

# Physics and Astronomy

## Major Requirements

The major requirements for the B.S. and B.A. degrees in Physics are as follows:

1. Lower-division requirements (63–64 units)

- a) PHYS 040A, PHYS 040B, PHYS 040C, PHYS 040D, PHYS 040E
- b) MATH 008B or MATH 009A, MATH 009B, MATH 009C, MATH 010A, MATH 010B, MATH 046
- c) CHEM 001A, CHEM 001B, CHEM 001C, CHEM 01LA, CHEM 01LB, CHEM 01LC

2. Upper-division requirements (55 units)

- a) PHYS 130A, PHYS 130B, PHYS 134, PHYS 135A, PHYS 135B, PHYS 136, PHYS 156A, PHYS 156B
- b) PHYS 139L, PHYS 142L. An approved senior thesis (PHYS 195A, PHYS 195B, PHYS 195C, PHYS 195D) in experimental physics or an internship (PHYS 198-I) in experimental physics at a government or industrial laboratory can be used in place of up to 3 units of PHYS 142L.
- c) A student may take up to a maximum of 8 units of undergraduate research in pursuit of a senior thesis (PHYS 195A, PHYS 195B, PHYS 195C, PHYS 195D).
- d) During the junior or senior years, a Physics internship (PHYS 198-I) of up to 12 units can be taken at an approved government or industrial laboratory. A maximum of 3 out of the 12 units may be used to satisfy the major requirements.
- e) Three elective courses to be taken in consultation with a faculty advisor. Specialized skills can be developed by taking physics electives from the following: PHYS 111 (Astrophysics and Stellar Astronomy) PHYS 150A, PHYS 150B (Introduction to Condensed Matter Physics) PHYS 151 (Topics in Modern Condensed Matter Physics) PHYS 163 (Atomic Physics and Spectroscopy) PHYS 164 (Introduction to Nuclear Physics) PHYS 165 (Introduction to Particle Physics)

PHYS 166 (Cosmology)  
PHYS 168 (Environmental Physics)  
PHYS 177 (Computational Methods for Physical Sciences)

## Biophysics option (B.S. degree only)

1. Lower-division requirements (76-77 units)

- a) PHYS 040A, PHYS 040B, PHYS 040C, PHYS 040D, PHYS 040E
- b) MATH 008B or MATH 009A, MATH 009B, MATH 009C, MATH 010A, MATH 010B, MATH 046
- c) CHEM 001A, CHEM 001B, CHEM 001C, CHEM 01LA, CHEM 01LB, CHEM 01LC
- d) BIOL 005A, BIOL 005B, BIOL 005C, BIOL 05LA

2. Upper-division requirements (88 units)

- a) PHYS 130A, PHYS 130B, PHYS 134, PHYS 135A, PHYS 135B, PHYS 136, PHYS 145A, PHYS 145B, PHYS 145C, PHYS 156A
- b) STAT 155
- c) CHEM 112A, CHEM 112B, CHEM 112C
- d) BIOL 105
- e) BCH 110A, BCH 110B, BCH 110C.

Students may substitute BIOL107A for BCH 110C  
f) 4 units of experimental research in either special studies (PHYS 190, PHYS 190L), an approved senior thesis (PHYS 195A, PHYS 195B, PHYS 195C, PHYS 195D), undergraduate research (PHYS 197), or an internship (PHYS 198-I).  
g) 12 units of elective courses (chosen after consultation with a faculty advisor)

## Physics Education option

1. Lower-division requirements (73-74 units)

- a) PHYS 040A, PHYS 040B, PHYS 040C, PHYS 040D, PHYS 040E
- b) MATH 008B or MATH 009A, MATH 009B, MATH 009C, MATH 010A, MATH 010B, MATH 046
- c) CHEM 001A, CHEM 001B, CHEM 001C, CHEM 01LA, CHEM 01LB, CHEM 01LC
- d) EDUC 003, EDUC 004
- e) LING 020 or LING 021

2. Upper-division requirements (75 units)

- a) PHYS 130A, PHYS 130B, PHYS 134, PHYS 135A, PHYS 135B, PHYS 136, PHYS 156A, PHYS 156B

b) PHYS 139L, PHYS 142L (3 units)

c) Two electives from the following list (8 units): PHYS 111, PHYS 145A, PHYS 145B, PHYS 145C, PHYS 150A, PHYS 150B, PHYS 151, PHYS 163, PHYS 164, PHYS 165, PHYS 166, PHYS 168, PHYS 177

d) EDUC 100B, EDUC 109, EDUC 110, EDUC 116, EDUC 139, EDUC 174, EDUC 177A

3. Upper division recommendations (4 units)

a) EDUC 104/MATH 104  
Students seeking an emphasis in environmental physics or chemical physics should consult with an advisor. The physics electives may be selected on an individual basis to stress one of these concentrations.

Students continuing on to graduate school are encouraged to take additional upper-division courses in Mathematics, such as MATH 146A, MATH 146B, MATH 146C, MATH 165A, MATH 165B, and MATH 113. To graduate, a minimum grade point average of 2.00 (C) is necessary overall and in the upper-division courses taken for the major (courses listed under 2.).

Although no foreign languages are required for the B.S. degree, the student who is planning to proceed to graduate work is reminded that reading proficiency in one or more foreign languages is required in some physics graduate programs.

## Bachelor of Arts

For the B.A. degree, additional units are required in Humanities, Social Sciences, and foreign language to meet the breadth requirements.

## Minor

The minor in Physics consists of 26 upper-division units in Physics. A minimum of 16 units must be unique to the minor and may not be used to satisfy major requirements.

1. First Tier (16 units)

- a) PHYS 130A
- b) PHYS 134
- c) PHYS 135A
- d) One Physics elective from PHYS 111, PHYS 150A, PHYS 151, PHYS 164, PHYS 165, PHYS 166, PHYS 177

2. Second Tier: at least 10 units from any upper-division Physics courses not chosen in the First Tier. The combined units from the First and Second Tiers should add to at least 26.

3. No more than 4 units of 190-199 courses may be used to fulfill the upper-division units for the minor.

See Minors under the College of Natural and Agricultural Sciences in the Colleges and Programs section of this catalog for additional information on minors.