

# PHYSICS MAJOR (B.S.)

<https://ceps.unh.edu/physics/program/bs/physics-major>

## Description

The bachelor of science degree in physics prepares students for professional work as physicists, and is the first step toward graduate work in physics. It is also excellent preparation for graduate programs in medicine, law, or engineering, as well as for technical jobs in industry. The required courses are those typically necessary for admission to graduate study in physics or astronomy.

## Requirements

Code	Title	Credits
<b>University Discovery requirements</b> <sup>1</sup>		
<b>Bachelor of Science requirements</b>		
<b>Minimum physics requirements:</b>		
PHYS 400	Freshman Seminar	1
PHYS 407	General Physics I	4
PHYS 408	General Physics II	4
PHYS 505 & PHYS 506	General Physics III and General Physics III Laboratory	4
PHYS 508	Thermodynamics and Statistical Mechanics	4
PHYS 601	Computational Physics Recitation I	1
PHYS 602	Computational Physics Recitation II	1
PHYS 605	Experimental Physics I	5
PHYS 615	Classical Mechanics and Mathematical Physics I	4
PHYS 616	Classical Mechanics and Mathematical Physics II	4
PHYS 701	Quantum Mechanics I	4
PHYS 702	Quantum Mechanics II	4
PHYS 703	Electricity and Magnetism I	4
PHYS 704	Electricity and Magnetism II	4
PHYS 705	Experimental Physics II	4
Select two electives from the following:		8
PHYS 708	Optics	
PHYS 710	Astrophysics I	
PHYS 712	Space Plasma Physics	
PHYS 718	Condensed Matter Physics	
PHYS 720	Nuclear Physics	
PHYS 764	General Relativity and Cosmology	
MATH 747	Introduction to Nonlinear Dynamics and Chaos	
MATH 753	Introduction to Numerical Methods I	
<b>Chemistry:</b>		
CHEM 403 or CHEM 405	General Chemistry I Chemical Principles for Engineers	4
<b>Mathematics:</b>		
MATH 425 & MATH 426	Calculus I and Calculus II	8
Select one of the following options: <sup>2</sup>		12
Option A:		
MATH 525 & MATH 526	Linearity I and Linearity II <sup>2</sup>	
Option B:		
MATH 528	Multidimensional Calculus	
MATH 527	Differential Equations with Linear Algebra	
MATH 545 or MATH 645	Introduction to Linear Algebra Linear Algebra for Applications	
<b>Computer Programming:</b>		
CS 410P or IAM 550	Introduction to Scientific Programming/Python Introduction to Engineering Computing	4
<b>Capstone:</b> <sup>3</sup>		
PHYS 795 & PHYS 799	Independent Study and Thesis	2-8

or INCO 790 & PHYS 799	Advanced Research Experience and Thesis
or PHYS 798	Senior Project

Total Credits 90-96

- Note that no physics course can satisfy these requirement for a physics major. The rationale behind this is that a course in physics does not broaden the education of a physics major.
- The Department generally recommends MATH 645 Linear Algebra for Applications over MATH 545 Introduction to Linear Algebra for physics majors.
- A capstone experience is required of all physics majors during their senior year. The Physics Department encourages students to write a senior thesis (PHYS 799 Thesis) for their capstone experience. Other options include independent study research projects (PHYS 795 Independent Study or INCO 590 Student Research Experience) or a special project as part of senior lab (PHYS 705 Experimental Physics II). All capstone experiences must be approved by the undergraduate committee during the student's penultimate semester.

By the end of the spring semester of the sophomore year, a student must have a minimum grade of C in each 400- or 500-level course specifically required for the B.S. degree and an overall grade-point average of at least 2.33 in these courses in order to continue in the B.S. program.

## Physics Electives

In the following table, "electives" include Discovery courses, writing-intensive courses, physics electives, and free-choice electives. Note that physics electives can only be taken in the junior or senior year because of prerequisites, and are in general offered every other year.

Code	Title	Credits
PHYS 708	Optics	4
PHYS 710	Astrophysics I	4
PHYS 712	Space Plasma Physics	4
PHYS 718	Condensed Matter Physics	4
PHYS 720	Nuclear Physics	4
PHYS 764	General Relativity and Cosmology	4

## Degree Plan

### Suggested Curriculum for B.S. in Physics

In this degree plan, "electives" include Discovery courses, Writing Intensive Courses, Physics electives, or electives required to meet 128 credit graduation requirement.

Course	Title	Credits
<b>First Year</b>		
<b>Fall</b>		
PHYS 400	Freshman Seminar	1
PHYS 407	General Physics I	4
MATH 425	Calculus I	4
ENGL 401	First-Year Writing	4
CHEM 403 or CHEM 405	General Chemistry I or Chemical Principles for Engineers	4
<b>Credits</b>		<b>17</b>
<b>Spring</b>		
PHYS 408	General Physics II	4
MATH 426	Calculus II	4

CS 410P or IAM 550	Introduction to Scientific Programming/ Python or Introduction to Engineering Computing	4
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Capstone	4
<b>Credits</b>	<b>16</b>
<b>Total Credits</b>	<b>128-132</b>

Discovery Elective	4
<b>Credits</b>	<b>16</b>

**Second Year****Fall**

PHYS 505 & PHYS 506	General Physics III and General Physics III Laboratory	4
PHYS 508	Thermodynamics and Statistical Mechanics	4
MATH 528 or MATH 525	Multidimensional Calculus or Linearity I	0-6
PHYS 601	Computational Physics Recitation I	1
Discovery Elective	4	
<b>Credits</b>	<b>13-19</b>	

**Spring**

PHYS 615	Classical Mechanics and Mathematical Physics I	4
PHYS 605	Experimental Physics I	5
PHYS 602	Computational Physics Recitation II	1
Select one of the following two options:	8 or 6	
(1) For students who took MATH 528:		
MATH 527 & MATH 645	Differential Equations with Linear Algebra and Linear Algebra for Applications	
(2) For students who took MATH 525:		
MATH 526	Linearity II	
<b>Credits</b>	<b>18-16</b>	

**Third Year****Fall**

PHYS 616	Classical Mechanics and Mathematical Physics II	4
PHYS 701	Quantum Mechanics I	4
Discovery or Major Electives	8	
<b>Credits</b>	<b>16</b>	

**Spring**

PHYS 702	Quantum Mechanics II	4
PHYS 703	Electricity and Magnetism I	4
Discovery or Major Electives	8	
<b>Credits</b>	<b>16</b>	

**Fourth Year****Fall**

PHYS 704	Electricity and Magnetism II	4
PHYS 705	Experimental Physics II	4
Discovery or Major Elective	4	
Capstone	4	
<b>Credits</b>	<b>16</b>	

**Spring**

Electives	12
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**Student Learning Outcomes**

- Students will master the fundamentals of mechanics, electricity and magnetism, quantum mechanics, and thermodynamics.
- Students will have a solid understanding of calculus, differential equations, and linear algebra and be able to use mathematics to solve physics problems.
- Students will be able to solve physics problems using computational methods.
- Students will be proficient at taking measurements in a physics lab and analyzing measurements to draw valid conclusions.
- Students will be well prepared for graduate study in physics and related disciplines.
- Students will be well prepared for technical careers.
- Students will be able to present scientific ideas effectively in both written and oral form.