Physics (<http://catalog.oregonstate.edu/college-departments/science/physics/physics-ba-bs-hba-hbs/optical-physics-option/>)
- Physics Teaching/Physics (<http://catalog.oregonstate.edu/college-departments/science/physics/physics-ba-bs-hba-hbs/physics-teachingphysics-option/>)

Major Code: 590

- Organize and carry out long, complex physics problems.
- Decide on strategies to be used and assumptions that need to be made.
- Determine what constitutes sufficient evidence for a conclusion.
- Use both algebraic and geometric approaches in problem-solving.
- Computationally model the behavior of physical systems.
- Troubleshoot difficulties encountered in experiments or computations.
- Translate physical descriptions into mathematical equations, and conversely, explain the physical meaning of mathematical results.
- Examine intermediate results or other quantities that could be used to ensure a solution is physically reasonable.
- Identify what they don't understand, and ask specific questions in order to gain understanding.
- Articulate where they experience difficulty; and take actions to move beyond that difficulty.
- Write effectively using professional norms.
- Present work verbally using professional norms.
- Use graphs and diagrams to convey their results.
- Write down clear step-by-step mathematical reasoning and equations.
- Collaborate with other students.
- Design an experiment to measure a given physical quantity.
- Make measurements on physical systems.
- Estimate sources of error in a measurement.

- Interpret their measurements, taking into account the limitations of the measurements and the limitations of models.

All physics majors must complete the following courses:

Code	Title	Credits
Baccalaureate Core		
Select 51 credits		
Required Courses		
CH 231 & CH 261	GENERAL CHEMISTRY and *LABORATORY FOR CHEMISTRY 231	5
CH 232 & CH 262	GENERAL CHEMISTRY and *LABORATORY FOR CHEMISTRY 232	5
CH 233 & CH 263	GENERAL CHEMISTRY and *LABORATORY FOR CHEMISTRY 233	5
MTH 251	*DIFFERENTIAL CALCULUS	4
MTH 252	INTEGRAL CALCULUS	4
MTH 253 or MTH 306	INFINITE SERIES AND SEQUENCES MATRIX AND POWER SERIES METHODS	4
MTH 254	VECTOR CALCULUS I	4
MTH 255	VECTOR CALCULUS II	4
MTH 256	APPLIED DIFFERENTIAL EQUATIONS	4
MTH 341	LINEAR ALGEBRA I	3
PH 211 & PH 221	*GENERAL PHYSICS WITH CALCULUS and RECITATION FOR PHYSICS 211	5
PH 212 & PH 222	*GENERAL PHYSICS WITH CALCULUS and RECITATION FOR PHYSICS 212	5
PH 213 & PH 223	*GENERAL PHYSICS WITH CALCULUS and RECITATION FOR PHYSICS 213	5
PH 315	PHYSICS OF CONTEMPORARY CHALLENGES	3
PH 335	TECHNIQUES OF THEORETICAL MECHANICS	3
PH 411	ELECTRONICS	3
PH 365 & PH 366 & PH 367	COMPUTATIONAL PHYSICS LAB and COMPUTATIONAL PHYSICS LAB and COMPUTATIONAL PHYSICS LAB	3
PH 422	PARADIGMS IN PHYSICS: STATIC FIELDS	3
PH 423	PARADIGMS IN PHYSICS: ENERGY AND ENTROPY	3
PH 424	PARADIGMS IN PHYSICS: OSCILLATIONS AND WAVES	3
PH 425	PARADIGMS IN PHYSICS: QUANTUM FUNDAMENTALS	3
PH 426	PARADIGMS IN PHYSICS: CENTRAL FORCES	3
PH 427	PARADIGMS IN PHYSICS: PERIODIC SYSTEMS	3
PH 401	RESEARCH	3
PH 403	*THESIS	3
Select one of the following:		15-22
Bachelor of Science in Physics		
Bachelor of Arts in Physics		
Total credits required for graduation		180

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Baccalaureate Core Course (BCC)

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Writing Intensive Course (WIC)

Bachelor of Science in Physics

For graduation with a Bachelor of Science degree in Physics under the basic physics option, additional course requirements consist of:

Code	Title	Credits
PH 415 or PH 464	COMPUTER INTERFACING AND INSTRUMENTATION SCIENTIFIC COMPUTING II	3
PH 431	CAPSTONES IN PHYSICS: ELECTROMAGNETISM	3
PH 441	CAPSTONES IN PHYSICS: THERMAL AND STATISTICAL PHYSICS	3

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PH 451	CAPSTONES IN PHYSICS: QUANTUM MECHANICS	3
PH 481	PHYSICAL OPTICS	4
Select 6 additional credits ¹		6
Total Credits		22

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At least 6 additional credits chosen from among the non-blanket Physics courses at the 400-level or beyond, or related courses in another department with the approval of the head undergraduate advisor.

Bachelor of Arts in Physics

To graduate with a Bachelor of Arts degree in Physics, additional course requirements consist of:

Code	Title	Credits
Select two of the following:		
PH 431	CAPSTONES IN PHYSICS: ELECTROMAGNETISM	6
PH 441	CAPSTONES IN PHYSICS: THERMAL AND STATISTICAL PHYSICS	
PH 451	CAPSTONES IN PHYSICS: QUANTUM MECHANICS	
Select 9 credits of approved electives ¹		9
Total Credits		15

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The student must complete 9 credits of approved electives in the College of Liberal Arts and must complete or demonstrate proficiency in the second year of a foreign language.

Major Code: 590

- Total Credits: 180
- Physics: 74
- PH Elective must be 400 level course (not 40x)
- Not shown are the Baccalaureate Core courses required by the university: Skills (Fitness, Speech, WR I, WR II), Perspectives (Cultural Diversity, Literature & the Arts, Social Processes & Institutions, Western Culture, and Difference, Power, & Discrimination), Synthesis (Contemporary Global Issues and Science, Technology, & Society)

First Year		
Fall		Credits
MTH 251	*DIFFERENTIAL CALCULUS	4
CH 231	GENERAL CHEMISTRY	4
CH 261	*LABORATORY FOR CHEMISTRY 231	1
PH 198	FIRST-YEAR ORIENTATION	1
Credits		10
Winter		
MTH 252	INTEGRAL CALCULUS	4
CH 232	GENERAL CHEMISTRY	4
CH 262	*LABORATORY FOR CHEMISTRY 232	1
Credits		9
Spring		
MTH 254	VECTOR CALCULUS I	4
CH 233	GENERAL CHEMISTRY	4
CH 263	*LABORATORY FOR CHEMISTRY 233	1
PH 211	*GENERAL PHYSICS WITH CALCULUS	4
PH 221	RECITATION FOR PHYSICS 211	1
Credits		14
Second Year		
Fall		
MTH 255	VECTOR CALCULUS II	4
PH 212	*GENERAL PHYSICS WITH CALCULUS	4

PH 222	RECITATION FOR PHYSICS 212	1
Credits		9

Winter

MTH 256	APPLIED DIFFERENTIAL EQUATIONS	4
PH 213	*GENERAL PHYSICS WITH CALCULUS	4
PH 223	RECITATION FOR PHYSICS 213	1
Credits		9

Spring

MTH 253	INFINITE SERIES AND SEQUENCES ¹	4
or MTH 264 and MTH 265	or INTRODUCTION TO MATRIX ALGEBRA and INTRODUCTION TO SERIES	
MTH 341	LINEAR ALGEBRA I	3
PH 315	PHYSICS OF CONTEMPORARY CHALLENGES	3
Credits		10

Third Year

Fall

PH 335	TECHNIQUES OF THEORETICAL MECHANICS	3
PH 411	ELECTRONICS	3
Credits		6

Winter

PH 422	PARADIGMS IN PHYSICS: STATIC FIELDS	3
PH 425	PARADIGMS IN PHYSICS: QUANTUM FUNDAMENTALS	3
PH 365	COMPUTATIONAL PHYSICS LAB	1
PH 415	COMPUTER INTERFACING AND INSTRUMENTATION ³	3
PH 401	RESEARCH ²	1
Credits		11

Spring

PH 424	PARADIGMS IN PHYSICS: OSCILLATIONS AND WAVES	3
PH 426	PARADIGMS IN PHYSICS: CENTRAL FORCES	3
PH 427	PARADIGMS IN PHYSICS: PERIODIC SYSTEMS	3
PH 366	COMPUTATIONAL PHYSICS LAB	1
PH 401	RESEARCH ²	1
Credits		11

Fourth Year

Fall

PH 403	*THESIS	1
PH 401	RESEARCH ²	1
PH 423	PARADIGMS IN PHYSICS: ENERGY AND ENTROPY	3
PH 367	COMPUTATIONAL PHYSICS LAB	1
PH 431	CAPSTONES IN PHYSICS: ELECTROMAGNETISM	3
PH elective		3
Credits		12

Winter

PH 403	*THESIS	1
PH 451	CAPSTONES IN PHYSICS: QUANTUM MECHANICS	3
PH 481	PHYSICAL OPTICS	4
PH 464	SCIENTIFIC COMPUTING II ³	3
Credits		11

Spring

PH 403	*THESIS	1
PH 441	CAPSTONES IN PHYSICS: THERMAL AND STATISTICAL PHYSICS	3
PH elective		3
Credits		7
Total Credits		119

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Students interested in a MTH minor or double major should take MTH 253. Other students should take MTH 264/MTH 265

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Three credits of PH 401 are required. Although they can be taken in terms other than shown here, it is strongly recommended to start research by the winter term of the junior year. Students doing external internships as a basis for their research should discuss this with the head advisor

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Students chose either PH 415 or PH 464