

# Physics, BA

## Learning Outcomes

Physics majors will be able to:

- demonstrate competency in applying the basic laws of physics in classical and quantum mechanics, electromagnetism, thermodynamics, and statistical physics;
- solve complex, real-world problems using the principles of physics; and
- demonstrate competency in using basic instrumentation and in analyzing the data obtained.

## Requirements

The Bachelor of Arts with a major in physics requires a minimum of 120 s.h., including at least 44 s.h. of work for the major (minimum of 24 s.h. in physics plus 20 s.h. in supporting coursework). The BA program requires fewer physics courses than the BS program does, giving students a wider choice of electives. Students must maintain a grade-point average of at least 2.00 in all courses for the major and in all UI courses for the major. They must also complete the College of Liberal Arts and Sciences GE CLAS Core.

The major is designed for students who wish to build a foundation of knowledge in physics but do not plan a research-oriented career in the discipline. The BA program is also good preparation for students interested in secondary school science teaching; see the section titled "Teacher Licensure." Bachelor of Arts students majoring in physics who are interested in science teaching and in earning a graduate degree may enroll in a combined degree program offered by the College of Liberal Arts and Sciences and the College of Education; see "BA/MAT (Science Education Subprogram)" under Combined Programs [p. 2] in this section of the catalog.

Students who earn a BA in physics may not earn a BS in applied physics or a BS in physics.

The BA with a major in physics requires the following courses or their equivalents. Substitutions may be allowed by exception through the department.

Requirements	Hours
Mathematics Courses	8
Physics Courses	15-19
Elective Physics Courses	9-10
Supporting Coursework	12

## Mathematics Courses

Course #	Title	Hours
Both of these:		
MATH:1850	Calculus I	4
MATH:1860	Calculus II	4
Or both of these:		
MATH:1550	Engineering Calculus I	4
MATH:1560	Engineering Calculus II	4

## Physics Courses

Course #	Title	Hours
These three courses:		
PHYS:1701	Physics I	4
PHYS:1702	Physics II	4
PHYS:2703	Physics III	4
Or these two courses:		
PHYS:1611	Introductory Physics I	4
PHYS:1612	Introductory Physics II	4
Both of these:		
PHYS:2704	Physics IV	4
PHYS:3756	Intermediate Laboratory	3

## Elective Physics Courses

Course #	Title	Hours
Three of these:		
PHYS:3710	Intermediate Mechanics	3
PHYS:3741	Introduction to Quantum Mechanics I	3
PHYS:3811	Electricity and Magnetism I	3
PHYS:3850	Electronics	4
PHYS:4720	Introductory Optics	3
PHYS:4726	Electro Optics	3
PHYS:4728	Introductory Solid State Physics	3
PHYS:4731	Plasma Physics I	3
PHYS:4740	Elementary Particles and Nuclear Physics	3
PHYS:4750	Advanced Laboratory	3
PHYS:4761	Mathematical Methods of Physics I	3
PHYS:4762	Mathematical Methods of Physics II	3
PHYS:4820	Optical Signal Processing	3
PHYS:4860	Computational Physics	3
PHYS:4905	Special Topics in Physics	arr.

## Supporting Coursework

Students should work with their academic advisor to select courses that fit with their plan of study. Students wishing to pursue subject areas that are not in the following list may do so with the approval of the director of undergraduate studies.

Course #	Title	Hours
Coursework from one these STEM subject areas or from coursework required for teacher licensure		12
	actuarial science (prefix ACTS)	
	biochemistry and molecular biology (prefix BMB)	
	biology (prefix BIOL)	
	chemistry (prefix CHEM)	
	computer science (prefix CS)	
	earth and environmental sciences (prefix EES)	
	engineering (subject to departmental approval)	
	geography (prefix GEOG)	
	mathematics (prefix MATH), except MATH:1210	

physics (prefix PHYS)  
 psychology (prefix PSY)  
 statistics (prefix STAT)

In planning this work, they should be guided by the College of Liberal Arts and Sciences maximum hours rule: students earning a BA may apply a maximum of 56 s.h. earned in one department to the minimum 120 s.h. required for graduation, whether or not the coursework is accepted toward the requirements for the major. Students who earn more than 56 s.h. from one department may use the additional semester hours to satisfy requirements for the major (if the department accepts them), and the grades they earn become part of their grade-point average, but they cannot apply the additional semester hours to the minimum 120 s.h. required for graduation.

## Teacher Licensure

Students interested in teaching in elementary and/or secondary schools should seek admission to the Teacher Education Program (TEP) in the College of Education.

To qualify for licensure in secondary teaching, students in the TEP complete a degree in education as well as a related College of Liberal Arts and Sciences degree. See Apply on the College of Education website for details on requirements and deadlines for applying to the College of Education and about TEP choices of majors leading to licensure.

## Double Major in Physics and Astronomy

Students working toward a Bachelor of Arts with a double major in physics and in astronomy must complete all requirements for both majors and must earn a minimum of 56 s.h. outside the Department of Physics and Astronomy in order to graduate. Students interested in earning a double major should consult with their advisors. See Requirements for a Bachelor's Degree on the College of Liberal Arts and Sciences website.

## Combined Programs

### BA/MAT (Science Education Subprogram)

Bachelor of Arts students in physics who are interested in pursuing a graduate degree in teaching may apply to the combined Bachelor of Arts/Master of Arts in Teaching with a science education subprogram offered by the College of Liberal Arts and Sciences and the College of Education. Designed for undergraduates majoring in biology, chemistry, environmental sciences, geoscience, or physics, the combined program enables students to earn a BA and MAT in five years by beginning to earn graduate credit during their fourth year of undergraduate study and by counting up to 19 s.h. of qualifying credit toward both degrees. For more information, see Science Education BA/MAT in the Master of Arts in Teaching, MAT (College of Education) section of the catalog. Interested students should consult an advisor.

## Undergraduate to Graduate (U2G) Program

Bachelor of Arts students in physics may pair their degree with an Undergraduate to Graduate (U2G) program, which allows earning a bachelor's and master's degree in five

years of study. See the Undergraduate to Graduate (U2G) website for available programs.

## Honors

### Honors in the Major

Students majoring in physics have the opportunity to graduate with honors in their major. They must maintain a University of Iowa grade-point average (GPA) of at least 3.33. During their junior and senior years, students must conduct an investigation under the guidance of a faculty member. They must present a written report of their research (honors thesis) and describe their research results at a departmental seminar.

### University of Iowa Honors Program

In addition to honors in the major, students have opportunities for honors study and activities through membership in the University of Iowa Honors Program. Visit Honors at Iowa to learn about the university's honors program.

Membership in the UI Honors Program is not required to earn honors in the physics major.

## Career Advancement

Physics graduates have mastered skills that are readily transferable to a number of fields. They might choose to work in research, engineering, software development, teaching, finance, biomedical research, or consulting.

The degree leads to careers in medicine, law, science-related administration, business, or technical writing. It also is good preparation for students interested in secondary school science teaching.

About 70% of physics and astronomy graduates go on to graduate school. With help from the department's in-house recruiting office, they win acceptance to some of the best graduate programs in the country.

The Pomerantz Career Center offers multiple resources to help students find internships and jobs.

## Academic Plans

### Four-Year Graduation Plan

The following checkpoints list the minimum requirements students must complete by certain semesters in order to stay on the university's Four-Year Graduation Plan. Courses in the major are those required to complete the major; they may be offered by departments other than the major department.

**Before the third semester begins:** MATH:1860 Calculus II and PHYS:1702 Physics II.

**Before the fifth semester begins:** PHYS:2703 Physics III, PHYS:2704 Physics IV, and up to four more courses in the major.

**Before the seventh semester begins:** two to four more courses in the major and at least 90 s.h. earned toward the degree.

**Before the eighth semester begins:** two or three more courses in the major.

**During the eighth semester:** enrollment in all remaining coursework in the major, all remaining GE CLAS Core courses, and a sufficient number of semester hours to graduate.

## Sample Plan of Study

Sample plans represent one way to complete a program of study. Actual course selection and sequence will vary and should be discussed with an academic advisor. For additional sample plans, see MyUI.

### Physics, BA

Course	Title	Hours
<b>Academic Career</b>		
<b>Any Semester</b>		
Research: students are strongly encouraged to be active participants in research within the department.		
GE CLAS Core: Sustainability <sup>a</sup>		
<b>Hours</b>		<b>0</b>
<b>First Year</b>		
<b>Fall</b>		
PHYS:1701	Physics I	4
MATH:1850	Calculus I <sup>b</sup>	4
RHET:1030 or ENGL:1200	Rhetoric: Writing and Communication or The Interpretation of Literature	3 - 4
GE CLAS Core: Social Sciences <sup>c</sup>		3
CSI:1600	Success at Iowa	1
<b>Hours</b>		<b>15-16</b>
<b>Spring</b>		
PHYS:1702	Physics II	4
MATH:1860	Calculus II	4
RHET:1030 or ENGL:1200	Rhetoric: Writing and Communication or The Interpretation of Literature	3 - 4
GE CLAS Core: Understanding Cultural Perspectives <sup>c</sup>		3
<b>Hours</b>		<b>14-15</b>
<b>Second Year</b>		
<b>Fall</b>		
PHYS:2703	Physics III	4
MATH:2700	Introduction to Linear Algebra <sup>d</sup>	4
GE CLAS Core: Values and Society <sup>c</sup>		3
GE CLAS Core: World Languages First Level Proficiency or elective course <sup>e</sup>		4 - 5
<b>Hours</b>		<b>15-16</b>
<b>Spring</b>		
PHYS:2704	Physics IV	3 - 4
MATH:2850	Calculus III <sup>d</sup>	4
GE CLAS Core: International and Global Issues <sup>c</sup>		3
GE CLAS Core: World Languages Second Level Proficiency or elective course <sup>e</sup>		4 - 5
Elective course <sup>f</sup>		3
<b>Hours</b>		<b>17-19</b>
<b>Third Year</b>		
<b>Fall</b>		
PHYS:3756	Intermediate Laboratory	3

Major: physics elective course numbered 3000 or above <sup>g</sup>	3
GE CLAS Core: Historical Perspectives <sup>c</sup>	3
GE CLAS Core: World Languages Third Level Proficiency or elective course <sup>e</sup>	4 - 5
Elective course <sup>f</sup>	1 - 3

**Hours 14-17**

#### Spring

Major: additional STEM course in chosen thematic area	3
Major: physics elective course numbered 3000 or above <sup>g</sup>	3
GE CLAS Core: World Languages Fourth Level Proficiency or elective course <sup>e</sup>	4 - 5
Elective course <sup>f</sup>	3
Elective course <sup>f</sup>	3

**Hours 16-17**

#### Fourth Year

##### Fall

Major: additional STEM course in chosen thematic area	3
Major: physics elective course numbered 3000 or above <sup>g</sup>	3
GE CLAS Core: Literary, Visual, and Performing Arts <sup>c</sup>	3
Elective course <sup>f</sup>	3
Elective course <sup>f</sup>	3

**Hours 15**

##### Spring

Major: additional STEM course in chosen thematic area	3
Major: additional STEM course in chosen thematic area	3
Elective course <sup>f</sup>	3
Elective course <sup>f</sup>	3
Elective course <sup>f</sup>	3
Degree Application: apply on MyUI before deadline (typically in February for spring, September for fall) <sup>h</sup>	

**Hours 15**

**Total Hours 121-130**

a Sustainability must be completed by choosing a course that has been approved for Sustainability AND for one of these General Education areas: Natural Sciences; Quantitative or Formal Reasoning; Social Sciences; Historical Perspectives; International and Global Issues; Literary, Visual, and Performing Arts; or Values and Society.

b Enrollment in math courses requires completion of a placement exam.

c GE CLAS Core courses may be completed in any order unless used as a prerequisite for another course. Students should consult with an advisor about the best sequencing of courses.

d While this course is not a major requirement, it is strongly recommended and a prerequisite for many physics and astronomy courses in the department.

e Students who have completed four levels of a single language or two levels of two different languages in high school or college have satisfied the GE CLAS Core World Languages requirement. Students who have completed three levels of a single language may complete a fourth-level course in the same language or may choose an

approved World Language and Cultural Exploration course. Enrollment in world languages courses requires a placement exam, unless enrolling in a first-semester-level course. Contact your academic advisor or CLAS Undergraduate Programs Office with questions concerning the World Languages requirement.

f Students may use elective courses to earn credit towards the total s.h. required for graduation or to complete a double major, minors, or certificates.

g See General Catalog for a list of approved courses.

h Please see Academic Calendar, on Office of the Registrar website, for current degree application deadlines. Students should apply for a degree for the session in which all requirements will be met. For any questions on appropriate timing, contact your academic advisor or Degree Services.