ASTR - ASTRONOMY (ASTR)

ASTR 101 Basic Astronomy

Credits 3. 3 Lecture Hours. (ASTR 1303 or PHYS 1303) Basic Astronomy. A qualitative approach to basic stellar astronomy; earth-moon-sun relationships then studies of distances to stars, stellar temperatures, and other physical properties; birth, life on the main sequence of the H-R diagram, and ultimate fates of stars; not open to students who have taken ASTR 111 or ASTR 314.

ASTR 102 Observational Astronomy

Credit 1. 3 Lab Hours. (ASTR 1103 or PHYS 1103) Observational Astronomy. Observational and laboratory course; use of techniques and instruments of classical and modern astronomy.

ASTR 103 Introduction to Stars and Exoplanets

Credits 3. 3 Lecture Hours. A qualitative study of stellar birth, stellar structure and evolution, stellar nucleosynthesis, the Hertzsprung-Russell Diagram, white dwarfs, neutron stars, supernovae, black holes, proto-planetary systems, origin of the solar system and the search for exoplanets; utilizes active learning methods that incorporate observations from the current generation of ground and space-based telescopes. Open to all majors.

ASTR 104 Introduction to Galaxies and Cosmology

Credits 3. 3 Lecture Hours. A qualitative study of properties of galaxies, galaxy evolution through cosmic time, galactic archaeology, active galactic nuclei, super-massive black holes, large-scale structure, the expansion history of the universe, cosmological parameters and Big Bang nucleosynthesis; utilizes active learning methods that incorporate observations from the current generation of ground and space-based telescopes. Open to all majors.

ASTR 109/PHYS 109 Big Bang and Black Holes

Credits 3. 3 Lecture Hours. Designed to give an intuitive understanding of the Big Bang and Black Holes, without mathematics, and de-mystify them for the non-scientist. **Cross Listing:** PHYS 109/ASTR 109.

ASTR 111 Overview of Modern Astronomy

Credits 4. 3 Lecture Hours. 2 Lab Hours. (ASTR 1303 and ASTR 1103, ASTR 1403, PHYS 1303 and PHYS 1103, PHYS 1403) Overview of Modern Astronomy. Roots of modern astronomy; the scientific method; fundamental physical laws; the formation of planets, stars, and galaxies; introduction to cosmology; includes an integrated laboratory that reinforces the lecture topics, including hands-on experience with telescopes and imaging of celestial objects; not open to students who have taken ASTR 101 or ASTR 314.

ASTR 285 Directed Studies

Credits 0 to 4. 0 to 4 Other Hours. Special work in laboratory or theory to meet individual requirements in cases not covered by regular curriculum; intended for use as lower-level credit. **Prerequisite:** Approval of department head.

ASTR 289 Special Topics in...

Credits 0 to 4. 0 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of astronomy. May be repeated for credit. **Prerequisite:** Approval of instructor.

ASTR 291 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in astronomy. May be repeated 2 times for credit. **Prerequisites:** Freshman or sophomore classification and approval of instructor.

ASTR 314 Survey of Astronomy

Credits 3. 3 Lecture Hours. Primarily for majors in science and engineering. Kepler's laws, law of gravitation, solar system, stars, stellar evolution, nucleosynthesis, cosmology, clusters, nebulae, pulsars, quasars, black holes. **Prerequisite:** PHYS 207 or PHYS 208.

ASTR 320 Astrophysical Research Methods

Credits 3. 3 Lecture Hours. Background and tools used in modern astrophysical research, including reduction of photometric and spectroscopic data, signal-to-noise and error calculations and order-of-magnitude estimates. **Prerequisite:** Grade of C or better in ASTR 314 or approval of instructor.

ASTR 401 Stars and Extrasolar Planets

Credits 3. 3 Lecture Hours. How stars are born, how internal structure changes, nuclear fuel burned and ultimate fate; extrasolar planet detection, formation, properties and habitability. **Prerequisite:** ASTR 314.

ASTR 403 Extragalactic Astronomy and Cosmology

Credits 3. 3 Lecture Hours. Physical makeup of individual galaxies and large scale structure in the universe; origin and eventual fate of the universe; interpretation of observational data as it relates to baryonic matter, Dark Matter and cosmological models with Dark Energy. **Prerequisite:** ASTR 314.

ASTR 420 Advanced Astrophysical Research Methods

Credits 3. 3 Lecture Hours. Advanced research techniques used by modern-day astronomers to obtain, process and analyze data from grounds and space-based telescopes. **Prerequisites:** Grade of C or better in ASTR 320 or approval of instructor.

ASTR 485 Directed Studies

Credits 0 to 12. 0 to 12 Other Hours. Special work in laboratory or theory to meet individual requirements in cases not covered by regular curriculum. **Prerequisite:** Approval of department head.

ASTR 489 Special Topics in...

Credits 0 to 4. 0 to 4 Other Hours. Selected topics in an identified topic of astronomy. May be repeated for credit. **Prerequisite:** Approval of instructor.

ASTR 491 Research

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in astronomy. May be repeated for credit. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded.
Prerequisites: Junior or senior classification and approval of instructor.