

Fall 2021

PHYS 202-001: Introductory Astronomy and Cosmology

Ian Gatley

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**New Jersey Institute of Technology
College of Science and Liberal Arts
Department of Physics
Introductory Astronomy and Cosmology, Section 001
Phys 202–001
Fall 2021**

**Mondays 11:30 a.m. to 12:50 p.m.
Wednesdays 11:30 a.m. to 12:50 p.m.
Tiernan Lecture Hall 2**

Instructor

Ian Gatley, Ph.D.
ian.gatley@njit.edu

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

Your final grade will be based upon homework, four in-class examinations, and one Final Examination. The in-class examinations will be held on the following dates.

First Examination	Monday, September 27, 2021
Second Examination	Monday, October 18, 2021
Third Examination	Wednesday, November 10, 2021
Fourth Examination	Monday, December 6, 2021

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. The scores you earn will determine your final grade based on the following table.

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 homework grades will not be “curved,” nor will the scores on the written reports be “curved.” The examination grades will not be “curved,” nor will the final grades be “curved.” The homework and the examinations will cover topics discussed in class and/or topics discussed in the textbook. The Final Examination will cover the entire course’s material.

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 class 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 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.

Syllabus

Wednesday	1-Sep	Observing the Sky (Chapters One & Two)
Wednesday	8-Sep	Orbits and Gravity (Chapter Three)
Monday	13-Sep	Earth, Moon, and Sky (Chapter Four)
Wednesday	15-Sep	Radiation and Spectra (Chapter Five)
Monday	20-Sep	Astronomical Instruments (Chapter Six)
Wednesday	22-Sep	Introduction to the Solar System (Chapter Seven)
Monday	27-Sep	Exam 1 (Chapters 1-7)
Wednesday	29-Sep	Earth and Other Cratered Worlds (Chapters 8 and 9)
Monday	4-Oct	Venus and Mars (Chapter Ten)
Wednesday	6-Oct	Giant Planets, Rings, Moons (Chapters 11 and 12)
Monday	11-Oct	Comets, Asteroids, Samples (Chapters 13 and 14)
Wednesday	13-Oct	The Sun (Chapters 15 and 16)
Monday	18-Oct	Exam 2 (Chapters 8-16)
Wednesday	20-Oct	Starlight and Stars (Chapters 17 and 18)
Monday	25-Oct	Distances. Gas & Dust in Space (Chapters 19 and 20)
Wednesday	27-Oct	Star & Planet Formation (Chapter Twenty-one)
Monday	1-Nov	Stars' Adolescence to Old Age (Chapter Twenty-two)
Wednesday	3-Nov	Death of Stars (Chapter Twenty-three)
Monday	8-Nov	Review of Chapters 17-23
Wednesday	10-Nov	Exam 3 (Chapters 17-23)
Monday	15-Nov	Black Holes, Curved Spacetime (Chapter Twenty-four)
Wednesday	17-Nov	The Milky Way Galaxy (Chapter Twenty-five)
Monday	22-Nov	Galaxies (Chapter Twenty-six)
Wednesday	24-Nov	QSOs, Black holes, Galaxy Evolution (Chapters 27 & 28)
Monday	29-Nov	The Big Bang (Chapter Twenty-nine)
Wednesday	1-Dec	Review of Chapters 24-29
Monday	6-Dec	Exam 4 (Chapters 24-29)
Wednesday	8-Dec	Review of Chapters 1-29

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Department of Physics
Introductory Astronomy and Cosmology (Phys 202)
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.
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 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.