

# ASTRONOMY COURSE PROGRAM

*Emeriti: (Professors)* Ronald N. Bracewell, Von R. Eshleman, Peter A. Sturrock

*Committee in Charge: (Director)* Vahé Petrosian; Roger W. Romani, Robert V. Wagoner

*Professors:* Blas Cabrera (Physics), Peter Michelson (Physics), Vahé Petrosian (Physics, Applied Physics), G. Leonard Tyler (Electrical Engineering), Robert V. Wagoner (Physics)

*Associate Professor:* Roger W. Romani (Physics)

*Assistant Professor:* Sarah Church (Physics)

*Professor (Research):* Philip H. Scherrer (Physics)

*Department Offices:* Varian, Room 304

*Mail Code:* 94305-4060

*Department Phone:* (650) 723-1439

*Email:* danav@stanford.edu

*Web site:* <http://www.stanford.edu/dept/astro/>

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

Although Stanford University does not have a degree program in astronomy or astrophysics, teaching and research in various branches of these disciplines is an ongoing activity in the departments of Applied Physics, Electrical Engineering, and Physics. For the convenience of students interested in the general areas of 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: ASTRNMY 100, Introduction to Observational and Laboratory Astronomy; PHYSICS 162 or EE 106, Planetary Exploration; PHYSICS 160, Introduction to Stellar and Galactic Astrophysics; PHYSICS 161, Introduction to Extragalactic Astrophysics and Cosmology. 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. A non-technical minor, intended for students whose major does not require the PHYSICS 50 series, requires 9 units of Physics courses (PHYSICS 21, 23, 25) and 10 units of Astronomy courses (PHYSICS 50 or 100, 3-4 units; PHYSICS 15, 16, 18N, 27, and 162, 6-7 units). The technical minor for other students consists of PHYSICS 27, 70, 100, 160, 161, and 162 (or EE 106).

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 in the departments of Applied Physics, Electrical Engineering, and Physics. 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.

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 Physics), 362 (Extragalactic Astrophysics and Cosmology), or 363 (Solar and Solar-Terrestrial Physics). Students lacking a background in astrophysics, gravitation, and plasma physics are recommended to take PHYSICS 260 and 262, Introduction to Astrophysics and to Gravitation, and 312 on Plasma Physics. Students with special interests in gravitation are recommended to 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 and 16 are for students not majoring in the sciences and are taught in different quarters by different instructors, but are related in topic. PHYSICS 27 is similar to 16, but at a more quantitative level. PHYSICS 18N is a freshman seminar and 81Q and 82Q are sophomore dialogues.

### PHYSICS

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

3 units, Aut (Romani)

#### PHYSICS 16. Cosmic Horizons

3 units, Win (Linde)

#### PHYSICS 18N. Revolutions in Concepts of the Cosmos

3 units, Win (Dimopoulos)

#### PHYSICS 27. Evolution of the Cosmos

3 units, Spr (Wagoner)

#### PHYSICS 81Q. Lookback Time in Cosmology

1 units (Romani) not given 2002-03

#### PHYSICS 82Q. Expanding Cosmic Horizons

1 units (Wagoner) not given 2002-03

**PHYSICS 85Q. Cosmology in the 21st Century***1 units***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.

**PHYSICS****PHYSICS 50. Astronomy Laboratory and Observational Astronomy***3 units, Aut, Sum (Cabrera, Staff)***PHYSICS 100. Introduction to Observational and Laboratory Astronomy***4 units, Spr (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.

**ELECTRICAL ENGINEERING****EE 106. Planetary Exploration***3 units, not given 2002-03***PHYSICS****PHYSICS 160. Introduction to Stellar and Galactic Astrophysics***3 units, Win (Petrosian)***PHYSICS 161. Introduction to Extragalactic Astrophysics and Cosmology***3 units, Spr (Petrosian)***PHYSICS 169A,B,C. Independent Study in Astrophysics and Honors Thesis***1-9 units, A: Aut, B: Win, C: Spr (Staff)***GRADUATE****PHYSICS****PHYSICS 260. Introduction to Astrophysics***3 units (Staff) not given 2002-03***PHYSICS 262. Introduction to Gravitation***3 units, Win (Kallosh)***PHYSICS 301. Astrophysics Laboratory***3 units, Sum (Staff)***PHYSICS 312. Basic Plasma Physics***3 units, Aut (Kosovichev)***PHYSICS 360. Physics of Astrophysics***3 units (Staff) alternate years, given 2003-04***PHYSICS 361. Stellar and Galactic Astrophysics***3 units, Spr (Madejski)***PHYSICS 362. Extragalactic Astrophysics and Cosmology***3 units (Staff) alternate years, given 2003-04***PHYSICS 363. Solar and Solar-Terrestrial Physics***3 units, Win (Kosovichev) not given 2003-04***PHYSICS 364. Advanced Gravitation***3 units, Spr (Kallosh)***PHYSICS 463. Special Topics in Astrophysics***3 units (Staff) not given 2002-03*

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