### 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

707-826-3277

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. 67-82. 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** (4) Calculus I
- **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:

- **CHEM 110** (5) General Chemistry I
- **CHEM 111** (5) General Chemistry II
- **MATH 210** (4) Calculus III
- **MATH 241** (3) Elements of Linear Algebra
- **PHYX 324** (4) Modern Physics
- **PHYX 325** (4) Analytical Mechanics
- **PHYX 343** (4) Introduction to Algebraic Structures
- **PHYX 351** (3) Elements of Linear Algebra
- **PHYX 360** (3) Electricity & Magnetism
- **PHYX 361** (3) Galaxies and Cosmology
- **PHYX 362** (2) Senior Lab

Plus one of these physics series:

- **PHYX 400** (3) Modern Physics
- **PHYX 401** (3) Modern Physics
- **PHYX 402** (3) Modern Physics
- **PHYX 403** (3) Modern Physics

### 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. 67-82.

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

#### Upper Division

- **MATH 240** (3) Intro to Mathematical Thought
- **MATH 343** (4) Intro to Algebraic Structures
- **MATH 344** (3) Linear Algebra
- **MATH 351** (4) Intro to Numerical Analysis

### 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
- **PHYX 316** (4) Electronic Instrumentation & Control Systems
- **PHYX 462** (2) Senior Lab

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
- **MATH 314** (3) Partial Differential Equations
- **MATH 343** (4) Intro to Algebraic Structures
- **MATH 344** (3) Linear Algebra
- **MATH 351** (4) Intro to Numerical Analysis
- **MATH 418** (3) Intro to Complex Analysis
- **PHYX 495** (1-3) Selected Topics in Physics for Seniors — Undergraduate Research

### OR

- **PHYX 106** (4) College Physics: Mechanics & Heat, and Thermodynamics
- **PHYX 107** (4) College Physics: Electromagnetism & Modern Physics, and Thermodynamics
- **PHYX 399** (1-3) Supplemental Work in Physics
Upper Division
PHYX 315 [3] Intro to Electronics & Electronic Instrumentation
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 430 [3] Computerized Instrumentation
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

OR
MATH 110 [4] Calculus II
MATH 210 [4] Calculus II

Upper Division
Take two of the following courses.
PHYX 303 [3] Life in the Universe
PHYX 310 [3] Spacetime & Relativity

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 110 [4] Calculus II
MATH 210 [4] Calculus II

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† [4] Analytical Mechanics
PHYX 420† [4] Optical Systems Design
PHYX 441† [3] Electricity & Magnetism I
PHYX 450† [4] Quantum Physics I
PHYX 495 [1-3] Selected Topics in Physics for Seniors — Undergraduate Research

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