

**New Jersey Institute of Technology**  
**College of Science and Liberal Arts**  
**Department of Physics**  
**Introductory Astronomy and Cosmology, Section 004**  
**Phys 202–004**  
**Spring 2023**

**Mondays, 01:00 p.m. to 02:20 p.m.      Kupfrian Hall, Room 210**  
**Wednesdays, 11:30 a.m. to 12:50 p.m.      Kupfrian Hall, Room 202**

**Textbook**

Jeffrey Bennett, Megan Donahue, Nicholas Schneider, and Mark Voit. *The Cosmic Perspective Fundamentals*, Third Edition. Pearson Education, Inc., United States of America, 2020.

**Grade**

Your final grade will be based upon three examinations (25% each) and one Final Examination (25%). The examinations will be administered on the following dates.

First Examination	Monday, February 20, 2023
Second Examination	Monday, March 27, 2023
Third Examination	Monday, April 24, 2023
Final Examination	to be announced

If you miss an examination, you will receive a grade of zero that will be calculated into your final grade. There are no make-up examinations. The following table will determine your final grade.

85% to 100%	A
80% to 84%	B+
70% to 79%	B
65% to 69%	C+
50% to 64%	C
40% to 49%	D
0% to 39%	F

The examination grades will not be curved, nor will the final grades be curved. Each examination, including the Final Examination, will consist of multiple-choice and/or true-false questions, all of which will come directly from topics discussed in class, topics discussed in the textbook, and topics discussed in the online notes. Each examination, including the Final Examination, will be closed book and closed notes. No formula sheet or cheat sheet will be provided, nor will either be permitted for any of the examinations.

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.

## 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 everyday 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 blueshifts and redshifts  
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 the Kepler 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  
comprehend the geology and the atmospheric processes of the terrestrial planets  
analyze the Jovian planetary systems as microcosms of the entire Solar System  
discuss the minor objects of the Solar System, including asteroids, meteoroids, comets, and dust  
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 Special Relativity Theory and General Relativity Theory)  
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