

ASTRONOMY AND ASTROPHYSICS

(AS) {ASTR}

001. A Survey of the Universe. (S) Physical World Sector. All classes. Only one ASTR course below ASTR 011 may be taken for credit. Engineering students receive no credit for this course.

A general survey, designed for the non-major, of the facts and theories of the astronomical universe, from solar system, to stars, to galaxies and cosmology. Topics include planets, satellites, small objects in the solar system, and extraterrestrial life; stars, their evolution, and their final state as white dwarfs, neutron stars, or black holes; galaxies, quasars, large structures, background radiation, and big bang cosmology. Elementary algebra and geometry will be used. This course is not recommended for physical-science majors or engineering students. Engineering students receive no credit for this course. Fulfills quantitative data analysis requirement.

003. The Solar System. (C) Physical World Sector. All classes. Only one ASTR course below ASTR 011 may be taken for credit.

A survey course on the Solar System designed for the non-major. The emphasis will be on understanding the origin and history of our Solar System and planetary systems around other stars using the latest observational results. Elementary algebra and geometry will be used. Physical science majors and engineering students should prefer ASTR 011 to this course.

006. The Solar System, Exoplanets, and Life. (C) Natural Science & Mathematics Sector. Class of 2010 and beyond. Also fulfills General Requirement in Physical World for Class of 2009 and prior. Only one ASTR course below ASTR 011 may be taken for credit. Fulfills quantitative data analysis requirement.

A survey course on planets and life covering our own Solar System and exoplanets orbiting other stars. Topics include the latest results and theories about: the origin and evolution of planetary systems around our Sun and other stars; the detection of exoplanets; the implications of planetary atmospheres for life; and the search for life on other planets in our Solar System. This course is designed for the non-major and elementary algebra and geometry will be used. Physical science majors and engineering students should prefer ASTR 011 to this course.

007. The Big Bang and Beyond. (C) Natural Science & Mathematics Sector. Class of 2010 and beyond. Also fulfills General Requirement in Physical World for Class of 2009 and prior. Only one ASTR course below ASTR 011 may be taken for credit.

An introductory course for students who do not intend to major in a physical science or engineering, covering theories of the Universe ranging from the ancient perspective to the contemporary hot big bang model, including some notions of Einstein's special and general theories of relativity. Topics will include the solar system, stars, black holes, galaxies, and the structure, origin and future of the Universe itself. Elementary algebra is used. Fulfills quantitative data analysis requirement.

150. Observational Astronomy. (M) Physical World Sector. All classes. An observing-based astronomy course for non-science majors; no prerequisites.

Topics: how to read star-maps and find objects in the night sky, learning about astronomical phenomena as we observe them, telescope training, planets, and stars, the nature of light, and signal processing. Two one-hour daytime lectures each week plus three-hour evening lab in smaller groups. Attendance at one lab session per week is required by each student - multiple times are scheduled due to the uncertainty and unpredictability of weather conditions for observing. Requires substantial out-of-class time dedication and commitment to sharing work in small groups.

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211. Introduction to Astrophysics I. (A) Physical World Sector. All classes. Prerequisite(s): MATH 104, PHYS 150, or concurrently.

This is a basic course for majors in astronomy, in other physical sciences, and in engineering covering fundamental knowledge of the solar system, its formation, properties of light and matter as they affect understanding astrophysical objects, and stellar structure and evolution including black holes.

212. Introduction to Astrophysics II. (B) Physical World Sector. All classes. Prerequisite(s): MATH 114, PHYS 151, or concurrently.

A basic course for majors in astronomy, in other physical sciences, and in engineering. Stars, galaxies, and the evolution of the universe.

250. Astronomical Techniques. (M) Prerequisite(s): ASTR 001, or ASTR 007, or ASTR 011, or ASTR 012. If a student has only taken ASTR 001 or ASTR007, MATH 240-241 will also be required. The observatories at DRL are used for experimental and observational practice.

Topics: spherical astronomy, timekeeping/coordinate systems, astrostatistics, telescopes, CCD's, signal processing, imaging, and data reduction using scientific software, brief introduction to radio astronomy. Three daytime lectures each week plus evening labs in smaller groups. Attendance at one lab session per week is required by each student. Actual observing times may not correspond to the scheduled block due to the uncertainty and unpredictability of weather conditions. Requires substantial out-of-class time dedication and commitment to sharing work in small groups.

392. Life and Death of Stars. (C)

This is an advanced undergraduate course on the life and death of stars. The course will cover the structure of stellar interiors, nuclear reactions and the formation of elements, stellar evolution, supernovae, and the physics of white dwarfs, neutron stars, and black holes. We will approach these topics from both theoretical and observational perspectives.

503. Astronomical Methods and Instrumentation. (M)

Techniques of modern astronomical observations, including: detection of light from the radio through gamma rays; sources of noise in astronomical measurements; image analysis and reduction techniques; telescope optics and adaptive optics; spectroscopic measurements; radio interferometry and spectroscopy.

533. Galaxies: Structure, Dynamics and Formation. (M)

Galactic structure and dynamics. Observed scaling relations. Models and observations of galaxy formation and evolution. Enrollment restricted to graduate students.