Spring 2022

PHYS 202-002: Introductory Astronomy and Cosmology

Ian Gatley

New Jersey Institute of Technology
College of Science and Liberal Arts
Department of Physics
Introductory Astronomy and Cosmology, Section 002
Phys 202−002

Spring 2022 Monday & Wednesday at 8:30 a.m. to 9:50 a.m.

Before Jan 30th SYNCHRONOUS ONLINE COURSE using Webex at:
http://njit.webex.com/join/gatley

From Jan 31st FACE-TO-FACE in Tiernan Lecture Hall 1

Instructor
Ian Gatley, Ph.D.
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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, four in-class examinations, and one Final Examination. The in-class examinations will be held on the following dates.

First Examination	Wednesday, February 9, 2022
Second Examination	Wednesday, March 2, 2022
Third Examination	Monday, April 4, 2022
Fourth Examination	Wednesday, April 27, 2022
Final Examination	Date and Time 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.

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

0% to 39%

F

The homework grades will not 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 an online or face-to-face 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 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	19-Jan	Observing the Sky (Chapters One & Two)
Monday	24-Jan	Orbits and Gravity (Chapter Three)
Wednesday	26-Jan	Earth, Moon, and Sky (Chapter Four)
Monday	31-Jan	Radiation and Spectra (Chapter Five)
Wednesday	2-Feb	Astronomical Instruments (Chapter Six)
Monday	7-Feb	Introduction to the Solar System (Chapter Seven)
Wednesday	9-Feb	Exam 1 (Chapters 1-7)
Monday	14-Feb	Earth and Other Cratered Worlds (Chapters 8 and 9)
Wednesday	16-Feb	Venus and Mars (Chapter Ten)
Monday	21-Feb	Giant Planets, Rings, Moons (Chapters 11 and 12)
Wednesday	23-Feb	Comets, Asteroids, Samples (Chapters 13 and 14)
Monday	28-Feb	The Sun (Chapters 15 and 16)
Wednesday	2-Mar	Exam 2 (Chapters 8-16)
Monday	7-Mar	Starlight and Stars (Chapters 17 and 18)
Wednesday	9-Mar	Distances. Gas & Dust in Space (Chapters 19 and 20)
Monday	21-Mar	Star & Planet Formation (Chapter Twenty-one)
Wednesday	23-Mar	Stars' Adolescence to Old Age (Chapter Twenty-two)
Monday	28-Mar	Death of Stars (Chapter Twenty-three)
Wednesday	30-Mar	Review of Chapters 17-23
Monday	4-Apr	Exam 3 (Chapters 17-23)
Wednesday	6-Apr	Black Holes, Curved Spacetime (Chapter Twenty-four)
Monday	11-Apr	The Milky Way Galaxy (Chapter Twenty-five)
Wednesday	13-Apr	Galaxies (Chapter Twenty-six)
Monday	18-Apr	QSOs, Black holes, Galaxy Evolution (Chapters 27 & 28)

Wednesday	20-Apr	The Big Bang (Chapter Twenty-nine)
Monday	25-Apr	Review of Chapters 24-29
Wednesday	27-Apr	Exam 4 (Chapters 24-29)
Monday	2-May	Review of Chapters 1-29
Wednesday	4-May	Reading day

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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.