Astronomy, B.S.

Learning Outcomes

Astronomy majors will be able to:

• demonstrate understanding of the fundamental concepts in astrophysics such as gravity, the nature of light, the physical characteristics of matter, and the motions of astronomical objects in the night sky;

• demonstrate proficiency in each of the major areas of astronomy—cosmology, galaxies, accretion and compact objects, the life cycle, and properties of stars and solar system science;

• show a working knowledge of a broad array of astrophysical phenomena that are based upon fundamental concepts; and

• gain familiarity with astronomical observations, instrumentation, computational methods, and software.

Requirements

The Bachelor of Science with a major in astronomy requires a minimum of 120 s.h., including at least 63 s.h. of work for the major. The program provides balanced and integrated coursework in astronomy, mathematics, and physics that prepares students for graduate studies in astronomy, astrophysics, or related science disciplines. Students also must complete the College of Liberal Arts and Sciences GE CLAS Core.

Students must complete several required mathematics courses in addition to the required physics and astronomy 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.

The B.S. with a major in astronomy requires the following courses or their equivalents.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mathematics Courses</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Physics Core Courses</td>
<td>24-28</td>
</tr>
<tr>
<td></td>
<td>Astronomy Core Courses</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>Upper-Level Physics Courses</td>
<td>6-7</td>
</tr>
<tr>
<td></td>
<td>Optional Upper-Level Elective Courses</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total Hours</strong></td>
<td>63-68</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</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>

Astronomy Core Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTR:1771</td>
<td>Introductory Astronomy I: Basic Astrophysics and Planetary Astronomy</td>
<td>4</td>
</tr>
<tr>
<td>ASTR:1772</td>
<td>Introductory Astronomy II: Stellar, Galactic, and Extragalactic Astronomy</td>
<td>4</td>
</tr>
<tr>
<td>ASTR:3771</td>
<td>Introduction to Astrophysics I (offered every other year)</td>
<td>3</td>
</tr>
<tr>
<td>ASTR:3772</td>
<td>Introduction to Astrophysics II (offered every other year)</td>
<td>3</td>
</tr>
<tr>
<td>ASTR:4850</td>
<td>Astronomical Laboratory (offered every other year)</td>
<td>3</td>
</tr>
</tbody>
</table>

Upper-Level Physics Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS:3756</td>
<td>Intermediate Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>PHYS:3850</td>
<td>Electronics</td>
<td>4</td>
</tr>
<tr>
<td>PHYS:3742</td>
<td>Introduction to Quantum Mechanics II</td>
<td>3</td>
</tr>
<tr>
<td>PHYS:4731</td>
<td>Plasma Physics I</td>
<td>3</td>
</tr>
</tbody>
</table>

Optional Upper-Level Elective Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS:3730</td>
<td>Statistical Physics</td>
<td>3</td>
</tr>
<tr>
<td>PHYS:3742</td>
<td>Introduction to Quantum Mechanics II</td>
<td>3</td>
</tr>
<tr>
<td>PHYS:4720</td>
<td>Introductory Optics</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: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:4905</td>
<td>Special Topics in Physics</td>
<td>arr.</td>
</tr>
</tbody>
</table>
In planning this work, they should be guided by the College of Liberal Arts and Sciences maximum hours rule: Students earning a B.S. 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 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.

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 astronomy have the opportunity to graduate with honors in their major. They must maintain a University of Iowa g.p.a. of at least 3.33. Students must earn 6-8 s.h. in PHYS:4999 Undergraduate Research during their junior and senior years and 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 astronomy major.

Career Advancement

Astronomy 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.

About 70 percent 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: calculus I-II and physics II.

Before the fifth semester begins: all of the remaining required math courses, physics III-IV, and two other courses in the major.

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

Before the eighth semester begins: 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.

### Astronomy, B.S.

<table>
<thead>
<tr>
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<tbody>
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<td>4</td>
</tr>
<tr>
<td>MATH:1850</td>
<td>Calculus I a, b</td>
<td>4</td>
</tr>
<tr>
<td>PHYS:1701</td>
<td>Physics I a</td>
<td>4</td>
</tr>
<tr>
<td>RHET:1030 or ENGL:1200</td>
<td>Rhetoric or The Interpretation of Literature</td>
<td>3 - 4</td>
</tr>
<tr>
<td>CSI:1600</td>
<td>Success at Iowa</td>
<td>2</td>
</tr>
</tbody>
</table>

**First Year**

**Fall**

**Hours**

17-18
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>RHET:1030</td>
<td>Rhetoric or The Interpretation of Literature</td>
<td>3 - 4</td>
</tr>
</tbody>
</table>

### Hours: 15-16

#### Second Year

**Fall**

- **GE CLAS Core: Social Sciences**<sup>c</sup> 
  3
- **MATH:2700** Introduction to Linear Algebra 
  4
- **PHYS:2703** Physics III 
  4
- **GE CLAS Core: World Languages First Level** Proficiency or elective course<sup>d</sup> 
  4 - 5

**Hours: 15-16**

**Spring**

- **MATH:2850** Calculus III 
  4
- **PHYS:2704** Physics IV 
  3 - 4
- **GE CLAS Core: International and Global Issues**<sup>c</sup> 
  3
- **GE CLAS Core: World Languages Second Level** Proficiency or elective course<sup>d</sup> 
  4 - 5

**Hours: 14-16**

#### Third Year

**Fall**

- **ASTR:3771** Introduction to Astrophysics I<sup>e</sup> 
  3
- **PHYS:3756** Intermediate Laboratory 
  3
- **PHYS:3811** Electricity and Magnetism I 
  3
- **GE CLAS Core: World Languages Second Level** Proficiency or elective course<sup>d</sup> 
  4 - 5

**Elective course**<sup>f</sup> 
  1 - 3

**Hours: 14-17**

**Spring**

- **ASTR:3772** Introduction to Astrophysics II<sup>e</sup> 
  3
- **PHYS:3812** Electricity and Magnetism II 
  3
- **PHYS:3710** Intermediate Mechanics 
  3
- **GE CLAS Core: World Languages Fourth Level** Proficiency or elective course<sup>d</sup> 
  4 - 5

**Hours: 13-14**

#### Fourth Year

**Fall**

- **PHYS:3741** Introduction to Quantum Mechanics I 
  3
- **GE CLAS Core: Diversity and Inclusion**<sup>c</sup> 
  3
- **GE CLAS Core: Historical Perspectives**<sup>c</sup> 
  3
- **GE CLAS Core: Values and Culture**<sup>c</sup> 
  3

**Elective course**<sup>f, g</sup> 
  3

**Hours: 15**

**Spring**

- **ASTR:4850** Astronomical Laboratory<sup>g</sup> 
  3
- **PHYS:3742** Introduction to Quantum Mechanics II 
  3
- **GE CLAS Core: Literary, Visual, and Performing Arts**<sup>c</sup> 
  3

**Elective course**<sup>f, g</sup> 
  3

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

**Hours: 15**

**Total Hours: 118-127**

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- **a** Fulfills a major requirement and may fulfill a GE requirement.
- **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 years of a single language in high school have satisfied the GE CLAS Core World Languages requirement. Enrollment in world languages courses requires a placement exam, unless enrolling in a first-semester-level course.
- **e** Typically this course is offered every other year. Check MyUI for course availability since offerings are subject to change.
- **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** Students who plan to pursue graduate study are advised to go as far as they can beyond the minimum requirements. See General Catalog for a list of appropriate courses.
- **h** 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 Graduation Services.