**DECLARING THE ASTRONOMY MAJOR**

You can declare your major any time, although we prefer that you complete at least half of the lower division course requirements. We strongly encourage you to come see the Student Affairs Officer as early as possible.

Students are accepted into the major with a minimum GPA of 2.0 or higher. All required courses for the major must be taken for a letter grade.

If you are interested in the Astronomy major please visit Dexter Stewart, the Student Services Officer, in 501E Campbell Hall. To contact her ahead of time, please call (510) 642-8520 or email her at dexters@berkeley.edu.

**ADVISING**

Undergraduates should make sure they visit the College of Letters and Sciences for a degree check after completing 90 units. They should also complete a degree check at the beginning of the semester in which they plan to graduate.

**HONORS PROGRAM**

For honors in Astrophysics, a student must fulfill the following additional requirements:

1) Maintain a grade-point average of at least 3.5 in all Astronomy courses and related fields.
2) Maintain a grade-point average of at least 3.3 in the University.

Candidates for graduation with honors in Astrophysics are required to take at least 3 units of AY H195 and carry out an individual research or study project.

The student’s project is chosen in consultation with a departmental adviser and the written report is judged by both the student’s research supervisor and by a departmental supervisor.

**JOB AND RESEARCH OPPORTUNITIES WITHIN THE DEPARTMENT**

The best way to get jobs or research experience is to talk to individual faculty members. There are a number of research centers, such as the Space Science Laboratories or the Lawrence Berkeley National Lab that provide employment and research opportunities for students.

**RESOURCES FOR MAJORS**

Declared Astrophysics majors will have access to our Undergraduate Lab through the entirety of their academic career at Berkeley.

Many instruments are available to students and staff, including two 10-meter telescopes at the Keck Observatory on Mauna Kea in Hawaii, 30-inch, 40-inch and 120-inch telescopes at Lick Observatory, a 16-element millimeter-wave interferometer in Southern California, the PAPER Array in South Africa, and a 30-inch telescope at Leuschner Observatory (near the campus). Laboratories are available for the development of radio, infrared, and optical instruments, and for the precise measurement of images and spectra.
Summary of Astronomy Department Major Course Requirements

<table>
<thead>
<tr>
<th>OPTIONAL</th>
<th>REQUIRED</th>
<th>REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Astro 7A</td>
<td>One of the Following:</td>
<td>Two of the Following Courses:</td>
</tr>
<tr>
<td>Astro 7B</td>
<td>Astro 120</td>
<td>Astro 160</td>
</tr>
<tr>
<td>Python/IDL</td>
<td>Astro 121</td>
<td>Astro C161</td>
</tr>
<tr>
<td>DeCal</td>
<td></td>
<td>Astro C162</td>
</tr>
</tbody>
</table>

For a Single Major: 30 units of Upper Division Electives
For a Double Major: 24 units of Upper Division Electives

NOTES FOR THE MAJOR
1) Astro 7A and Astro 7B are highly recommended as a supplement for upper division courses.
2) The 30 unit requirement (or 24 units for double majors with another major) is the sum of Astronomy upper division courses and electives.

Summary of Astronomy Department Minor Course Requirements

Astronomy minors must complete the courses listed in the following rubric:

<table>
<thead>
<tr>
<th>Two of the following:</th>
<th>Three Upper Division Electives</th>
<th>7A and 7B are highly recommended as a supplement for the upper division electives but are not required.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Astro 120</td>
<td></td>
<td></td>
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<tr>
<td>Astro 121</td>
<td></td>
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</tr>
<tr>
<td>Astro 160</td>
<td></td>
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<tr>
<td>Astro C161</td>
<td></td>
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</tr>
<tr>
<td>Astro C162</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTES FOR THE MINOR
1) Astro 7A and Astro 7B are highly recommended but not required.
2) Lower division prerequisites must be satisfied (please see Declaring the Major page for more information).
## COURSES

<table>
<thead>
<tr>
<th>Courses</th>
<th>Required Prerequisites</th>
<th>Recommended Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Astro 7A*</td>
<td>Physics 7A/B** Math 1A/B</td>
<td></td>
</tr>
<tr>
<td>Astro 7B*</td>
<td>Physics 7A/B/C** Math 1A/B</td>
<td></td>
</tr>
<tr>
<td>Astro 120</td>
<td>Physics 7A/B/C Math 54**</td>
<td>Astro 7A/7B Python/IDL DeCal</td>
</tr>
<tr>
<td>Astro 121</td>
<td>Physics 7A/B/C Math 54**</td>
<td>Astro 7A/B Python/IDL DeCal Physics 110A/B</td>
</tr>
<tr>
<td>Astro 160</td>
<td>Physics 112</td>
<td>Astro 7A Physics 137A</td>
</tr>
<tr>
<td>Astro C161</td>
<td>Physics 7A/B/C</td>
<td>Astro 7B Physics 112 Physics 137A/B</td>
</tr>
<tr>
<td>Astro C162</td>
<td>Physics 7A/B/C</td>
<td>Astro 7A Physics 112</td>
</tr>
<tr>
<td>Python/IDL DeCal*</td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

* Course not required but strongly recommended for anyone considering the Astrophysics major. Please consult with the undergraduate adviser.
** Prerequisite course can be taken concurrently.
DECLARING THE ASTROPHYSICS MAJOR AND MINOR

Courses to Complete Before Declaring

The lower-division requirements for declaring the Astrophysics major and minor are:

- Math 1A/1B
- Math 53/54
- Physics 7A/B/C

Once you have decided to declare the Astrophysics major and have completed the courses listed above you will need to do the following (please note that this is a brief overview and full major declaration info can be found on the L&S Advising Website):

Declaring as Single Major

To declare as a single major, print and complete the Major Declaration form (available on the website). Bring this form to Dexter Stewart (dexters@berkeley.edu) in 501E Campbell Hall, for approval signature. You may also wish to schedule a meeting with Dexter to review course plans and requirements.

Declaring as Double/Triple Major

To declare Astrophysics as part of a double/triple major, print and complete the Double Major Declaration Form. Advisers in both major departments must sign the form; the Astronomy adviser, Dexter Stewart (dexters@berkeley.edu) is located in 501E Campbell Hall. (Currently the form only has space to list two majors; if you are declaring three majors make sure you still write in the third.)

After obtaining signatures from each adviser you are required to schedule a 30-minute meeting with an L&S College adviser to review your plans; make sure to take the completed and signed Double Major Declaration form with you to your meeting. We suggest scheduling this meeting ahead of time to expedite the process, as meeting slots tend to fill up quickly and same-day meetings are hard to schedule.
### SUMMARY OF UPPER DIVISION ELECTIVES FOR ASTROPHYSICS

#### PHYSICS
- 105 Analytical Mechanics
- 110A/B Electromagnetism and Optics
- 111 Modern Physics and Advanced Electrical Laboratory
- 112 Introduction to Statistical and Thermal Physics
- 124 Introductory Nuclear Physics
- 129A/B Particle Physics
- 137A/B Quantum Mechanics
- 142 Introduction to Plasma Physics
- 150 Introduction to Atmospheric and Space Sciences

#### MATHEMATICS
- 104 Introduction to Analysis
- 110 Linear Algebra
- 121A/B Mathematical Tools for the Physical Sciences
- 128A/B Numerical Analysis
- 160 History of Mathematics [req Math 113]
- 185 Introduction to Complex Analysis [req Math 104]

#### EECS
- 150 Components and Design Techniques for Digital Systems [req 61C or EE 40 or 42]
- 160 User Interface Design and Development [req 61B]
- 164 Programming Languages and Compilers [req 61B/C]
- 169 Software Engineering [req 61B/C]
- 184 Foundations of Computer Graphics [req 61B]
- 186 Introduction to Database Systems [req 61B/C]
- 188 Introduction to Artificial Intelligence [req 61A/B]

#### STATISTICS
- 101 Introduction to the Theory of Probability
- 102 Introduction to the Theory of Statistics [req 101]
- 134 Concepts of Probability
- 135 Concepts of Statistics [req 101 or 134]
- 153 Introduction to Time Series [req 101 or 134]
### SUMMARY OF UPPER DIVISION ELECTIVES FOR ASTROPHYSICS

#### EPS
- 108 Geodynamics
- 121 Geophysics [req GEO 108]
- 122 Physics of the Earth and Planetary Interiors [req PHY 105]

#### GEOGRAPHY
- 146 Applied Physical Climatology

#### CHEMISTRY
- 104A/B Advanced Inorganic Chemistry
- 105 Instrumental Methods of Analysis [req 104A]
- 108 Inorganic Synthesis and Reactions [req 104A/B]
- 112A/B Organic Chemistry
- 120A/B Physical Chemistry
- 122 Quantum Mechanics and Spectroscopy [req 120A/B]
- 125 Physical Chemistry Laboratory [req 120A/B]
- 142 Nuclear Chemistry