

# ASTRONOMY COURSE PROGRAM

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Courses given in Astronomy have the subject code ASTRNMY. For a complete list of subject codes, see Appendix.

Although Stanford University does not have a degree program in astronomy or astrophysics, teaching and research in various branches of these disciplines are ongoing activities in the departments of Applied Physics, Electrical Engineering, and Physics. For the convenience of students interested in astronomy, astrophysics, and cosmology, a course program for undergraduate and graduate study is listed below.

The program is especially committed to providing introductory courses for the student who wishes to be informed about the fields of astronomy without the need for prerequisites beyond high school algebra and physics. Astronomy courses numbered below 100 are designed to serve this group of students.

Astronomy courses numbered 100-199 serve the student interested in an initial scientific study of astronomy. The courses numbered 200 and above are for graduate students and advanced undergraduates, subject to prior approval by the course instructor.

## UNDERGRADUATE PROGRAMS

The University does not offer a separate undergraduate major in Astronomy. Students who intend to pursue graduate study in astronomy or space science are encouraged to major in physics, following the advanced sequence if possible, or in electrical engineering if the student has a strongly developed interest in radioscience. The course descriptions for these basic studies are listed under the appropriate department sections of this bulletin. Students desiring guidance in developing an astronomy-oriented course of study should contact the chair of the Astronomy Program Committee. The following courses are suitable for undergraduates and are recommended to students considering advanced study in astronomy or astrophysics: PHYSICS 100, Introduction to Observational and Laboratory Astronomy; PHYSICS 160, Introduction to Stellar and Galactic Astrophysics; PHYSICS 161, Introduction to Extragalactic Astrophysics and Cosmology; GES 222, Planetary Systems: Dynamics and Origins. Students planning study in astronomy beyond the B.S. are urged to take PHYSICS 260 and 262, Introduction to Astrophysics and to Gravitation, and to consider an undergraduate thesis (PHYSICS 169) or honors thesis in an astrophysics related area. The above-mentioned courses are required for physics majors who choose the curriculum with a concentration in astrophysics (see the "Physics" section of this bulletin). The student observatory, located in the hills to the west of the campus and equipped with a 24-inch and other small reflecting telescopes, is used for instruction of the observation-oriented courses.

## MINORS

The minor program in Astronomy is described in the "Physics" section of this bulletin. The non-technical minor, intended for students whose major does not require the PHYSICS 40 series, requires 10 units of Physics courses (PHYSICS 21, 23, 25/26) and 9-10 units of Astronomy courses (PHYSICS 50 or 100, 3-4 units; PHYSICS 15, 16, 17, 6 units). The technical minor for other students consists of PHYSICS 70, 100, 160, 161, 164, 14 units in addition to the 40 series.

To be accepted to the minor program, students need to obtain an adviser selected from the faculty in the Astronomy Course Program. The minor declaration deadline is three quarters before graduation (that is, beginning Autumn Quarter if the student is graduating at the end of Spring Quarter). All courses for the minor must be taken at Stanford University, and a letter grade of 'C' or better must be received for all units applied toward the minor.

## GRADUATE PROGRAMS

Graduate programs in astronomy and astrophysics and related topics are carried out primarily in the Department of Physics but also the departments of Applied Physics and Electrical Engineering. Students should consult the course listings, degree requirements, and research programs of these departments for more detailed information. For graduate research opportunities, see the "Center for Space Science and Astrophysics" section of this bulletin and the Kavli Institute of Particle Astrophysics and Cosmology at <http://kipac.stanford.edu>.

Stanford is a member of a consortium using the Hobby Eberly telescope, a 10-meter-class telescope located at McDonald Observatory in Texas. Opportunities to do research projects using this telescope are available for graduate students.

Students planning to conduct research in astronomy and astrophysics are required to take PHYSICS 360, Physics of Astrophysics, and at least one of the following: PHYSICS 361, Stellar and Galactic Astrophysics, 362, Extragalactic Astrophysics and Cosmology, or 363, Solar and Solar-Terrestrial Physics. Students lacking a background in astrophysics, gravitation, and plasma physics should take PHYSICS 260 and 262, Introduction to Astrophysics and to Gravitation, and PHYSICS 312, Basic Plasma Physics. Students with special interests in gravitation should take PHYSICS 364, Advanced Gravitation.

Students interested in research programs in space physics involving spacecraft studies of the planets, their satellites, and their near-space environments should see the "Center for Space Science and Astrophysics" section of this bulletin.

## COURSES

### ELEMENTARY LECTURES

The following courses provide a descriptive knowledge of astronomical objects and astrophysics of the universe. PHYSICS 15, 16, and 17 are for students not majoring in the sciences and are taught in different quarters by different instructors, but are related in topic.

#### PHYSICS

##### PHYSICS 15. The Nature of the Universe

3 units, Win, Sum (Sako)

##### PHYSICS 16. Cosmic Horizons

3 units, Aut (Abel)

##### PHYSICS 17. Black Holes

3 units, Spr (Blandford)

### OBSERVATORY

The following courses are intended to familiarize students with observational methods and analysis of astronomical data. PHYSICS 100 involves more advanced observations and is intended for students with some background in physics.

**ELECTRICAL ENGINEERING**

**EE 106. Planetary Exploration**  
3 units, Spr (Fraser-Smith)

**PHYSICS**

**PHYSICS 50. Astronomy Laboratory and Observational Astronomy**  
3 units, Spr (Church)

**PHYSICS 100. Introduction to Observational and Laboratory Astronomy**  
4 units, Aut (Romani)

**ADVANCED UNDERGRADUATE**

The following courses are for students with a more advanced knowledge of basic physics and mathematics, and form the core courses for a concentration in astrophysics for Physics majors.

**PHYSICS**

**PHYSICS 160. Introduction to Stellar and Galactic Astrophysics**  
3 units, Win (Romani)

**PHYSICS 161. Introduction to Extragalactic Astrophysics and Cosmology**  
3 units, Spr (Michelson)

**PHYSICS 169A,B,C. Independent Study in Astrophysics and Honors Thesis**  
1-9 units, A: Aut, B: Win, C: Spr (Staff)

**GRADUATE****GEOLOGICAL AND ENVIRONMENTAL SCIENCES**

**GES 222. Planetary Systems: Dynamics and Origins**  
3 units, Aut (Lissauer)

**PHYSICS**

**PHYSICS 260. Introduction to Astrophysics and Cosmology**  
3 units, Aut (Petrosian)

**PHYSICS 262. Introduction to Gravitation**  
3 units, Win (Wagoner)

**PHYSICS 301. Astrophysics Laboratory**  
3 units, Aut (Romani)

**PHYSICS 312. Basic Plasma Physics**  
3 units (Kosovichev) not given 2005-06

**PHYSICS 360. Physics of Astrophysics**  
3 units, Win (Petrosian)

**PHYSICS 361. Stellar and Galactic Astrophysics**  
3 units (Petrosian) not given 2005-06

**PHYSICS 362. Advanced Extragalactic Astrophysics and Cosmology**  
3 units, Spr (Petrosian)

**PHYSICS 363. Solar and Solar-Terrestrial Physics**  
3 units, Win (Kosovichev)

**PHYSICS 364. Advanced Gravitation**  
3 units (Linde) not given 2005-06

**PHYSICS 463. Special Topics in Astrophysics: Experimental Cosmology**  
3 units, Aut (Abel, Allen)