# Bachelor of Science in Physics: Concentration in Astrophysics - Quantitative Reasoning Category III/IV and Stretch English

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

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
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<tbody>
<tr>
<td><strong>First Semester</strong></td>
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<tr>
<td>ENG 104</td>
<td>Writing the First Year: Finding Your Voice Stretch I ¹</td>
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<tr>
<td>MATH 197</td>
<td>Prelude to Calculus I (Prerequisite for MATH 226) ², ³</td>
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<tr>
<td>GE Area A ⁴</td>
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<td>GE Area C</td>
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<tr>
<td><strong>Second Semester</strong></td>
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<tr>
<td>ENG 105</td>
<td>Writing the First Year: Finding Your Voice Stretch II (A2) ¹</td>
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<td>MATH 198</td>
<td>Prelude to Calculus II (Prerequisite for MATH 226, B4) ², ³</td>
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<td>GE Area A</td>
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<tr>
<td><strong>Third Semester</strong></td>
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<tr>
<td>MATH 226</td>
<td>Calculus I (Major Prerequisite, B4) ², ³</td>
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<td>GE Area B: Life Science (B2)</td>
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<td>GE Area C</td>
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<td>GE Area E</td>
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<tr>
<td><strong>Fourth Semester</strong></td>
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<tr>
<td>CSC 309</td>
<td>Computer Programming for Scientists and Engineers (Major Upper-Division Core)</td>
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<tr>
<td>MATH 227</td>
<td>Calculus II (Major Prerequisite)</td>
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<tbody>
<tr>
<td>PHYS 220 &amp; PHYS 222</td>
<td>General Physics with Calculus I and General Physics with Calculus I Laboratory (Major Prerequisite, B1, B3)</td>
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<td><strong>GE Area D</strong></td>
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<tr>
<td><strong>Fifth Semester</strong></td>
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<tr>
<td>MATH 228</td>
<td>Calculus III (Major Prerequisite)</td>
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<tr>
<td>PHYS 230 &amp; PHYS 232</td>
<td>General Physics with Calculus II and General Physics with Calculus II Laboratory (Major Prerequisite)</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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<td>SF State Studies or University Elective (if selecting MATH 245) or MATH 325</td>
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<tr>
<td>MATH 325</td>
<td>Linear Algebra (if selecting MATH 376)</td>
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<tr>
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<tr>
<td><strong>Sixth Semester</strong></td>
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<tr>
<td>ASTR 300</td>
<td>Stars, Planets, and the Milky Way (Major Upper-Division Core)</td>
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<tr>
<td>MATH 245 or MATH 376</td>
<td>Elementary Differential Equations and Linear Algebra (Major Prerequisite) or Ordinary Differential Equations I</td>
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<tr>
<td>PHYS 240 &amp; PHYS 242</td>
<td>General Physics with Calculus III and General Physics with Calculus III Laboratory (Major Prerequisite)</td>
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<tr>
<td>GE Area UD-C: Upper-Division Arts and/or Humanities (Consider SF State Studies Course)</td>
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<tr>
<td>GE Area UD-D: Upper-Division Social Sciences (Consider SF State Studies Course)</td>
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<tr>
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<tr>
<td><strong>Seventh Semester</strong></td>
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<tr>
<td>ASTR 301</td>
<td>Observational Astronomy Laboratory (Major Upper-Division Core)</td>
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<td>PHYS 320</td>
<td>Modern Physics I (Major Upper-Division Core)</td>
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<tr>
<td>PHYS 330</td>
<td>Analytical Mechanics I (Major Upper-Division Core)</td>
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<tr>
<td>PHYS 385</td>
<td>Introduction to Theoretical Physics I (Major Upper-Division Core)</td>
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**Eighth Semester**

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<tr>
<td>ASTR 340GW</td>
<td>The Big Bang - GWAR (Major Upper-Division Core)</td>
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<tr>
<td>PHYS 360</td>
<td>Electricity and Magnetism I (Major Upper-Division Core)</td>
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<tr>
<td>PHYS 370</td>
<td>Thermodynamics and Statistical Mechanics (Major Upper-Division Core)</td>
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**Units** 11

**Ninth Semester**

<table>
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<th>Course</th>
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<tbody>
<tr>
<td>ASTR 400</td>
<td>Stellar Astrophysics (Major Upper-Division Core)</td>
<td>3</td>
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<tr>
<td>PHYS 430</td>
<td>Quantum Mechanics I (Major Upper-Division Core)</td>
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Major Elective (6 Units Total) - Take One 3

**Units** 9

**Tenth Semester**

<table>
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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>ASTR 470</td>
<td>Observational Techniques in Astronomy (Major Upper-Division Core)</td>
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Select One (Major Culminating Experience):

- ASTR 498 & PHYS 695
  - Astronomy Research Literature and Culminating Experience in Physics
- ASTR 697
  - Senior Project

Major Elective (6 Units Total) - Take One 3

**Units** 9

**Total Units** 125

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1. 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.

2. Depending on courses completed through Early Start, students in Pathway/Category III or IV may be required to enroll in a support course to complement their Quantitative Reasoning/B4 requirement. There are multiple course options for this pathway. Before enrolling in a B4 course, students should verify their MATH Pathway/Category in their Student Center. Information regarding the courses that correspond with your MATH Pathway/Category can be found on the Developmental Studies Office Website.

3. QR Category III students with a grade of B or higher in high school pre-calculus in the past year may be able to enroll in MATH 226. Please see a department advisor.

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

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