

# PHYSICS

**Bachelor of Science degree  
with a major in Physics** (traditional)

**Bachelor of Science degree  
with a major in Physics —  
concentration in astronomy**

**Bachelor of Arts degree  
with a major in Physics**

**Minor in Astronomy**

**Minor in Physics**

**Department Chair**

Monte Mola, Ph.D.

**Department of Physics and Astronomy**

Science Complex A 470

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humboldt.edu/physics

## The Program

Students completing this program will have demonstrated:

- understanding of how physics attempts to describe processes in nature
- competency in abstract reasoning and problem-solving skills
- understanding and use of physical and mathematical models
- knowledge of physics concepts applicable to a range of disciplines
- understanding of how physics relates and applies to studies in other disciplines
- breadth, depth, and rigor expected of a student with an undergraduate degree in physical science
- proficiency and skill in constructing and performing laboratory experiments and in the interpretation of experimental observations
- understanding the theories that support modern physical science.

This program is the prerequisite to many research positions offered by government and industry, and to graduate study. Careers in physics often require advanced degrees beyond the BS. Typical opportunities: aerospace scientist, medical technologist, systems analyst, astronomer, meteorologist, industrial hygienist, electronics engineer, fusion engineer, oceanographer, physical chemist, geophysicist, physicist.

The university's nearby observatory on Fickle Hill has a 16-inch telescope, a 12-inch telescope, and several 8-inch telescopes for student and community use. The department also offers a well-equipped computer electronics laboratory.

## Preparation

In high school take English, mathematics, and physics.

## REQUIREMENTS FOR THE MAJOR: BACHELOR OF SCIENCE

*For a description of degree requirements to be fulfilled in addition to those listed below for the major, please see "The Bachelor's Degree" section of the catalog, pp. 66-81. The Upper Division Area B General Education requirement is met by the coursework within the Bachelor of Science degree for either option in the Physics major.*

*A minimum grade of C- is required for all courses with the "PHYX" prefix for the BS physics major degree.*

### Lower Division Core

Core courses required for all majors:

CHEM 109	(5)	General Chemistry I
CHEM 110	(5)	General Chemistry II
MATH 109	(4)	Calculus I
MATH 110	(4)	Calculus II
MATH 210	(4)	Calculus III
MATH 241	(3)	Elements of Linear Algebra
PHYX 109	(4)	General Physics A: Mechanics
PHYX 210	(4)	General Physics B: Thermodynamics, Waves & Optics
PHYX 211	(4)	General Physics C: Electricity & Magnetism

### Upper Division Core

Core courses required for all majors:

MATH 311	(2)	Vector Calculus
MATH 313	(4)	Ordinary Differential Equations
PHYX 320	(3)	Modern Physics
PHYX 324	(4)	Analytical Mechanics
PHYX 325	(4)	Thermal Physics
PHYX 340	(2)	Mathematical and Computational Methods
PHYX 441	(3)	Electricity & Magnetism I
PHYX 442	(3)	Electricity & Magnetism II
PHYX 450	(4)	Quantum Physics I
PHYX 484	(0.5)	Physics Seminar I
PHYX 485	(0.5)	Physics Seminar II

### Astronomy Concentration

PHYX 310	(3)	Spacetime & Relativity
PHYX 360	(4)	Physics of Stars & Planets
PHYX 361	(4)	Galaxies and Cosmology

### Physics (Traditional)

PHYX 315	(3)	Intro to Electronics & Electronic Instrumentation
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PHYX 316	(4)	Electronic Instrumentation & Control Systems
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PHYX 462	(2)	Senior Lab
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Those students intending to enter graduate school in physics should take more courses in physics and mathematics. For example:

MATH 240	(3)	Intro to Mathematical Thought
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MATH 314	(3)	Partial Differential Equations
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MATH 343	(4)	Intro to Algebraic Structures
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MATH 344	(3)	Linear Algebra
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MATH 351	(4)	Intro to Numerical Analysis
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MATH 418	(3)	Intro to Complex Analysis
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PHYX 495	(1-3)	Selected Topics in Physics for Seniors — Undergraduate Research
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## REQUIREMENTS FOR THE MAJOR: BACHELOR OF ARTS

*For a description of degree requirements to be fulfilled in addition to those listed below for the major, please see "The Bachelor's Degree" section of the catalog, pp. 66-81.*

*A minimum grade of C- is required for all courses with the "PHYX" prefix for the BA physics major degree.*

### Lower Division

CHEM 109	(5)	General Chemistry I
CHEM 110	(5)	General Chemistry II
MATH 109	(4)	Calculus I
MATH 110	(4)	Calculus II
MATH 210	(4)	Calculus III
MATH 241	(3)	Elements of Linear Algebra

Plus one of these physics series:

- PHYX 106 (4) College Physics:  
Mechanics & Heat, **and**
- PHYX 107 (4) College Physics:  
Electromagnetism &  
Modern Physics, **and**
- PHYX 399 (1-3) Supplemental Work  
in Physics

### OR

- PHYX 109 (4) General Physics A:  
Mechanics, **and**
- PHYX 210 (4) General Physics B:  
Thermodynamics,  
Waves & Optics
- PHYX 211 (4) General Physics C:  
Electricity & Magnetism

### Upper Division

- MATH 313 (4) Ordinary Differential Equations  
PHYX 304 (4) The Cosmos (recommended early in your program)  
PHYX 315 (3) Intro to Electronics & Electronic Instrumentation  
PHYX 320 (3) Modern Physics  
PHYX 324 (4) Analytical Mechanics  
PHYX 441 (3) Electricity & Magnetism I  
PHYX 442 (3) Electricity & Magnetism II  
Plus 12 units from the following physics courses:  
PHYX 310 (3) Spacetime & Relativity  
PHYX 316 (4) Electronic Instrumentation & Control Systems  
PHYX 325 (4) Thermal Physics  
PHYX 360 (4) Physics of Stars & Planets  
PHYX 420 (4) Optical Systems Design  
PHYX 430 (3) Computerized Instrumentation  
PHYX 450 (4) Quantum Physics I  
PHYX 462 (2) Senior Lab

### REQUIREMENTS FOR THE MINORS

#### Minor in Astronomy

A minimum grade of C- is required for all courses with the "PHYX" prefix for the physics minor degree.

#### Lower Division

Take one of the following series of courses.

- MATH 101T (3) Trigonometry, **or**  
MATH 102 (4) Algebra & Elementary Functions  
PHYX 104 (4) Descriptive Astronomy  
PHYX 106 (4) College Physics: Mechanics & Heat  
PHYX 107 (4) College Physics: Electromagnetism & Modern Physics

#### OR

- MATH 109 (4) Calculus I  
MATH 110 (4) Calculus II  
MATH 210 (4) Calculus II  
PHYX 109 (4) General Physics A: Mechanics  
PHYX 210 (4) General Physics B: Thermodynamics, Waves & Optics  
PHYX 211 (4) General Physics C: Electricity & Magnetism

#### Upper Division

Take two of the following courses.

- PHYX 303 (3) Life in the Universe  
PHYX 304 (4) Cosmos  
PHYX 310 (3) Spacetime & Relativity

- PHYX 360 (4) Physics of Stars & Planets  
PHYX 361 (4) Galaxies and Cosmology

#### Minor in Physics

A minimum grade of C- is required for all courses with the "PHYX" prefix for the physics minor degree.

#### Lower Division

- MATH 109 (4) Calculus I  
MATH 110 (4) Calculus II  
MATH 210 (4) Calculus II  
PHYX 109 (4) General Physics A: Mechanics  
PHYX 210 (4) General Physics B: Thermodynamics, Waves & Optics  
PHYX 211 (4) General Physics C: Electricity & Magnetism

#### Upper Division

- PHYX 320 (3) Modern Physics, **or**  
CHEM 362 (3) Physical Chemistry II

Plus 3 additional units of upper division physics courses:

- PHYX 310 (3) Spacetime & Relativity  
PHYX 315 (3) Intro to Electronics & Electronic Instrumentation  
PHYX 324<sup>†</sup> (4) Analytical Mechanics  
PHYX 325 (4) Thermal Physics  
PHYX 340<sup>†</sup> (2) Mathematical & Computational Methods  
PHYX 420<sup>†</sup> (4) Optical Systems Design  
PHYX 441<sup>†</sup> (3) Electricity & Magnetism I  
PHYX 450<sup>†</sup> (4) Quantum Physics I  
PHYX 495 (1-3) Selected Topics in Physics for Seniors – Undergraduate Research



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<sup>†</sup> Course requires one or more prerequisites that are not required elsewhere in the minor. See course description for prerequisites.

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