New Jersey Institute of Technology College of Science and Liberal Arts Department of Physics Introductory Astronomy and Cosmology, Section 106 Phys 202-106 Spring 2025 Fridays, 06:00 p.m. to 08:50 p.m. Electrical and Computer Engineering Center, Room 115

Instructor

Professor Nuggehalli M. Ravindra, Ph.D. (Ravi) ravindra@njit.edu Tiernan Hall, Room 414 - Lab 973-596-3278

Office Hours: Generally very flexible; Wednesdays – 11 AM to 12 Noon.

Textbook

Jeffrey Bennett, Megan Donahue, Nicholas Schneider, and Mark Voit. *The Cosmic Perspective Fundamentals*, Third Edition. Pearson Education, Inc., United States of America, 2020.

The electronic version of the following 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 <u>https://openstax.org/details/books/astronomy</u>

Grade

Your final grade will be based upon two examinations (30% each) and one Final Examination (40%). The examinations will be administered on the following dates.

First Examination	Friday, February 28, 2025
Second Examination	Friday, April 11, 2025
Final Examination	Group Presentations

If you miss an examination, you will receive a grade of zero that will be calculated into your final grade. There are no make-up examinations.

Although the following table will be used to determine your final grade, all examinations must be taken to earn a satisfactory final grade in the course.

85% to 100%	Α
80% to 84%	B+
70% to 79%	В
65% to 69%	C+
50% to 64%	С
40% to 49%	D
0% to 39%	F

The examination grades will not be curved, nor will the final grades be curved. Each examination, including the Final Examination, will consist of multiple-choice and/or true-false questions, all of which will come directly from topics discussed in class and topics discussed in the textbook. Each examination, including the Final 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 Conduct

All students who are disruptive in the classroom are in violation of the Academic Honor Code. All such students will be dismissed from the classroom and will be reported to the Dean of Student Services. Forms of disruptive conduct include, but are not limited to, talking, whispering, creating any noise, or performing any behavior that interferes with the instructor's ability to conduct class.

All students who cheat during an examination are in violation of the Academic Honor Code. All such students 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 include, but are not limited to, talking with another student, copying work from another student's examination, allowing another student to copy work from your own examination, or use of any materials besides the examination.

Syllabus

Friday,	January 24, 2025	introduction to the universe: our location in space and time-Chapter 1 introduction to the sky - Chapter 2
Fridav.	January 31, 2025	the wave theory of light
	,.,.	guantum physics: photons, atoms, and spectra
		observational astronomy - Chapter 3
Friday,	February 07, 2025	history of astronomy from ancient astronomy to the beginnings
		of modern astronomy - Chapter 3
		the Newtonian model of the universe - Chapter 3
Friday,	February 14, 2025	introduction to the Solar System - Chapter 4
		the Earth-Moon system - Chapter 5
Friday,	February 21, 2025	the terrestrial planets and their moons - Chapter 5
		the jovian, gas-giant planets, their moons, and their rings - Chapter 6
		the minor objects of the Solar System - Chapter 6
Friday,	February 28, 2025	First Examination
Friday,	March 07, 2025	our star, the Sun - Chapter 8
		stellar properties - Chapter 8
Friday,	March 14, 2025	the Hertzsprung-Russell diagram - Chapter 8
		stellar evolution: birth, life, and death - Chapter 9
Friday,	March 21, 2025	Spring Break (no classes)
Friday,	March 28, 2025	star clusters - Chapter 9
		binary star systems - Chapter 8 and Chapter 10
Friday,	April 04, 2025	stellar remnants: white dwarfs, neutron stars, and black holes
(Chapter	r Ten)	
		the Special Theory of Relativity - Chapter 10
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Friday,	April 11, 2025	Second Examination
Friday,	April 18, 2025	Good Friday (no classes)
Friday,	April 25, 2025	our galaxy, the Milky Way Galaxy - Chapter 11
F ull days	May 02 2025	galactic properties - Chapter 11
Friday,	May 02, 2025	the Hubble classification of galaxies - Chapter 11
Tuesday		galactic evolution: birth, me, and death - Chapter 11
Wodpos	day May 07, 2025	NUT follows a Thursday schedule
weunes	uay, iviay 07, 2025	dark matter and the large scale structure
		of the universe. Chapter 12 and Chapter 14
		cosmology and the history
		of the universe - Chanter 12 and Chanter 13
Thursda	v. May 08, 2025	reading day (no classes)
Friday.	May 09. 2025	reading day (no classes)
Friday.	May 16, 2025	Final Examination

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 everyday 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 blueshifts and redshifts

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 the Kepler laws to explain observations of planetary motion

describe the Newtonian 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 of planets

comprehend the geological processes 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 Special Relativity Theory and General Relativity Theory)

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

summarize the Big Bang model of cosmology

comprehend theories on the frontiers of theoretical physics

explain the history of the universe

https://www.njit.edu/registrar/spring-2025-academic-calendar

January	20	Monday	Martin Luther King, Jr. Day
January	21	Tuesday	First Day of Classes
January	25	Saturday	Saturday Classes Begin
January	27	Monday	Last Day to Add/Drop a Class
January	27	Monday	Last Day for 100% Refund, Full or Partial Withdrawal
January	28	Tuesday	W Grades Posted for Course Withdrawals
February	3	Monday	Last Day for 90% Refund, Full or Partial Withdrawal, No Refund for Partial Withdrawal after this date
February	17	Monday	Last Day for 50% Refund, Full Withdrawal
March	10	Monday	Last Day for 25% Refund, Full Withdrawal
March	16	Sunday	Spring Recess Begins - No Classes Scheduled - University Open
March	22	Saturday	Spring Recess Ends
April	3	Thursday	Wellness Day - No Classes Scheduled - University Open
April	7	Monday	Last Day to Withdraw
April	18	Friday	Good Friday - No Classes Scheduled - University Closed
April	20	Sunday	Easter Sunday - No Classes Scheduled - University Closed
Мау	6	Tuesday	Thursday Classes Meet
Мау	7	Wednesday	Friday Classes Meet
Мау	7	Wednesday	Last Day of Classes
Мау	8	Thursday	Reading Day 1
Мау	9	Friday	Reading Day 2
Мау	10	Saturday	Final Exams Begin
Мау	16	Friday	Final Exams End
Мау	18	Sunday	Final Grades Due
Мау	19	Monday	Master's and PhD Candidate Commencement - Bloom Wellness and Events Center
Мау	21	Wednesday	Undergraduate Candidate Commencement - Prudential Center