# Bachelor of Science in Physics: Concentration in Astrophysics Roadmap

120 Total Units Required  
Minimum Number of Units in the Major: 71

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First Semester</strong></td>
<td></td>
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</tr>
<tr>
<td>MATH 226</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>GE Area A: Oral Communication (A1) or Critical Thinking (A3)</td>
<td>3</td>
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</tr>
<tr>
<td>GE Area A: Written English Communication (A2)</td>
<td>3</td>
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</tr>
<tr>
<td>GE Area C: Arts (C1)</td>
<td>3</td>
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<tr>
<td>GE Area C: Humanities: Literature (C3)</td>
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<td>16</td>
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<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td><strong>Second Semester</strong></td>
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</tr>
<tr>
<td>MATH 227</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 220 &amp; PHYS 222</td>
<td>General Physics with Calculus I and General Physics with Calculus I Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>GE Area A: Oral Communication (A1) or Critical Thinking (A3)</td>
<td>3</td>
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</tr>
<tr>
<td>GE Area A: Written English Communication II (A4) or Written English Communication (A2) Stretch II</td>
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<tr>
<td><strong>Units</strong></td>
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<thead>
<tr>
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<tr>
<td><strong>Third Semester</strong></td>
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<tr>
<td>MATH 228</td>
<td>Calculus III</td>
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<tr>
<td>MATH 325</td>
<td>Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 230 &amp; PHYS 232</td>
<td>General Physics with Calculus II and General Physics with Calculus II Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>GE Area B: Life Science (B2)</td>
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<td></td>
</tr>
<tr>
<td>GE Area D: U.S. History (D2) or U.S. and California Government (D3)</td>
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<td></td>
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<tr>
<td><strong>Units</strong></td>
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<thead>
<tr>
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<tr>
<td><strong>Fourth Semester</strong></td>
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<tr>
<td>MATH 245 or MATH 376</td>
<td>Elementary Differential Equations and Linear Algebra or Ordinary Differential Equations I</td>
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</tr>
<tr>
<td>PHYS 240 &amp; PHYS 242</td>
<td>General Physics with Calculus III and General Physics with Calculus III Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>GE Area A: Written English Communication II (A4) if not already satisfied</td>
<td>3</td>
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<tr>
<td><strong>Units</strong></td>
<td></td>
<td>13-15</td>
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<tr>
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<tbody>
<tr>
<td><strong>Fifth Semester</strong></td>
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<tr>
<td>ASTR 300</td>
<td>Stars, Planets, and the Milky Way</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 320</td>
<td>Modern Physics I</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 330</td>
<td>Analytical Mechanics I</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 385</td>
<td>Introduction to Theoretical Physics I</td>
<td>3</td>
</tr>
<tr>
<td>GE Area C: Arts (C1) or Humanities (C2)</td>
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<td></td>
</tr>
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<tr>
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<tbody>
<tr>
<td><strong>Sixth Semester</strong></td>
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<tr>
<td>ASTR 301</td>
<td>Observational Astronomy Laboratory</td>
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<tr>
<td>ASTR 340GW</td>
<td>The Big Bang - GWAR</td>
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<td>CSC 309</td>
<td>Computer Programming for Scientists and Engineers</td>
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<tr>
<td>PHYS 360</td>
<td>Electricity and Magnetism I</td>
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</tr>
<tr>
<td>GE Area UD-C: Upper Division Arts and/or Humanities (Consider SF State Studies Course)</td>
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<tr>
<td><strong>Seventh Semester</strong></td>
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<tr>
<td>ASTR 400</td>
<td>Stellar Astrophysics</td>
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<tr>
<td>ASTR 470</td>
<td>Observational Techniques in Astronomy</td>
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</tr>
<tr>
<td>PHYS 370</td>
<td>Thermodynamics and Statistical Mechanics</td>
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<tr>
<td>PHYS 430</td>
<td>Quantum Mechanics I</td>
<td>3</td>
</tr>
<tr>
<td>GE Area UD-D: Upper Division Social Sciences (Consider SF State Studies Course)</td>
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<td></td>
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<tr>
<td><strong>Units</strong></td>
<td></td>
<td>15</td>
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<tr>
<td><strong>Eighth Semester</strong></td>
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<tr>
<td>ASTR 498 or PHYS 695 or PHYS 697</td>
<td>Astronomy Research Literature or Senior Project</td>
<td>1-3</td>
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<tr>
<td>Major Elective (6 Units Total) – Take Two</td>
<td>6</td>
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<tr>
<td>GE Area UD-B: Upper Division Physical and/or Life Sciences (Consider SF State Studies Course)</td>
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<tr>
<td>SF State Studies or University Elective</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td><strong>Units</strong></td>
<td></td>
<td>13-15</td>
</tr>
</tbody>
</table>

**Total Units** 120-122
Depending on courses completed through Early Start and in high school, students in Pathway/Category 3 or 4 may be required to enroll in additional courses before they can take MATH 199 or MATH 226. Most students in Pathway/Category 3 or 4 will need to take a stretch format for MATH 199 (MATH 197 in Fall 2018 and MATH 198 in Spring 2019). Before enrolling in a B4 course, students should verify their MATH Pathway/Category in their Student Center (http://cms.sfsu.edu/content/student-center). Information regarding the courses that correspond with your MATH Pathway/Category can be found on the Developmental Studies Office Website (http://developmentalstudies.sfsu.edu).

To avoid taking additional units, it is recommended that you meet LLD and SF State Studies requirements (AERM, GP, ES, SJ) within your GE or major.

ENG 114 can only be taken if you complete Directed Self-Placement (DSP) and select ENG 114; if you choose ENG 104/ENG 105 through DSP you will satisfy A2 upon successful completion of ENG 105 in the second semester; multilingual students may be advised into alternative English courses.

Major Electives (6 units)
Chosen from upper division courses in Physics or Astronomy with consent of an advisor. Three of the 6 units must be in a course numbered 400–499. Up to 1 unit of a 600 level course in ASTR.