

# BACHELOR OF SCIENCE IN PHYSICS: CONCENTRATION IN ASTROPHYSICS – PHYS ASSOCIATE DEGREE FOR TRANSFER (ADT) ROADMAP

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This is a sample pathway for students who transfer to San Francisco State University in the current Bulletin year with an AS-T in Physics. Twenty-four units in the major (MATH 226, MATH 227, MATH 228, PHYS 220, PHYS 222, PHYS 230, PHYS 232, PHYS 240, and PHYS 242) and all lower-division GE requirements have been satisfied. Additional units in the major may have been satisfied. Check with a major advisor about the most appropriate course sequence. **Degree completion guaranteed in 60 units**; see the Associate Degree for Transfer (ADT) section for more information (<http://bulletin.sfsu.edu/undergraduate-admissions/transfer-students/>).

## To Do at SF State:

Enough total units to reach 120 minimum for graduation; 30 units minimum at the upper-division level; to include the following:

### University-Wide Requirements: 9-15 Units

- American Institutions (0-6 units) - US History, US Government, California State and Local Government. See next bullet if not completed before transfer.
- Upper division GE (9 units): Courses approved for both UD GE and American Institutions may double-count.
- Students entering the major with the AS-T in Physics are not required to fulfill SF State Studies or Complementary Studies requirements.

### Physics B.S. (Astrophysics) Major: 44-47 units

MATH 226, MATH 227, MATH 228, PHYS 220, PHYS 222, PHYS 230, PHYS 232, PHYS 240, and PHYS 242 met in transfer.

- Prerequisites (3 units if MATH 245 equivalent not completed before transfer; see note 3 above)
- Upper-division Requirements (38 units)
- Upper-division Electives (6 units): Units in physics or astronomy selected with the consent of advisor. Three of the six elective units must be in courses numbered 400-499. No more than one unit of a 600-level ASTR course may count towards the electives.

### University Electives: 4 or More Units

Depends on course choices made at the community college, how transferred units are applied to the requirements above, and course choices at SF State. Some courses may meet more than one requirement, e.g., both in UD GE and the major.

#### Plan A

Course	Title	Units
<b>First Semester</b>		
Select One (UD-C, USH, CSLG):		3
HIST 470	The U.S. Constitution to 1896 (AERM, SJ)	
HIST 471	The U.S. Constitution Since 1896 (AERM, SJ)	
Select One (Lower-Division Core): <sup>1,2</sup>		3
MATH 245	Elementary Differential Equations and Linear Algebra	
MATH 376	Ordinary Differential Equations I	
PHYS 320	Modern Physics I (Upper-Division Core) <sup>3</sup>	3
GE Area UD-B: Upper Division Physical and/or Life Sciences <sup>4</sup>		3
University Elective		4
		<b>Units</b>
		<b>16</b>
<b>Second Semester</b>		
ASTR 300	Stars, Planets, and the Milky Way (Upper-Division Core) <sup>5</sup>	3

ASTR 340GW	The Big Bang - GVAR (Upper-Division Core) <sup>5</sup>	3
CSC 309	Computer Programming (Upper-Division Core)	3
PHYS 360	Electricity and Magnetism I (Upper-Division Core) <sup>5,6</sup>	3
PHYS 370	Thermodynamics and Statistical Mechanics (Upper-Division Core) <sup>5</sup>	3
<b>Units</b>		<b>15</b>
<b>Third Semester</b>		
ASTR 301	Observational Astronomy Laboratory (Upper-Division Core) <sup>3</sup>	2
ASTR 400	Stellar Astrophysics (Upper-Division Core) <sup>3</sup>	3
PHYS 430	Quantum Mechanics I (Upper-Division Core) <sup>3</sup>	3
PHYS 460	Electricity and Magnetism II (Upper-Division Core) <sup>3</sup>	3
GE Area UD-B: Upper Division Physical and/or Life Sciences or University Elective if UD-B is Already Satisfied		3
<b>Units</b>		<b>14</b>
<b>Fourth Semester</b>		
ASTR 470	Observational Techniques in Astronomy (Upper-Division Core) <sup>5</sup>	3
Select One (Upper-Division Core): <sup>5</sup>		3
ASTR 498 & PHYS 695 ASTR 697	Astronomy Research Literature and Culminating Experience in Physics Senior Project	
Major Elective - Take Two <sup>7</sup>		6
GE Area UD-D: Upper-Division Social Sciences		3
<b>Units</b>		<b>15</b>
<b>Total Units</b>		<b>60</b>

<sup>1</sup> Take PHYS 330 if MATH 245 complete.

<sup>2</sup> A course in differential equations and linear algebra is required before taking PHYS 330 and PHYS 385. Students transferring in without an equivalent to MATH 245 must delay taking PHYS 330 and PHYS 385 until the following Fall semester, which will affect other elements of this sample roadmap. Overall time for degree completion will be extended. *Students in this situation should consult with a department advisor for an alternate advising plan.*

<sup>3</sup> ASTR 301, ASTR 400, PHYS 320, PHYS 430 and PHYS 460 offered fall semesters only.

<sup>4</sup> Take PHYS 385 if MATH 245 complete.

<sup>5</sup> ASTR 300, ASTR 340GW, ASTR 470, ASTR 697, PHYS 360 and PHYS 370 offered spring semesters only.

<sup>6</sup> PHYS 385 must be taken before PHYS 360.

<sup>7</sup> **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(s) numbered 400–499. Up to 1 unit of a 600 level course in ASTR may count toward this requirement.

**Plan B**

Course	Title	Units
<b>First Semester</b>		
Select One (UD-C, USH, CSLG):		3
HIST 470	The U.S. Constitution to 1896 (AERM, SJ)	
HIST 471	The U.S. Constitution Since 1896 (AERM, SJ)	
Select One:		3
University Elective (if selecting MATH 245)		
MATH 325	Linear Algebra (if selecting MATH 376)	

GE Area UD-B: Upper-Division Physical and/or Life Sciences		3
	<b>Units</b>	<b>9</b>
<b>Second Semester</b>		
ASTR 300	Stars, Planets, and the Milky Way (Major Upper-Division Core)	3
CSC 309	Computer Programming (Major Upper-Division Core)	3
Select One (Major Lower-Division Prerequisite):		3
MATH 245	Elementary Differential Equations and Linear Algebra	
MATH 376	Ordinary Differential Equations I	
GE Area UD-D: Upper-Division Social Sciences		3
	<b>Units</b>	<b>12</b>
<b>Third Semester</b>		
ASTR 301	Observational Astronomy Laboratory (Major Upper-Division Core)	2
PHYS 320	Modern Physics I (Major Upper-Division Core)	3
PHYS 330	Analytical Mechanics I (Major Upper-Division Core)	3
PHYS 385	Introduction to Theoretical Physics I (Major Upper-Division Core)	3
	<b>Units</b>	<b>11</b>
<b>Fourth Semester</b>		
ASTR 340GW	The Big Bang - GVAR (Major Upper-Division Core)	3
PHYS 360	Electricity and Magnetism I (Major Upper-Division Core)	3
PHYS 370	Thermodynamics and Statistical Mechanics (Major Upper-Division Core)	3
	<b>Units</b>	<b>9</b>
<b>Fifth Semester</b>		
ASTR 400	Stellar Astrophysics (Major Upper-Division Core)	3
PHYS 430	Quantum Mechanics I (Major Upper-Division Core)	3
Major Elective - Take One <sup>1</sup>		3
	<b>Units</b>	<b>9</b>
<b>Sixth Semester</b>		
ASTR 470	Observational Techniques in Astronomy (Major Upper-Division Core)	3
Select One (Major Culminating Experience):		3
ASTR 498 & PHYS 695	Astronomy Research Literature and Culminating Experience in Physics	
ASTR 697	Senior Project	
Major Elective - Take One <sup>1</sup>		3
University Elective		1
	<b>Units</b>	<b>10</b>
	<b>Total Units</b>	<b>60</b>

<sup>1</sup> **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(s) numbered 400–499. Up to 1 unit of a 600 level course in ASTR may count toward this requirement.