**Physics**

**Bachelor of Science degree**
- with a major in Physics (traditional)
- with a major in Physics — concentration in astronomy

**Bachelor of Arts degree**
- with a major in Physical Science [see physical science]

**Minor in Astronomy**
**Minor in Physics**

**Department Chair**
Monty 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**

**(Physics BS)**

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.

**Unit Requirements**

<table>
<thead>
<tr>
<th>Course units: 67</th>
</tr>
</thead>
<tbody>
<tr>
<td>Astronomy/Physics units: 9/11</td>
</tr>
<tr>
<td>Total units in the major: 76/78</td>
</tr>
<tr>
<td>Total units required for the degree: 120</td>
</tr>
</tbody>
</table>

**Special Grade Requirement**

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

**Core Courses (67 units)**

The following core courses are required for all physics majors.

**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
- **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**

- **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

**Complete one of the following to fulfill the requirements of the major:**

**Astronomy Concentration (11 units)**

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

**Physics — traditional (9 units)**

- **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

**REQUIREMENTS FOR THE MINORS**

**Minor in Astronomy**

Total units required for the minor: 21-32

**Special Grade Requirement**

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

**Lower Division**

Complete 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

**2020-2021 Humboldt State University Catalog**
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**

*Complete 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**

*Total units required for the minor: 30*

**Special Grade Requirement**

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

**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 † (4) Analytical Mechanics
PHYX 325 (4) Thermal Physics
PHYX 340 † (2) Mathematical & Computational Methods
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.