Physics, BS

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 Science with a major in physics requires a minimum of 120 s.h., including at least 55 s.h. of work for the major (minimum of 42 s.h. in physics plus 16 s.h. in supporting coursework). 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 also must complete the College of Liberal Arts and Sciences GE CLAS Core.

Students must complete several required mathematics courses in addition to their required physics core. The department offers a wide range of upper-level electives and students are encouraged to explore different research areas. All students are strongly encouraged to get involved with research.

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

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

Mathematics Courses

<table>
<thead>
<tr>
<th>Course #</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH:1850</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>MATH:1860</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>MATH:2700</td>
<td>Introduction to Linear Algebra</td>
<td>4</td>
</tr>
<tr>
<td>MATH:2850</td>
<td>Calculus III</td>
<td>4</td>
</tr>
</tbody>
</table>

Or all of these:

<table>
<thead>
<tr>
<th>Course #</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH:1550</td>
<td>Engineering Mathematics I: Single Variable Calculus</td>
<td>4</td>
</tr>
<tr>
<td>MATH:1560</td>
<td>Engineering Mathematics II: Multivariable Calculus</td>
<td>4</td>
</tr>
<tr>
<td>MATH:2550</td>
<td>Engineering Mathematics III: Matrix Algebra</td>
<td>2</td>
</tr>
<tr>
<td>MATH:3550</td>
<td>Engineering Mathematics V: Vector Calculus</td>
<td>3</td>
</tr>
</tbody>
</table>

Introductory Physics Courses

<table>
<thead>
<tr>
<th>Course #</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS:1701</td>
<td>Physics I</td>
<td>4</td>
</tr>
<tr>
<td>PHYS:1702</td>
<td>Physics II</td>
<td>4</td>
</tr>
<tr>
<td>PHYS:2703</td>
<td>Physics III</td>
<td>4</td>
</tr>
</tbody>
</table>

Or these two courses:

<table>
<thead>
<tr>
<th>Course #</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS:1611</td>
<td>Introductory Physics I</td>
<td>4</td>
</tr>
<tr>
<td>PHYS:1612</td>
<td>Introductory Physics II</td>
<td>4</td>
</tr>
</tbody>
</table>

Physics Core Courses

<table>
<thead>
<tr>
<th>Course #</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS:2704</td>
<td>Physics IV</td>
<td>4</td>
</tr>
<tr>
<td>PHYS:3710</td>
<td>Intermediate Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>PHYS:3730</td>
<td>Statistical Physics</td>
<td>3</td>
</tr>
<tr>
<td>PHYS:3741</td>
<td>Introduction to Quantum Mechanics I</td>
<td>3</td>
</tr>
<tr>
<td>PHYS:3742</td>
<td>Introduction to Quantum Mechanics II</td>
<td>3</td>
</tr>
<tr>
<td>PHYS:3756</td>
<td>Intermediate Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>PHYS:3811</td>
<td>Electricity and Magnetism I</td>
<td>3</td>
</tr>
<tr>
<td>PHYS:3812</td>
<td>Electricity and Magnetism II</td>
<td>3</td>
</tr>
</tbody>
</table>

Upper-Level Elective Courses

Students can only take these courses once: PHYS:3850 Electronics, PHYS:4750 Advanced Laboratory, or ASTR:4850 Observational Techniques in Astronomy.

Students must take at least three different courses from the following lists to satisfy this requirement. Undergraduate majors who plan to pursue graduate study are advised to go as far as they can beyond the minimum requirements in the following list, including further work in mathematics.

<table>
<thead>
<tr>
<th>Course #</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS:3850</td>
<td>Electronics</td>
<td>4</td>
</tr>
<tr>
<td>PHYS:4750</td>
<td>Advanced Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>ASTR:4850</td>
<td>Observational Techniques in Astronomy</td>
<td>3</td>
</tr>
</tbody>
</table>

Two of these:

<table>
<thead>
<tr>
<th>Course #</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS:3850</td>
<td>Electronics</td>
<td>4</td>
</tr>
<tr>
<td>PHYS:4720</td>
<td>Introductory Optics</td>
<td>3</td>
</tr>
<tr>
<td>PHYS:4726</td>
<td>Electro Optics</td>
<td>3</td>
</tr>
<tr>
<td>PHYS:4728</td>
<td>Introductory Solid State Physics</td>
<td>3</td>
</tr>
<tr>
<td>PHYS:4731</td>
<td>Plasma Physics I</td>
<td>3</td>
</tr>
<tr>
<td>PHYS:4740</td>
<td>Elementary Particles and Nuclear Physics</td>
<td>3</td>
</tr>
<tr>
<td>PHYS:4750</td>
<td>Advanced Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>PHYS:4761</td>
<td>Mathematical Methods of Physics I</td>
<td>3</td>
</tr>
<tr>
<td>PHYS:4762</td>
<td>Mathematical Methods of Physics II</td>
<td>3</td>
</tr>
<tr>
<td>PHYS:4820</td>
<td>Optical Signal Processing</td>
<td>3</td>
</tr>
<tr>
<td>PHYS:4860</td>
<td>Computational Physics</td>
<td>3</td>
</tr>
<tr>
<td>PHYS:4905</td>
<td>Special Topics in Physics</td>
<td>3</td>
</tr>
</tbody>
</table>
Learn about the university’s honors program.

University of Iowa Honors Program. Visit for honors study and activities through membership in the.

In addition to honors in the major, students have opportunities (honors thesis) and describe their research results at a.

Students must present a written report of their research investigation under the guidance of a faculty member.

For their junior and senior years, students must conduct an of Iowa grade-point average (GPA) of at least 3.33. During

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. Students must present a written report of their research (honors thesis) and describe their research results at a.

Double Major in Physics and Astronomy

Students working toward a Bachelor of Science 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.

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. Students 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 provides preparation for careers in industry, employment in research laboratories, and graduate study in physics and related sciences.

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, MATH:2700 Introduction to Linear Algebra, MATH:2850 Calculus III, and up to two 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, BS

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Academic Career</td>
<td></td>
</tr>
<tr>
<td>Any Semester</td>
<td>Research: students are strongly encouraged to be active participants in research within the department.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GE CLAS Core: Sustainability</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
</tbody>
</table>

First Year

Fall

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS:1701</td>
<td>Physics I</td>
<td>4</td>
</tr>
</tbody>
</table>
Physics, BS

MATH:1850 Calculus I \(^b\) 
4

RHET:1030 Rhetoric or ENGL:1200 The Interpretation of Literature 
3 - 4

GE CLAS Core: Social Sciences \(^c\) 
3

CSI:1600 Success at Iowa 
2

**Hours** 16-17

**Spring**

PHYS:1702 Physics II 
4

MATH:1860 Calculus II 
4

RHET:1030 Rhetoric or ENGL:1200 The Interpretation of Literature 
3 - 4

GE CLAS Core: Diversity and Inclusion \(^c\) 
3

**Hours** 15-16

**Second Year**

**Fall**

PHYS:2703 Physics III 
4

MATH:2700 Introduction to Linear Algebra 
4

GE CLAS Core: Values and Culture \(^c\) 
3

GE CLAS Core: World Languages First Level Proficiency or elective course \(^d\) 
4 - 5

**Hours** 15-16

**Spring**

PHYS:2704 Physics IV 
4

PHYS:3710 Intermediate Mechanics 
3

MATH:2850 Calculus III 
4

GE CLAS Core: World Languages Second Level Proficiency or elective course \(^d\) 
4 - 5

**Hours** 15-16

**Third Year**

**Fall**

PHYS:3741 Introduction to Quantum Mechanics I 
3

PHYS:3811 Electricity and Magnetism I 
3

GE CLAS Core: Historical Perspectives \(^c\) 
3

GE CLAS Core: World Languages Third Level Proficiency or elective course \(^d\) 
4 - 5

Elective course \(^e\) 
1 - 3

**Hours** 14-17

**Spring**

PHYS:3742 Introduction to Quantum Mechanics II 
3

PHYS:3812 Electricity and Magnetism II 
3

PHYS:3850 Electronics \(^f\) 
4

GE CLAS Core: World Languages Fourth Level Proficiency or elective course \(^d\) 
4 - 5

**Hours** 14-15

**Fourth Year**

**Fall**

PHYS:3730 Statistical Physics 
3

PHYS:3756 Intermediate Laboratory \(^f\) 
3

Major: upper-level physics course 
3

GE CLAS Core: Literary, Visual, and Performing Arts \(^c\) 
3

Elective course \(^e\) 
3

**Hours** 15

**Spring**

Major: upper-level physics course 
3

**GE CLAS Core: International and Global Issues \(^c\)** 
3

Elective course \(^e\) 
3

Elective course \(^e\) 
3

Elective course \(^e\) 
3

Degree Application: apply on MyUI before deadline (typically in February for spring, September for fall)

**Hours** 15

**Total Hours** 118-126

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\(^a\) 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 and Formal Reasoning; Social Sciences; Historical Perspectives; International and Global Issues; Literary, Visual, and Performing Arts; or Values and Culture.

\(^b\) 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.

\(^d\) 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.

\(^e\) 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.

\(^f\) Students who choose PHYS:3850 as one of their two required laboratory courses are advised to take it before they take PHYS:3756 Intermediate Laboratory.

\(^g\) Please see Academic Calendar, 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.