

**ASTRONOMY AND  
ASTROPHYSICS**      **AST**

**Department of Physics and  
Astronomy  
College of Natural Science**

- 101      The Celestial Clockworks**  
Spring. 1(1-0)  
Relationship between ancient skylore and timekeeping. Establishment of a calendar and celestial navigation. Development of the Greek horoscope as a time recorder and coordinate system.
- 207      The Science of Astronomy**  
Fall. 3(3-0) P: ((PHY 231 or concurrently) or (PHY 231C or concurrently) or (PHY 183 or concurrently) or (PHY 183B or concurrently) or (ISP 205 or concurrently) or (LB 273 or concurrently)) and ((MTH 114 or concurrently) or (MTH 116 or concurrently) or (MTH 132 or concurrently))  
In-depth study of one topic in astronomy with emphasis on key discoveries. Topics may be cosmology, the solar system, and the life of stars.
- 208      Planets and Telescopes**  
Spring. 3(2-2) P: (PHY 183 or PHY 183B or PHY 193H or LB 273) and ((MTH 103 or concurrently) or (MTH 114 or concurrently) or (MTH 116 or concurrently) or (MTH 132 or concurrently) or (LB 118 or concurrently)) RB: AST 207 SA: AST 303, AST 312  
Origin and nature of the solar system. Planets of the solar system and other star systems. Determination of time and celestial coordinates. Astronomical instruments and observational methods.
- 304      Stars**  
Fall of even years. 3(3-0) P: AST 208 and (PHY 215 or PHY 215B) and (PHY 321 or concurrently) RB: AST 208  
Physical processes that determine the structure and evolution of stars. Observations of stars and star clusters. Spectra of stars.
- 308      Galaxies and Cosmology**  
Fall of odd years. 3(3-0) P: (AST 208) and ((PHY 215 or concurrently) or PHY 215B) and (PHY 321 or concurrently) SA: AST 402  
The Milky Way. Structure and content of galaxies. Active galaxies and quasars. The expanding universe. Modern cosmological models.
- 310      Directed Studies**  
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 4 credits in all enrollments for this course. R: Approval of department.  
Individual study or project in astronomy or astrophysics under the direction of a faculty member.
- 410      Senior Thesis**  
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 5 credits in all enrollments for this course. P: (AST 301) and completion of Tier I writing requirement.  
Design and execute an original experiment or computation. A written and oral report of the research is required.

- 800      Research Methods**  
Fall, Spring, Summer. 3(3-0) A student may earn a maximum of 12 credits in all enrollments for this course. RB: AST 801  
Apprenticeship in astrophysical research. Student will work closely with faculty member to learn research techniques.
- 805      Research Project**  
Fall, Spring. 3(0-3) A student may earn a maximum of 6 credits in all enrollments for this course.  
Research project to be completed under the guidance of an astronomy faculty member.
- 810      Radiation Astrophysics**  
Fall of odd years. 3(3-0)  
Transfer of radiation through plasmas and processes for emission and absorption of photons. Interpretation of the spectra of stars, the interstellar medium, and galaxies.
- 820      Advanced Topics in Astrophysics**  
Fall, Spring. 3(3-0) A student may earn a maximum of 9 credits in all enrollments for this course. RB: AST 801  
Advanced work in a specialized astrophysical topic.
- 825      Galactic Astronomy**  
Spring of odd years. 3(3-0)  
The Milky Way as a galaxy. Observations and techniques of theoretical analysis that are used to discover the features of our galaxy.
- 835      Extragalactic Astronomy**  
Fall of even years. 3(3-0)  
Galaxies beyond the Milky Way. Large-scale structure of the universe. Cosmology.
- 840      Stellar Astrophysics**  
Spring of even years. 3(3-0)  
Physics of stellar interiors. Methods for calculating stellar models. Principles of stellar evolution.
- 850      Electrodynamics of Plasmas**  
Spring of odd years. 3(3-0) Interdepartmental with Electrical and Computer Engineering and Physics. Administered by Electrical and Computer Engineering. RB: ECE 835 or PHY 488 SA: EE 850  
Plasma kinetic and macroscopic plasma transport theory. Electromagnetic wave propagation and charged particle diffusion processes in plasma. Electromagnetic energy absorption via elastic and inelastic collisions. Dc, rf, and microwave discharges.
- 860      Gravitational Astrophysics**  
Fall. 3(3-0) A student may earn a maximum of 6 credits in all enrollments for this course. RB: PHY 820 and PHY 841  
Experimental foundations, theory, and applications of gravitational physics and general relativity. Tests of the equivalence principle, modern solar system tests of general relativity, Schwarzschild metric, Hawking effect, Einstein's field equations.
- 899      Master's Thesis Research**  
Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 36 credits in all enrollments for this course. R: Open only to graduate students in the Astronomy and Astrophysics major.  
Master's thesis research.

- 911      Numerical Techniques in Astronomy**  
Spring of odd years. 2(2-0) P: PHY 810 and PHY 820 or approval of department  
Numerical solutions to key problems in astronomy and astrophysics. N-body gravitational calculations, hydrodynamics in astronomy, radiative transfer, and techniques for large datasets. Offered first half of semester.
- 999      Doctoral Dissertation Research**  
Fall, Spring, Summer. 1 to 24 credits. A student may earn a maximum of 36 credits in all enrollments for this course. R: Open to doctoral students in the Astrophysics and Astronomy Major.  
Doctoral dissertation research.