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Spring 2022

PHYS 202-102: Introductory Astronomy and Cosmology

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New Jersey Institute of Technology
College of Science and Liberal Arts
Department of Physics
Introductory Astronomy and Cosmology, Section 102
PHYS 202-102
Spring 2022

Wednesdays 6:00PM – 8:50PM	**GITC 1100**

Synchronous-online: https://njit.webex.com/join/sasha

Instructor

Prof Alexander Kosovichev
alexander.g.kosovichev@njit.edu

Office hours: by appointment

Textbook

The Cosmic Perspective Fundamentals (2nd or 3rd Edition)
Author(s): Jeffrey Bennett; Megan Donahue; Nicholas Schneider; Mark Voit
Publisher: Pearson
Print ISBN: 9780134988504, 0134988507
eText ISBN: 9780134899916, 0134899911
https://www.vitalsource.com/products/the-cosmic-perspective-fundamentals-jeffrey-o-bennett-megan-o-v9780134899916

Optional: OpenStax Astronomy, https://openstax.org/details/books/astronomy

Canvas

We will use Canvas for quizzes, examinations, and class participation.

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	Wednesday, February 9, 2022
Second Examination	Wednesday, March 2, 2022
Third Examination	Wednesday, April 6, 2022
Fourth Examination	Wednesday, April 27, 2022
Final Examination	to be announced

There will be no "make-up" quizzes or examinations. The grades you earn will determine your final grade based on the following table.

Class participation and quizzes	20%
Four exams	15% each
Final exam	20%
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.” 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.

Missed Exams: Students who miss a common exam will receive a score of zero for that exam unless they present a valid excuse within 7 days of the exam. Students with two or more missing, unexcused common exams automatically fail the course. Students expecting to be absent from a common exam should discuss their situation with their instructor PRIOR TO their absence. In order to qualify for a (rare) "make-up" common exam, a student needs to document the reason for not being able to take the test as scheduled (for example, due to an exam conflict or documented illness). Under NJIT policy, the documentation should be presented to the student’s Physics 202 instructor AND to the Dean of Students, both of whom must agree to permit a "make-up" exam.

Syllabus

Wednesday	19-Jan	Lec 1 Our place in the Universe (Chapter One)
		Lec 2 Basic patterns and motions on the sky (Chapter Two) - Quiz 1
Wednesday	26-Jan	Lec 3 Light, the electromagnetic spectrum, photons, and telescopes (p.43,80,132)
		Lec 4 Atoms and atomic spectra (p.152) – Quiz 2
Wednesday	2-Feb	Lec 5 Early models of the Universe (Chapter Three)
		Lec 6 The Newtonian model of the Universe (Chapter Three) – Quiz 3
Wednesday	9-Feb	Lec 7 Introduction to the Solar System (Chapter Four)
		First Examination
Wednesday	16-Feb	Lec 8 The Earth-Moon system (Chapter Five)
		Lec 9 Histories of the terrestrial worlds (Chapter Five) – Quiz 4
Wednesday	23-Feb	Lec 10 Global warming (Chapter Five)
		Lec 11 The Jovian worlds of the Solar System (Chapter Six) – Quiz 5
Wednesday	2-Mar	Lec 12 The minor objects of the Solar System (Chapter Six)
		Second Examination
Wednesday	9-Mar	Lec 13 Our star, the Sun (Chapter Eight)
		Lec 14 Stars and their properties (Chapter Eight) – Quiz 6
Wednesday	23-Mar	Lec 15 Stars and stellar evolution (Chapter Eight)
		Lec 16 Star formation (Chapter Nine) – Quiz 7
Wednesday	30-Apr	Lec 17 Star death (Chapter Nine)
		Lec 18 Neutron Stars and Black Holes (Chapter Ten) – Quiz 8
Wednesday	6-Apr	Lec 19 Einstein’s two theories of relativity (Chapter Ten)
		Third Examination
Wednesday	13-Apr	Lec 20 Our galaxy, the Milky Way Galaxy (Chapter Eleven)
		Lec 21 Galaxies beyond the Milky Way (Chapter Eleven) – Quiz 9
Wednesday	20-Apr	Lec 22 Galaxy evolution & the big bang (Chapters Twelve and Thirteen)
		Lec 23 Dark matter and dark energy (Chapter Fourteen) – Quiz 10
Wednesday	27-April	**Fourth Examination**
Wednesday	4-May	Reading day
	6-12-May	**Final Examination**

Final Exam date to be announced (6-12May)

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.

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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.