

Fall 2019

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 2019**

Tuesdays, 4:00 p.m. to 5:20 p.m. Tiernan Lecture Hall 1
Thursdays, 4:00 p.m. to 5:20 p.m. Tiernan Lecture Hall 1

Instructor

Ian Gatley, Ph.D.
Tiernan Hall, Room 476
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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, quizzes, class participation, four examinations, and one Final Examination. The examinations will be administered on the following dates.

First Examination	Thursday, September 19, 2019
Second Examination	Thursday, October 10, 2019
Third Examination	Thursday, November 7, 2019
Fourth Examination	Thursday, December 5, 2019
Final Examination	to be announced

There will be no “make-up” quizzes or examinations. If you miss a quiz or an examination, you will receive a grade of zero for that quiz or examination. The grades 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 quiz grades be “curved.” The examination grades will not be “curved,” nor will the final grades be “curved.” The homework, the quizzes, 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. Each quiz and each 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.

Academic Integrity

Any student who is disruptive in the classroom will be in violation of the Academic Honor Code and will be reported to the Dean of Student Services.

Any student who cheats during a quiz or 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 a quiz or an examination include, but are not limited to, talking with another student, copying work from another student's work, allowing another student to copy work from your own work, or use of any materials besides the examination paper and a writing utensil.

Syllabus

Tuesday	3-Sep	Observing the Sky (Chapters Two)
Thursday	5-Sep	Orbits and Gravity (Chapter Three)
Tuesday	10-Sep	Earth, Moon, and Sky (Chapter Four)
Thursday	12-Sep	Radiation and Spectra (Chapter Five)
Tuesday	17-Sep	Astronomical Instruments (Chapter Six)
Thursday	19-Sep	First Examination
Tuesday	24-Sep	Introduction to the Solar System (Chapter Seven)
Thursday	26-Sep	Earth and Other Cratered Worlds (Chapters 8 and 9)
Tuesday	1-Oct	Venus and Mars (Chapter Ten)
Thursday	3-Oct	Giant Planets, Rings, Moons (Chapters 11 and 12)
Tuesday	8-Oct	Comets, Asteroids, Samples (Chapters 13 and 14)
Thursday	10-Oct	Second Examination
Tuesday	15-Oct	The Sun (Chapters 15 and 16)
Thursday	17-Oct	Starlight and Stars (Chapters 17 and 18)
Tuesday	22-Oct	Distances. Gas & Dust in Space (Chapters 19 and 20)
Thursday	24-Oct	Star & Planet Formation (Chapter Twenty-one)
Tuesday	29-Oct	Stars' Adolescence to Old Age (Chapter Twenty-two)
Thursday	31-Oct	Death of Stars (Chapter Twenty-three)
Tuesday	5-Nov	Review of Chapters 15-23
Thursday	7-Nov	Third Examination
Tuesday	12-Nov	Black Holes, Curved Spacetime (Chapter Twenty-four)
Thursday	14-Nov	The Milky Way Galaxy (Chapter Twenty-five)
Tuesday	19-Nov	Galaxies (Chapter Twenty-six)
Thursday	21-Nov	QSOs, Black holes, Galaxy Evolution (Chapters 27 & 28)
Tuesday	26-Nov	The Big Bang (Chapter Twenty-nine)
Tuesday	3-Dec	Review of Chapters 24-29
Thursday	5-Dec	Fourth Examination
Tuesday	10-Dec	Review of Chapters 1-29
Thursday	12-Dec	Reading Day

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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.