New Jersey Institute of Technology
College of Science and Liberal Arts - Department of Physics

PHYS 202: Introductory Astronomy and Cosmology, Section 105, Fall 2024

Astronomy is the study of everything in the universe beyond Earth's atmosphere. That includes objects we can see with our naked eyes, like the Sun, the Moon, the planets, and the stars. It also includes objects we can only see with telescopes or other instruments, like faraway galaxies and tiny particles. And it even includes questions about things we can't see at all, like dark matter and dark energy.

-American Museum of Natural History.

Instructor:

Dr. Matthew Cooper
mbc9@njit.edu
454 Tiernan Hall
Office hours: Wednesday 2:20 - 4:00 PM
Thursday 2:20 - 4:00 PM

Textbook: The electronic version of the textbook is available online at no cost

Astronomy (yes, the name of the book is ***Astronomy***)
Senior Contributing Authors: Andrew Fraknoi, David Morrison, & Sidney C. Wolff
https://openstax.org/details/books/astronomy

Grade:

- You take college classes to be assessed by a professional on your mastery of the material, so that assessment can be used to demonstrate/prove certain competencies.
- Your final grade will be based upon 2 in-class examinations, weekly quizzes, and one Final Examination. The in-class examinations will be during the "second-half of the Thursday class," and the dates are noted below in the course outline. PREPARE FOR THOSE DATES NOW!
- Exams are all open notes and open book. You should not be memorizing for this class.
- The Grade Distribution will be determined by:

Exam 1:	20%
Exam 2:	20%
Final Exam:	30%
Quizzes:	30%

- The date and time of the Final Examination will be announced later.
- There will be no "make-up" examinations. If you miss an examination, you will receive a grade of zero for that examination unless you have accommodations from the Dean of Students.

- Introductory Astronomy and Cosmology (Phys 202) and Introductory Astronomy and Cosmology Laboratory (Phys 202A) are two separate courses for which you will receive two separate and independently determined grades. Moreover, you are free to be registered for either one of these courses without being registered for the other course. If you are registered for both courses, withdrawal from one course does not mean you must withdraw from the other course.

Academic Integrity:

- Any student who is disruptive in the online session will be in violation of the Academic Honor Code and will be reported to the Dean of Student Services.
- Any student who cheats during an examination or in the writing of a report will be in violation of the Academic Honor Code. The student will automatically fail the course and will be reported to the Dean of Student Services so that further action may be taken. Examples of cheating during an examination include, but are not limited to, talking with another student, copying work from another student's work, or allowing another student to copy work from your own work. All cell phones are to be left in the student's backpack during examinations. A cell phone seen in someone's lap during an exam will be constituted as an attempt to cheat.

Week	Topic
Sept. 5th	Intro to Class and Review of Syllabus Observing the Sky (Chapters 1 and 2)
Sept. 12th	Observing the Sky (Chapters 1 and 2) Orbits and Gravity (Chapter 3) Earth, Moon, and Sky (Chapter 4)
Sept. 19th	Radiation and Spectra (Chapter 5) Astronomical Instruments (Chapter 6)
Sept. 26th	Introduction to the Solar System I (Chapter 7, 8, 9, 10, 11, 12, 13, 14)
Oct. 3rd	**Exam 1 (Chapters 1-6)**
Oct. 10th	Introduction to the Solar System II (Chapter 7, 8, 9, 10, 11, 12, 13, 14)
Oct. 17th	The Sun (Chapters 15 and 16)
Oct. 24th	Starlight and Stars (Chapters 17 and 18)
Oct. 31st	Distances, Gas, & Dust in Space (Chapters 19 and 20)
Nov. 7th	**Exam 2 (portions of Chapters 7-14, and Chapters 15-20)**
Nov. 14th	Star & Planet Formation (Chapter 21)
Nov. 21st	Stars' Adolescence to Old Age (Chapter 22) Death of Stars (Chapter 23)
Nov. 26th	Black Holes, Curved Spacetime (Chapter 24)
Dec. 5th	The Big Bang (Chapter 29)
TBD	**Final Exam (comprehensive)**

Learning Objectives and Outcomes:

- Comprehend our place in the universe.
- Describe the size of the universe, and relate this size to everyday human experience.
- Describe the age of the universe, and relate this age to every day human experience.
- Understand various astronomical coordinate systems.
- Analyze the changes in the sky from different locations on the Earth.
- Recall the brightest stars in the sky and several constellations in the sky.
- Comprehend the electromagnetic spectrum.
- Use the Doppler effect to analyze redshifts and blueshifts.
- Understand the laws of optics, and use them to construct telescopes.
- Comprehend atomic theory, including subatomic particles.
- Analyze different types of spectra.
- Describe the changes in perspective that led to the Copernican revolution.
- Apply Kepler's laws to explain observations of planetary motion.
- Describe Newton's model of the universe, including Newton's laws and Newton's theory of gravitation.
- Describe the origin of the solar system, and explain how this model explains the properties planets.
- Describe the properties of the Sun.
- Analyze the interior of the Sun, including the nuclear reactions in its core.
- Analyze other stars in the context of the Hertzsprung-Russell diagram.
- Use the Hertzsprung-Russell diagram to discuss the birth, evolution, and death of stars.
- Evaluate various Hertzsprung-Russell diagrams for different types of star clusters.
- Analyze the evolution of binary star systems.
- Describe Einstein's model of the universe (both the special relativity and the general relativity theories).
- Describe the properties of the Milky Way galaxy.
- Analyze other galaxies in the context of the Hubble sequence.
- Discuss various theories of the birth, evolution, and death of galaxies.
- Describe the large-scale structure of the universe.
- Explain the evidence, both theoretical and observational, for the expansion of the universe.
- Calculate the age of the universe from the Hubble law.
- Formulate the Big Bang model of cosmology.
- Comprehend theories on the frontiers of theoretical physics.
- Explain the history of the universe.