ASTR 101 Basic Astronomy
Credits 3. 3 Lecture Hours.
(ASR 103) 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.
(ASR 1103 or PHYS 1103) Observational Astronomy. Observational and laboratory course which may be taken in conjunction with ASTR 101 or ASTR 314. Use of techniques and instruments of classical and modern astronomy.
Prerequisite: ASTR 101 or ASTR 314, or registration therein.

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.

ASTR 111 Overview of Modern Astronomy
Credits 4. 3 Lecture Hours. 2 Lab Hours.
(ASR 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 119/PHYS 119 Big Bang and Black Holes: Laboratory Methods
Credit 1. 2 Lab Hours.
Hands-on understanding of the concepts surrounding the Big Bang and Black Holes; emphasis on the evidence-based decision making process, methods and presentation; for non-scientists. Companion course for ASTR 109/PHYS 109/ASTR 109.
Prerequisite: ASTR/PHYS 109/ASTR 109 or registration therein.
Cross Listing: PHYS 119/ASTR 119.

ASTR 285 Directed Studies
Credits 1 to 4. 1 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 1 to 4. 1 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 1 to 12. 1 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 1 to 4. 0 to 4 Lecture Hours. 0 to 4 Lab 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.