

This four-year plan has been constructed for a student entering the program prepared for **first semester Calculus (MATH 122AB or 125)**. Please visit the Astronomy Department academic webpage for more information <http://www.as.arizona.edu/academics>

FALL 1

ASTR 196	1	* Astro Major Seminar
ENGL 101	3	# Composition
MATH 122AB	5	^ Calculus I
CSC 110	4	% Computer Programming
---	3	Gen Ed or Elective

Total Units: 16

SPRING 1

PHYS 141/161H	4	^ Intro Mechanics
ENGL 102	3	# Composition
MATH 129	3	^ Calculus II
---	3	Gen Ed or Elective
---	3	Gen Ed or Elective

Total Units: 16

FALL 2

ASTR 250	3	^ Fund. Of Astronomy
MATH 223	4	^ Vector Calculus
PHYS 142/162H	4	^ Intro Thermo. & Optics
---	4	Foreign Language
ASTR 39X	1	* Research

Total Units: 16

SPRING 2

ASTR 296A	1	* Research Seminar [odd years]
MATH 254	3	^ Differential Equations
PHYS 241/261H	4	^ Intro E&M
PHYS 263H	3	Relativity & Quantum
---	4	Foreign Language
ASTR 39X	1	* Research

Total Units: 16

FALL 3

ASTR 300A	3	Astrophys. I : Dynamics
PHYS 204	3	^ Math Tech. in Phys.
PHYS 321	3	^ Theo. Mechanics
MATH 313	3	* Linear Algebra
---	3	Gen Ed or Elective
ASTR 39X	1	* Research

Total Units: 16

SPRING 3

ASTR 300B	3	Astrophys. II : Radiative Processes
ASTR 302	3	Observational Astronomy
PHYS 331	3	^ E&M I
PHYS 371	3	Quantum Theory I
---	3	Gen Ed or Elective
ASTR 49X	1	Research

Total Units: 16

FALL 4

ASTR 400A	3	Th. Astrophys. I : Stellar
PHYS 305	3	\$ Computational Physics
---	3	Gen Ed or Elective
---	3	Elective
---	3	Elective
ASTR 49X	1	Research

Total Units: 16

SPRING 4

ASTR 400B	3	Th. Astrophys. II: Gal./Exgal.
PHYS 426	3	^ Thermal Physics
---	3	Gen Ed or Elective
---	3	Elective
---	3	Elective
ASTR 49X	1	Research

Total Units: 16

* = Optional. Not required for the ASTR Major graduation, but recommended.

= If test into ENGL 109H, may replace ENGL 101,102 with single semester of 109H.

^ = If start with MATH 129 (or higher), then may take classes denoted with "^" one semester earlier.

% = CSC 110 (or equivalently ECE 175 or PHYS 105A) may be taken any semester prior to taking PHYS 305 & ASTR 302

\$ = PHYS 305 may be taken in any semester starting Fall 3 through Fall 4. It is a prereq for PHYS 426.

Undergraduate Astronomy Degree Requirements

B.S. IN ASTRONOMY (36 UNITS)

B.S. in Astronomy automatically obtains a Physics Minor. A total of 120 units (42 upper division) are required to graduate

<u>Course No.</u>	<u>Units</u>	<u>Course Title</u>	<u>Semester(s) Offered</u>
ASTR 250	3	Fundamentals of Astronomy	Fall/Spring
ASTR 300A	3	Astronomy and Astrophysics I (Gravity and Mechanics)	Fall
ASTR 300B	3	Astronomy and Astrophysics II (Radiation and Matter)	Spring
ASTR 302	3	Introduction to Observational Astronomy	Spring
PHYS 305	3	Computational Physics	Fall/Spring
PHYS 321	3	Theoretical Mechanics I	Fall/Spring
PHYS 331	3	Electricity & Magnetism I	Fall/Spring
PHYS 371	3	Quantum Theory I	Fall/Spring
ASTR 400A	3	Theoretical Astrophysics I: Stellar (writing emphasis)	Fall
ASTR 400B	3	Theoretical Astrophysics II: Galactic and Extragalactic	Spring
PHYS 426	3	Thermal Physics	Fall/Spring
ASTR 492/8/9(H) ¹	3	Research Project (or Honors Thesis)	Fall/Spring/Summer

¹ 3 units of either 492 (Directed Research; for a letter grade), 498H (Senior Capstone; letter grade) or 499 (Independent Study; pass/fail). ASTR 499H (letter grade) may also be taken for Honors credit. **Gen Ed Requirements:** 4 Tier 1 (two courses numbered 150s and two courses numbered 160s) plus 3 Tier 2 (1 each from HUM, INDV, and ARTS). Course descriptions may be found at <http://gened.arizona.edu>
2 semesters of a foreign language are required (if not tested out of).

Astrophysics Relevant Upper Division Electives

Astronomy & Planetary Science Electives:

ASTR 485	3	Radio Astronomy
ASTR 488	3	Astrochemistry
PTYS 403	3	Physics of Solar System
PTYS 407	3	Chemistry of Solar System
PTYS 411	3	Geophysics of Solar System
PTYS 416	3	Comets, Asteroids, Kuiper Belt
PTYS 442	3	Mars
PTYS 450	3	Origin of Planetary Systems

Statistics & Computing Electives:

ISTA 311	3	Information & Inference
ISTA 421	3	Intro Machine Learning
MATH 363	3	Intro to Stat. Methods

Math Electives (see catalog for complete list):

MATH 313	3	!! Linear Algebra
MATH 424	3	Theory of Complex Variables
MATH 454	3	ODEs & Stability Theory
MATH 456	3	Applied Partial Diffy Q
MATH 475A/B	3,3	Numerical Analysis I/II

Optics Electives:

OPTI 310/330	3,3	Physical Optics I/II
PHYS 320	3	Optics
ASTR 416	3	Ast. Optics (Detect Exoplanets)
ASTR 428	3	Adaptive Optics

Astrobiology Electives:

MCB 315	3	Quantitative Biology
ASTR 475	3	Planetary Astrobiology
GEOS 484	3	Evol. of Earth & Biosphere

Instrumentation Electives:

PHYS 381/382/481	2,2,2	Experimental Phys. I/II/III
PHYS 405	3	Digital Electronics
ASTR 418*	3	Instrumentation & Stats
PHYS 460	3	Solid State Physics

Physics Electives (see catalog for complete list):

PHYS 332	3	E&M II
PHYS 450	3	Nuclear Physics
PHYS 469	3	Intro General Relativity
PHYS 472	3	Quantum Theory II

!! = The MATH Minor requires MATH 313 (or 310) plus one MATH 3/400 level minor elective.

* = ASTR 418 = graduate course ASTR 518. Requires MATH 122, 223, 254 & PHYS 141/161 & 142/162.

* = ASTR 418 - Highly recommended: ASTR 300A/B, 302, and 305.

Minors & Double Majors Fact Sheet

The Minors and Double Majors listed below are optional (not required).

Mathematics MINOR

2 electives: **MATH 313** (Linear Algebra) or **MATH 310** (Applied Linear Algebra) plus **1 MATH elective** must be filled with 1 choice from: MATH 315, 322, 323, 330, 361, 362, 363, 368, 401A, 401B, 402, 404, 407, 413, 415A, 415B, 422, 424, 425A, 425B, 432, 443, 445, 446, 447, 454, 456, 464, 466, 468, 475A, 475B, 485, 488, or 498(H)

Planetary Science MINOR

6 electives: **3 Core PTYS electives (PTYS 403, 407, 411)**, **1 elective** selected from **300 and 400 level PTYS classes**, plus **2 additional electives** approved by a PTYS minor adviser. Note: PTYS 407 requires 2 semesters of Chemistry (103/104 AB) as a prerequisite (CHEM 151/152 or AP credit also count).

Astrobiology MINOR

6 electives: **3 Core Astrobiology electives (MCB315, AST 406, AST 475, AST 488, PTYS 450, GEOS 484)**, plus **3 300-500 level electives** in relevant topics approved by an Astrobiology Minor advisor. Please check <http://astrobiology.arizona.edu> for additional information.

Optics MINOR

6 electives: **OPTI 201 R/L** and **OPTI 202 R/L** plus **4 choices** from **OPTI 300 - 490** level courses

Mathematics Double MAJOR

7 electives: Additional requirements for the Applied Mathematics major are **MATH 313, 323, 422, and 485**. In addition, **2 Electives** must be filled with one pair of classes: **MATH 454 & 456** or **MATH 464 & 466** or **MATH 475A & 475B**, plus **1 more MATH 400-level** class. MATH 355 is recommended instead of 254.

Physics Double MAJOR

7 electives: Additional requirements for the Physics major are **PHYS 332, 381, 382 472, and 49X (2 additional electives chosen from PHYS 320, 405, 422, 431, 450, 460, 468, 469, 473, 476, or 483.**

8/7/2020

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