

# ASTRONOMY (ASTR)

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**ASTR 7020 Cosmology and Black Holes 3 cr**

Topics include static solutions of Einstein's equations, gravitational waves, static models for stars \*(white dwarfs, neutron stars), dynamic models for stars (Birkhoff theorem, black holes), and cosmology (Robertson-Walker metric, Friedmann equations). Further topics discussed in the course are cosmic inflation, dark matter and energy, as well as large-scale structure of the universe. Students may not hold credit for both ASTR 4020 and ASTR 7020.

**PR/CR: A minimum grade of C is required unless otherwise indicated.**

Prerequisite: PHYS 7010.

**Mutually Exclusive:** ASTR 4020, PHYS 4020

**ASTR 7100 High-Energy Astrophysics 3 cr**

This course provides an introduction to the growing field of high-energy radiation processes and astrophysical sources. Processes include Bremsstrahlung, inverse Compton scattering, pion decay, and particle acceleration. Sources include compact objects, supernovae and their remnants, gamma-ray bursts, clusters of galaxies. Students may not hold credit for both ASTR 4100 and ASTR 7100.

**Mutually Exclusive:** ASTR 4100

**ASTR 7200 Radio Astronomy 3 cr**

This course provides an introduction to observational radio astronomy and processes in radio astrophysics. Topics include radiative transfer; blackbody radiation; radio telescopes, receivers, and interferometers; thermal (e.g., HII regions) and non-thermal (e.g., radio galaxies) continuum sources; pulsars and spectral-line sources. Students may not hold credit for both ASTR 4200 and ASTR 7200.

**Mutually Exclusive:** ASTR 4200

**ASTR 7400 Magnetohydrodynamics, Astrophysical Plasmas, and the Interstellar Medium 3 cr**

This course develops a theoretical understanding of the interstellar magnetic fields for a diverse range of astrophysical objects, processes, and phenomena. Furthermore, the theoretical aspects of magnetohydrodynamics, and foundations for the physics of cosmic ray diffusion and acceleration, are also discussed. Students may not hold credit for both ASTR 4400 and ASTR 7400.

**Mutually Exclusive:** ASTR 4400