Astronomy (AST)

AST 301 Introduction to Astronomy 3 Hours
General introduction to astronomy for nonscience majors. The solar system, stars, galaxies, and cosmology.

AST 101L Astronomy Discovery Laboratory 1 Hour
Hands-on projects in observational astronomy and related laboratory disciplines. Students work in small groups.

AST 302 Self-Paced Introduction to Astronomy 3 Hours
General, self-paced introduction to astronomy for nonscience majors. The solar system, stars, galaxies, and cosmology.

AST 303 Introduction to Astronomy with Celestial Observations 3 Hours
General introduction to astronomy for nonscience majors. The solar system, stars, galaxies, and cosmology. Introduces students to the night sky and includes some observational activities.

AST 103L Astronomical Observations 1 Hour
Observations of the night sky with the naked eye and small telescopes; indoor laboratory activities.

AST 104 Undergraduate Astronomy Seminar 1 Hour
Discussions about current astronomical research, with different topics emphasized each semester.

AST 307 Introductory Astronomy 3 Hours
Introduction to astronomy for science and engineering students. The solar system, stars, galaxies, and cosmology.

AST 309 Topics in Astronomy for Nonscience Students 3 Hours
Selected topics in modern astronomy: solar system, galaxies, peculiar stars, cosmology, and others.

AST 309.1 Popular Astronomy 3 Hours
Survey of topics of greatest interest to the public and the media, including new planets, black holes, dark matter, dark energy, and the origin of the Universe.

AST 309C Birth of Stars and Planets 3 Hours
Study of how stars and planets form, including discussions on the implications for the formation of our own solar system. Designed for non-College of Natural Sciences majors.

AST 309G Popular Astronomy for Nonscience Students 3 Hours
Subjects include new planets, neutron stars, supernovae, gamma-ray bursts, black holes, dark matter, dark energy, and the origin of the universe. Designed for non-College of Natural Sciences majors.

AST 309L Search for Extraterrestrial Life 3 Hours
Origin of life in the solar system, existence of other planetary systems, possibilities and techniques for detection of and communication with other intelligences. Designed for non-College of Natural Sciences majors.

AST 309N Lives and Deaths of Stars 3 Hours
How stars live and die; extremes of stars and their life cycles. Exotic objects such as white dwarfs, supernovae, neutron stars, pulsars, and black holes. Specific subjects may vary with instructor. Designed for non-College of Natural Sciences majors.

AST 309P Astronomy in Science Fiction 3 Hours
The use of astronomy and other sciences in science fiction literature. Critical analysis of selected novels as to the validity of the astronomy used. Designed for non-College of Natural Sciences majors.

AST 309Q Time and the Cosmos 3 Hours
From the beginning of time in the Big Bang to the end of time in the black hole. Includes the early universe, the formation and evolution of single and double stars, and the supercompact objects they eventually become: white dwarfs, pulsars, and black holes. Designed for non-College of Natural Sciences majors.

AST 309R Galaxies, Quasars, and the Universe 3 Hours
Galaxies, quasars, giant black holes; cosmic evolution; the origin and future of the universe. Designed for non-College of Natural Sciences majors.

AST 309S The Solar System 3 Hours
The nature, origin, and evolution of our solar system, including planets, moons, and other bodies. Designed for non-College of Natural Sciences majors.

AST 309T The Milky Way Galaxy 3 Hours
Our spiral system of stars, gas, and dust; star formation. Designed for non-College of Natural Sciences majors.

AST 110C, 210C, 310C Conference Course in Astronomy 1-3 Hours
Independent research course with supervision by astronomy faculty member or research scientist.

AST 110K, 210K, 310K Topics in Astronomy Research 1-3 Hours

AST 111G, 211G, 311G Galaxy Evolution - Vertically Integrated Projects I 1-3 Hours
Improve Python programming skills and learn application to galaxy evolution research in astronomy. Develop research skills through a group project and discussions. Report on progress each week, produce a research notebook, and conduct presentations.

AST 112G, 212G, 312G Galaxy Evolution - Vertically Integrated Projects II 1-3 Hours
Collaborate with senior mentoring team to define and develop capstone research project. Complete original project initiated in Astronomy 211G, and present results at the CNS Undergraduate Research Fair. Analyze and discuss current scientific papers related to astronomy.

AST 119S, 219S, 319S, 419S, 519S, 619S, 719S, 819S, 919S Topics in Astronomy 1-9 Hours
This course is used to record credit the student earns while enrolled at another institution in a program administered by the University's Study Abroad Office. Credit is recorded as assigned by the study abroad adviser in the Department of Astronomy. University credit is awarded for work in an exchange program; it may be counted as coursework taken in residence. Transfer credit is awarded for work in an affiliated studies program.

AST 321 Topics in Current Problems in Astronomy 3 Hours

AST 122G, 222G, 322G Galaxy Evolution - Vertically Integrated Projects Capstone 1-3 Hours
Continue capstone research project developed in Astronomy 212G. Discuss and pursue publication possibilities. Present poster of research results at the CNS Undergraduate Research Fair and in an oral presentation.

AST 324 Origins: The Universe, Stars, Planets, and Life 3 Hours
Cosmic origins from the Big Bang to life, and the connections among the origins of stars, planets, and life.

AST 129S, 229S, 329S, 429S, 529S, 629S, 729S, 829S, 929S Topics in Astronomy 1-9 Hours
This course is used to record credit the student earns while enrolled at another institution in a program administered by the University's Study Abroad Office. Credit is recorded as assigned by the study abroad adviser in the Department of Astronomy. University credit is awarded for work in an exchange program; it may be counted as coursework taken in residence. Transfer credit is awarded for work in an affiliated studies program.

AST 350L History and Philosophy of Astronomy 3 Hours
Historical influence of astronomical concepts on social, economic, literary, and scientific life; the place of astronomy in society.

AST 351 Astronomical Instrumentation 3 Hours
A hands-on course in computer-controlled optical instrumentation. Intended for natural science and engineering students interested in the practical aspects of instrument design and construction. Includes optics and optical design, electronics, machining and mechanical design, and computer interfacing. Students work in groups and as teams to design a computer-controlled optical instrument.

AST 352K Stellar Astronomy 3 Hours
Properties of stars and starlight: principles of radiation; interpretation of stellar spectra. Observational techniques such as photometry, spectroscopy, and telescopes and detectors; variable stars; binary stars.

AST 352L Positional, Dynamical, and Kinematical Astronomy 3 Hours
Coordinate systems and time; stellar positions and motions; the kinematics and dynamics of star clusters and galaxies.

AST 152M Stellar Astronomy Laboratory 1 Hour
An introduction to practical observational techniques in astronomy, designed for astronomy majors or advanced students in a physical science. Exercises on the spectroscopy, photometry, and positions of stars using a sixteen-inch telescope on campus.

AST 353 Astrophysics 3 Hours
Survey of the physics of stellar and nonstellar radiation laws, stellar atmospheres and interiors; high-energy astrophysics. Designed for science and engineering majors.

AST 358 Galaxies and the Universe 3 Hours
Our galaxy and its constituents; stars and interstellar matter. Properties of other galaxies; galaxy interactions and mergers; expansion and evolution of the universe. Designed for science and engineering majors.

AST 364P Planetary Systems 3 Hours
Modern studies of the solar system, including properties of the planets and smaller bodies, and the origin of planetary systems.

AST 367M Physical Science: Methods of Astronomy 3 Hours
An introductory, self-paced course in the methods of astronomy that emphasizes learning astronomical principles through observations.

AST 175, 275, 375 Topics in Astronomy Research 1-3 Hours

AST 175C, 275C, 375C Conference Course in Astronomy 1-3 Hours
Independent research course with astronomy faculty member or research scientist.

AST 376 Special Topics in Advanced Astronomy 3 Hours

AST 376.1 Observational Methods in Astronomy 3 Hours
A hands-on course in astronomical observations and data analysis. Explores astronomical observing techniques, data reduction and analysis, and interpretation of results. The coursework will include regular exercises in obtaining and analyzing data to solve currently relevant astronomical problems.

AST 376C Cosmology 3 Hours
The laws of physics applied to the Universe at large: its featureless beginning in the Big Bang, its fundamental constituents including radiation, atoms, and dark matter; the discoveries of universal expansion and dark energy, and a structure reflected in the web of galaxies. Designed for science and engineering majors.

AST 376R A Practical Introduction to Research Methods 3 Hours
Practical exercises including analysis of imaging data, visualization, programming exercises with Python, IDL or other languages, statistical analyses, and training for papers and oral presentations.

AST 379H Honors Tutorial Course 3 Hours
Research project and thesis for students electing to take the honors program in astronomy.

AST 380E Radiative Processes and Radiative Transfer 3 Hours
Classical and quantum radiative processes relevant to astrophysics; basic radiative transfer.

AST 381 Topics in Theoretical Astrophysics 3 Hours

AST 381C Gravitational Dynamics 3 Hours
Orbital, collective, and tidal effects of astronomical objects, such as planets, stars, galaxies, and interstellar medium, under the influence of a gravitational field.

AST 381S Seminar in Theoretical Astrophysics 3 Hours
Topics to be announced.

AST 382C Astrophysical Gas Dynamics 3 Hours
The basic principles of compressible gas dynamics and magnetohydrodynamics, developed and applied in an astrophysical context to a wide range of astronomical phenomena.

AST 382D Astronomical Data Analysis 3 Hours
Apply statistical analysis techniques to astronomical data. Examine probability theory, parameter estimation, Bayesian statistics, Markov Chain Monte Carlo methods, and model fitting.

AST 383 Topics in Stellar Astronomy 3 Hours

AST 383C Stellar Atmospheres 3 Hours
Observational properties of stellar atmospheres; theoretical calculations of stellar atmospheres and stellar spectra.

AST 383D Stellar Structure and Evolution 3 Hours
Theoretical calculations of the structure and evolution of stars.

AST 383E Order of Magnitude Astrophysics 3 Hours
Apply rapid estimation strategies employing astrophysical knowledge to answer a broad range of problems. Develop skills in posing and answering questions about research.

AST 383L Seminar in Planets and Life 3 Hours
Discussions concerning the solar system; the detection, formation, and evolution of planets; planetary atmospheres, climates, and meteorology; and various aspects of life in the universe.

AST 383T Seminar in Stellar Astronomy 3 Hours

AST 384C Computational Astrophysics 3 Hours
Investigate, compare, and implement computational techniques for numerical modeling of astrophysical systems.

AST 384T Current Studies in Astronomy for Teachers 3 Hours
Lectures and laboratory work in astronomy for elementary and secondary school teachers of earth science, physical science, or astronomy.

AST 385 Topics in Conference Course 3 Hours

AST 185C Conference on Modern Astronomy 1 Hour
A broad introduction to the research being conducted by the faculty and research staff in astronomy.

AST 386 Topics in Extragalactic Astronomy 3 Hours
Topics include classification of galaxies, distance indicators, luminosities, dimensions, colors, spectra, polarization, radio emission, rotation, masses; formation and evolution; pairs, groups, clusters, superclusters, large-scale distribution, redshifts, cosmology.

AST 386C Properties of Galaxies 3 Hours
Observational properties of galaxies and their interpretation; includes a discussion of the Milky Way galaxy.

AST 386S Seminar in Extragalactic Astronomy 3 Hours
Topics to be announced.

AST 389 Topics in Dynamical Astronomy 3 Hours
Topics include planetary and stellar motions, asymptotic representations of quasi integrals, galactic dynamics.

AST 390F Stars, Planets, and Interstellar Matter Seminar 3 Hours
Present and discuss current research broadly related to stars, planets in the Solar System, extrasolar planets, and interstellar matter.

AST 390G Galaxies and Cosmology Seminar 3 Hours
Present and discuss current research on properties of galaxies, galaxy evolution, cosmology, and related subjects.

AST 391 Graduate Research in Astronomy 3 Hours

AST 392D Mathematical Methods of Astrophysics 3 Hours
Statistics, error theory, least squares and curve fitting, numerical methods, approximation theory, Fourier transforms, sampling theory, time-series analysis.

AST 392E Topics in Optical Techniques in Astronomy 3 Hours
Topics include photometry, spectroscopy, direct imaging, interferometry and polarimetry at ultraviolet, visual, and infrared wavelengths.

AST 392G Observing Techniques in Astronomy 3 Hours
Survey of techniques used at the McDonald Observatory. Includes workshop at the observatory.

AST 392J Astronomical Instrumentation 3 Hours
A hands-on course in instrument development, including mechanical design and machining, electronics design, optical design and optics, computer interfacing, and project planning. Students use CAD programs in each area and design and build a computer-controlled instrument. Learning activities are carried out in groups and teams.

AST 393F Survey of the Interstellar Medium 3 Hours
A broad introduction to the processes and properties of the interstellar medium. Topics include H I regions, H II regions, molecular clouds, interstellar dust, and the distribution of the interstellar medium in our galaxy.

AST 393S Seminar in Interstellar Matter 3 Hours
Topics to be announced.

AST 394F Formation of Galaxies and Large-Scale Structure 3 Hours
Investigate formation and evolution of galaxies and larger structures in their cosmological context, including dark matter, dark energy, and the intergalactic medium.

AST 394P Planetary Astrophysics 3 Hours
Discuss exoplanet detection methods; demographics, architecture, formation and evolution of planetary systems; planetary interiors, atmospheres and habitability.

AST 395H High Redshift Galaxies 3 Hours
Examine galaxy evolution, emphasizing first galaxies to the cosmic star formation peak at redshift z=2. Interpret relevant observations and simulations.

AST 396C Elements of Cosmology 3 Hours
A theoretical discussion of the origin and evolution of the universe; includes a brief review of general relativity.

AST 697 Graduate Research Project 6 Hours
Two-semester graduate research project in astronomy.

AST 698 Thesis 6 Hours

AST 398R Master's Report 3 Hours
Preparation of a report to fulfill the requirement for the master's degree under the report option.

AST 398T Supervised Teaching in Astronomy 3 Hours
Effective astronomy teaching: course design, instructional materials, test design, other methods. In-class practice teaching. Projects in astronomy education.

AST 399W, 699W, 999W Dissertation 3,6,9 Hours