Astronomy
College of Science, Engineering and Technology
Department of Physics and Astronomy
141 Trafton Science Center N • 507-389-5743
Website: cset.mnsu.edu/pa/

Chair: Youwen Xu
Paul Eskridge, Steven Kipp, Russell Palma, James Pierce

This program is slated for closure and is not accepting majors. Contact the Office of the Dean of this College for additional information.

The astronomy program serves the needs of a wide range of students, from those with only a casual interest in the subject to those students planning careers in the field. The 100-level courses (which include general education offerings) are designed to introduce astronomy to the student with a minimal background in mathematics and the physical sciences. The courses taken by astronomy majors and minors cover a variety of topics in modern astronomy and astrophysics and require significant preparation in mathematics and physics.

The astronomy major serves as the first step toward a career in teaching or research in astronomy. Students majoring in astronomy are strongly encouraged to consider a double major with mathematics or physics.

Admission to Major is granted by the department. Minimum university admission requirements are
- a minimum of 32 earned semester credit hours.
- a minimum cumulative GPA of 2.00 (“C”).

Contact the department for application procedures.

Many courses in the astronomy program require prerequisites. Students should consult the COURSE DESCRIPTIONS section of this bulletin to determine these courses.

POLICIES/INFORMATION

GPA Policy. Astronomy majors or minors must maintain a minimum 2.5 GPA in all coursework for their astronomy program, and in addition must earn a “C” or better for a course to apply to their major or minor. These standards apply to the courses required for the degree and their prerequisites. A minimum cumulative GPA of 2.0 is required for graduation. There are no prerequisite GPA requirements for internships.

Refer to the College regarding required advising for students on academic probation.

P/N Grading Policy. No more than one-fourth of the total undergraduate degree requirements may be earned in P/NC courses.

Residency and Transfer Credit. At least 30 hours of undergraduate credit must be earned at Minnesota State Mankato during the last two academic years.

Students majoring in astronomy have an advisor from their area of interest assigned to them. Questions and concerns pertaining to advising and the assignment of advisors can be answered by Angie B. Bomier, student relations coordinator, TR C125 Trafton Science Center, telephone 389-1521.

The astronomers operate two observatories on the southern edge of the campus. Standeford Observatory contains a 14-inch Schmidt-Cassegrain telescope, used for visual observations by general education students and other observatory visitors. Several other 10- to 13-inch telescopes are also available for instructional use by students in Astronomy 125. Andreas Observatory houses a 0.5-meter computer-controlled Cassegrain telescope. This instrument, which is equipped with photographic and electronic cameras and photometers, is used primarily for advanced instruction and faculty research. Standeford Observatory is open regularly for students and other visitors during the spring and the fall. Public viewing nights at Andreas Observatory are held occasionally during the year as weather permits.

ASTRONOMY BS

Most professional astronomers hold a doctorate in astronomy or astrophysics; this major is designed to prepare students for graduate studies in these areas.

Required General Education

MATH 121 Calculus I (4)
PHYS 221 General Physics I (4)

Required Support Courses

MATH 122 Calculus II (4)
MATH 223 Calculus III (4)
MATH 321 Ordinary Differential Equations (4)
PHYS 222 General Physics II (3)
PHYS 223 General Physics III (3)
PHYS 232 General Physics II Lab (1)
PHYS 233 General Physics III Lab (1)
PHYS 335 Modern Physics I (3)

Required for Major

AST 201 Spherical Astronomy (2)
AST 215 Astronomy and Astrophysics I (4)
AST 225 Astronomy and Astrophysics II (4)
AST 353 Photometry I (2)
AST 354 Photometry II (2)
AST 355 Astrometry (2)
AST 357 Spectroscopy (2)
AST 420 Stellar Astrophysics (3)
AST 421 Stellar Structure (3)
AST 430 Galactic Structure (3)
AST 431 Extragalactic Astronomy (3)
PHYS 441 Mechanics (4)
PHYS 447 Electricity and Magnetism I (3)
PHYS 448 Electricity and Magnetism II (3)
PHYS 461 Quantum Mechanics (4)
PHYS 465 Computer Applications in Physics (3)

Required Minor: None.

ASTRONOMY MINOR

Required General Education

MATH 121 Calculus I (4)
PHYS 221 General Physics I (4)

Required Support Courses

MATH 122 Calculus II (4)
PHYS 222 General Physics II (3)
PHYS 223 General Physics III (3)

Required for Minor

AST 125 Observational Astronomy (3)
AST 201 Spherical Astronomy (2)
AST 215 Astronomy and Astrophysics I (4)
AST 225 Astronomy and Astrophysics II (4)

COURSE DESCRIPTIONS

AST 101 (3) Introduction to Astronomy
Broad survey of astronomy: the night sky, seasons, moon phases, eclipses, light, telescopes, stars, stellar evolution, galaxies, cosmology, the solar system.
Fall, Spring
GE-3

AST 102 (3) Introduction to the Planets
Survey of our solar system: the sun, planets, moons, asteroids, comets, and meteors; history of the discovery and exploration of the solar system.
Fall, Spring
GE-3
AST 104 (2) Introduction to Experimental Astronomy
Experiments in astronomy; astronomical observations; measurement, interpretation, and analysis of various types of astronomical data. Lab included.
Pre or Co-req: AST 101 or AST 102
Variable
GE-3

AST 115 (2) Life in the Universe
The probability of extraterrestrial intelligent life; the chemical basis of life; planetary environments; habitable zones; the Drake equation; UFOs; space travel; interstellar communication; limits on technical civilizations.
Fall, Spring
GE-2, GE-3

AST 125 (3) Observational Astronomy
Techniques for observing with naked eye, binoculars and small telescopes; constellation and star identification; use of star atlases and handbooks; observations of stars, binaries, clusters, nebulae, etc. Evening observing sessions required.
Pre: AST 101 or consent
Fall

AST 201 (2) Spherical Astronomy
The celestial sphere; coordinate systems; sidereal and solar time; diurnal motion; precession; proper motion; refraction; aberration; parallax. Requires a background in trigonometry.
Spring

AST 215 (4) Astronomy and Astrophysics I
Celestial mechanics; gravitational and tidal forces; stellar motions and parallax; radiation and matter; magnitudes and stellar spectra; binary stars and stellar masses; stellar structure and evolution.
Pre: MATH 121 and PHYS 221
Fall

AST 225 (4) Astronomy and Astrophysics II
Stellar endpoints; close binary systems; variable stars; the Milky Way; normal galaxies; galactic evolution; active galaxies and quasars; cosmology.
Pre: AST 215, MATH 122, PHYS 222
Spring

AST 294 (1-6) Workshop
A short course devoted to a specific astronomical topic. May be repeated for credit on each new topic.
Variable

AST 351 (1) Telescope Operations
Telescope optics; operating the 0.5-meter telescope; pointing and guiding; preparation of observing lists and finder charts; operation of the telescope’s ancillary equipment.
Pre: AST 201 and AST 215, Consent
Variable

AST 353 (2) Photometry I
Photometric systems; observational techniques of point-source photometry: methods of data reduction; interpretation of data.
Pre: AST 215
ALT-Fall

AST 354 (2) Photometry II
Observations of extended sources; photometric calibration of extended sources; use of secondary standard stars.
Pre: AST 353
ALT-Spring

AST 355 (2) Astrometry
Reduction of digital images to determine positions, proper motions, and parallaxes of stars; analysis of errors.
Pre: AST 201 and AST 215
ALT-Spring

AST 357 (2) Spectroscopy
Line identification; radial velocity determinations; spectral classification.
Pre: AST 225
ALT-Fall

AST 420 (3) Stellar Astrophysics
Blackbody radiation; radiative transfer; atomic structure; spectroscopic notation; excitation; ionization; absorption and emission coefficients; line profiles; analysis of stellar spectra.
Pre: AST 225 and PHYS 223
ALT-Fall

AST 421 (3) Stellar Structure
The gaseous state; degenerate matter; equations of stellar structure; polytropes; models of stellar interiors and atmospheres; stellar evolution; nucleosynthesis; stellar endpoints.
Pre: AST 420
ALT-Spring

AST 430 (3) Galactic Structure
Structure, kinematics, and dynamics of our galaxy.
Pre: AST 225, PHYS 222, MATH 223
ALT-Fall

AST 431 (3) Extragalactic Astronomy
Normal galaxies; groups and clusters of galaxies; galaxy interactions and mergers; active galactic nuclei; large-scale structure; galaxy formation and evolution; cosmology.
Pre: AST 430
ALT-Spring

AST 488 (1-4) Seminar
May be repeated for credit on each new topic.
Pre: Consent
Variable

AST 491 (1-6) In-Service
A course designed to upgrade the qualifications of persons on-the-job.
Variable

AST 493 (1-6) Undergraduate Research
Students will conduct supervised research in astronomy.
Pre: Consent
Variable

AST 494 (1-6) Workshop
A short course devoted to a specific astronomical topic. May be repeated for credit on each new topic.
Variable

AST 495 (1-4) Selected Topics
A course in a particular area of astronomy not regularly offered. May be repeated for credit on each new topic.
Pre: Consent
Variable

AST 497 (1-16) Internship
Provides a student the opportunity to gain expertise and experience in a special field under the supervision of a qualified person.
Pre: Consent
Variable

AST 499 (1-8) Individual Study
Individual study under the guidance of an astronomy faculty member.
Pre: Consent
Fall, Spring