

Spring 2020

## PHYS 202-002: 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 202–002  
Spring 2020**

**Tuesdays 8:30 a.m. to 9:50 a.m.  
Thursdays 8:30 a.m. to 9:50 a.m.**

**Tiernan Lecture Hall 1  
Tiernan Lecture Hall 1**

**Instructor**

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

First Examination	Tuesday, February 11, 2020
Second Examination	Tuesday, March 3, 2020
Third Examination	Thursday, April 2, 2020
Fourth Examination	Tuesday, April 28, 2020
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	21-Jan	Observing the Sky (Chapters One & Two)
Thursday	23-Jan	Orbits and Gravity (Chapter Three)
Tuesday	28-Jan	Earth, Moon, and Sky (Chapter Four)
Thursday	30-Jan	Radiation and Spectra (Chapter Five)
Tuesday	4-Feb	Astronomical Instruments (Chapter Six)
Thursday	6-Feb	Introduction to the Solar System (Chapter Seven)
Tuesday	11-Feb	Exam 1 (Chapters 1-7)
Thursday	13-Feb	Earth and Other Cratered Worlds (Chapters 8 and 9)
Tuesday	18-Feb	Venus and Mars (Chapter Ten)
Thursday	20-Feb	Giant Planets, Rings, Moons (Chapters 11 and 12)
Tuesday	25-Feb	Comets, Asteroids, Samples (Chapters 13 and 14)
Thursday	27-Feb	The Sun (Chapters 15 and 16)
Tuesday	3-Mar	Exam 2 (Chapters 8-16)
Thursday	5-Mar	Starlight and Stars (Chapters 17 and 18)
Tuesday	10-Mar	Distances. Gas & Dust in Space (Chapters 19 and 20)
Thursday	12-Mar	Star & Planet Formation (Chapter Twenty-one)
Tuesday	24-Mar	Stars' Adolescence to Old Age (Chapter Twenty-two)
Thursday	26-Mar	Death of Stars (Chapter Twenty-three)
Tuesday	31-Mar	Review of Chapters 17-23
Thursday	2-Apr	Exam 3 (Chapters 17-23)
Tuesday	7-Apr	Black Holes, Curved Spacetime (Chapter Twenty-four)
Thursday	9-Apr	The Milky Way Galaxy (Chapter Twenty-five)
Tuesday	14-Apr	Galaxies (Chapter Twenty-six)
Thursday	16-Apr	QSOs, Black holes, Galaxy Evolution (Chapters 27 & 28)
Tuesday	21-Apr	The Big Bang (Chapter Twenty-nine)
Thursday	23-Apr	Review of Chapters 24-29
Tuesday	28-Apr	Fourth Examination
Thursday	30-Apr	Review of Chapters 1-29
Tuesday	5-May	No Class (Friday classes meet)
Thursday	7-May	Reading Day

**New Jersey Institute of Technology**  
**College of Science and Liberal Arts**  
**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.