

Astronomy 3: The Nature of the Universe

Lecture Section 2

Fall 2024

Lectures: Monday, Wednesday, Friday, 11:00 am – 11:50 am, Physics and Astronomy (PAB) 1425

Homepage: <http://www.astro.ucla.edu/~aes/AST3>

BruinLearn Homepage: <https://bruinlearn.ucla.edu/courses/190817>

Personnel:

Professor: Alice Shapley
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Head TA: Kate Holwick
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Office Hours: Monday, 4:00-6:00 pm

TA: Samantha Morrison
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Office Hours: Tuesday, 1:00-2:00 pm

TA: Shreya Karthikeyan
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Office Hours: Tuesday, 4:00-5:00 pm

TA: Liz Holzknecht
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Office: 3-145X Knudsen
Office Hours: Tuesday, 11:00 am-12:00 pm

Discussion Sections (i.e. “Labs”):

All discussion sections take place in Knudsen 1116.

Discussion Section 2A: Monday 8:00 - 9:50 am, Samantha Morrison

Discussion Section 2B: Wednesday 12:00 - 1:50 pm, Liz Holzkecht

Discussion Section 2C: Thursday 8:00 - 9:50 am, Shreya Karthikeyan

Discussion Section 2D: Thursday 10:00 - 11:50 am, Shreya Karthikeyan

Discussion Section 2E: Thursday 12:00 - 1:50 pm, Samantha Morrison

Discussion Section 2F: Thursday 2:00 - 3:50 pm, Liz Holzkecht

Text: The Essential Cosmic Perspective, 9th Edition (2022), by Bennett, Donahue, Schneider, & Voit (required). The textbook may be purchased new, used, or in digital form. See more information below regarding the UCLA Inclusive Access program.

Astronomy 3 Lab Manual: Package of Lab exercises for discussion sections (posted on BruinLearn, week by week).

Calculators: A simple one is **highly** recommended, though not required.

1 Introduction

This course provides a broad introduction to astronomy and our place in the universe. We will start by discussing the mind-bogglingly vast range in physical scales spanned by astronomy, and then learn how we can perform astronomical observations in our everyday lives. We will then follow the history of astronomy as a science, reviewing the fundamental physical concepts of motion, energy, gravity, and light on which it is based, along with the tools used to make astronomical measurements. After these preliminaries, we will delve into the nature of planets, stars, galaxies, and the Universe as a whole.

2 Learning Outcomes

Based on lectures, hands-on laboratory exercises, and weekly homework quizzes, students will engage in the scientific process of inquiry, analysis, problem-solving, and quantitative reasoning. They will also acquire an informed appreciation of scientists, scientific research, and technology, make evidence-based decisions, discuss the interactions between humans and their physical world, and explain the origin and physical processes governing the Earth and the surrounding universe.

3 GE Credit Acknowledgment

Upon successful completion of this course, students will satisfy the General Education requirement in the area of Foundations of Scientific Inquiry: Physical Sciences, including a laboratory/demo component. The laboratory component is fulfilled through 8 2-hour in-class laboratory assignments.

4 Prerequisites

We will review all the basic physical concepts required for understanding the material in the course. However, we expect a knowledge of entry-level UC mathematics (algebra, geometry, and basic trigonometry).

5 Grading: Labs, Homework and Exams, etc.

Final grades will be based on lab assignments (a total of 8 to be completed during the quarter); homework assignments (a total of 8 on-line quizzes given during the quarter); two midterm exams; and the final exam. These factors will be combined in the following percentages to determine your class grade:

- 20% Lab assignments
- 10% Homework assignments
- 20% First midterm exam (in class)
- 20% Second midterm exam (in class)
- 30% Final exam

Final marks for the course will be graded on a curve.

Lab assignments are *required*. You must attend lab starting week 1 of the quarter. There will be no labs during weeks 7 and 9, due to the Veterans Day and Thanksgiving holidays. Labs for the course will be performed in the lab classroom (Knudsen 1116) during the 2-hour discussion section, and are to be handed in at the conclusion of the discussion section. Each lab assignment is roughly 10 pages in length and covers one of the key topics of the course in considerable depth through both hands-on activities and mathematical calculations. Attendance is required for labs. **Your best 6 lab grades will be used to calculate your lab grade.** This grading policy allows for missed labs due to extenuating circumstances. You must complete at least 5 labs in order to receive a passing grade in Astronomy 3. Exams may draw from topics covered during lab sessions.

Homework will be assigned roughly every week (starting during week 1) and will consist of on-line quizzes based on lectures and reading (10 questions per week), in addition to the reading assignments from the textbook. Quizzes will be due at 10 pm on each Monday, unless otherwise announced. **No late homework will be accepted.** At least 5 homework assignments must be turned in to pass the course.

Exams will consist of two midterms (**in class**), each worth 20%, and a final exam worth 30%. The first midterm will take place on Monday, October 21st, and the second one on Wednesday, November 13th. The final exam will be on Friday, December 13th, from 8:00 am - 11:00 am. The exams will be (almost) exclusively based on **multiple choice** questions.

Extra Credit opportunities will be announced during the quarter.

6 Resources

UCLA Inclusive Access

This course is part of the UCLA Inclusive Access program. Your textbook materials are being automatically provided to you, digitally, through the course website before the first day of class or upon enrollment. The materials are being provided at a reduced and competitive price. You will receive e-mail from the UCLA Store (UCLA Store no-reply@verbasoftware.com) with program details and cost sent directly to your email address on file with the Registrar. It is your responsibility to read all communication coming from the bookstore. Check your spam folder if not received.

Everyone enrolled in this course is automatically a participant to start and will have access to the materials through 2nd week of class. Those remaining in the program after 2nd week will be billed for the materials directly to their BruinBill account and will continue to have access to the course materials. If you do not wish to participate in Inclusive Access, you must opt-out by the Friday of 2nd week deadline or you will be billed. Those who opt-out will lose access to the digital materials starting week 3 and will be responsible for obtaining the materials on their own.

Do not pay for your materials through the publisher website unless you are opting out of Inclusive Access. All Inclusive Access course materials will be billed to your BruinBill account. Any questions regarding the Inclusive Access program can be directed to inclusiveaccess@asucla.ucla.edu.

Other Resources

- Midterms, finals, quizzes and labs must be completed by the student without assistance and in a manner consistent with standard testing procedures and regulations. Any cheating will be dealt with through the University. We follow the UCLA policies on intellectual integrity, which can be found at: <http://www.deanofstudents.ucla.edu/Student-Conduct>.
- The UCLA Astronomy division and your professor and teaching assistants are committed to promoting and fostering an inclusive environment to serve our diverse community of learners. Please visit our website at <http://www.astro.ucla.edu/content/astronomy-division-diversity-resources> to learn more about diversity resources and workshops. Our website also lists contact information for allies within the department who are actively working to address diversity issues. If you have questions, concerns, ideas, or feedback, we would love to hear from you.
- Title IX prohibits gender discrimination, including sexual harassment, domestic and dating violence, sexual assault, and stalking. Students who have experienced sexual harassment or sexual violence can receive confidential support and advocacy at the CARE Advocacy Office for Sexual and Gender-Based Violence, which is found on the 1st Floor of the Wooden Center West, CAREadvocate@caps.ucla.edu, (310) 206-2465. You can also report sexual violence or sexual harassment directly to the University's Title IX Office (2241 Murphy Hall) at titleix@conet.ucla.edu, (310) 206-3417.
- CAPS (Counseling and Psychological Services) offers 24-hour crisis counseling via phone (310-825-0768) as well as in-person short-term counseling for all students. Students can walk in Mon-Thurs. 9am - 4pm, Fri. 9am - 3pm and be seen by a Brief Screen Counselor on the same day, who will address immediate needs and determine future care as needed. Please visit www.counseling.ucla.edu for more mental health resources available on campus.
- COVID Policies: Ensuring a safer campus depends on each of us following the latest UCLA health and safety guidelines. While campus policies must be modified to address changing local, state, and national orders and guidance, the current campus protocols are available at <https://covid-19.ucla.edu/covid-protocols-at-a-glance/>

Schedule of Lectures

Week	Date	Title	Chapter
0	Sep. 27	General course intro. Our place in the universe.	1
1	30	Astronomy and You.	2
	Oct. 2	Ancient Astronomy.	3
	4	The Copernican Revolution and Beyond. <i>Lab: Quantitative Skills</i>	3
2	7	Motion, Force, Energy.	4
	9	Gravity, Light.	4, 5
	11	Learning from Light. <i>Lab: Naked-Eye Astronomy</i>	5
3	14	The Solar System.	6
	16	Terrestrial Planets.	7
	18	Terrestrial Planet Surface Processes. <i>Lab: Light and Telescopes</i>	7
4	21	Midterm Exam 1, in class	
	23	Jovian Planets.	8
	25	Jovian Moons. <i>Lab: Light: Color and Spectra</i>	8
5	28	Pluto, Asteroids, Comets.	9
	30	Extrasolar Planets.	10
	Nov. 1	The Sun. <i>Lab: Gravity and Extrasolar Planets</i>	11
6	4	Measurements of Stars.	12
	6	Star Clusters, Star formation.	12, 13
	8	Stellar life cycles, White Dwarfs. <i>Lab: Spectra, Stars, and the H-R Diagram</i>	13, 14
7	11	Veterans Day, no class.	
	13	Midterm Exam 2, in class	
	15	Neutron Stars, Black Holes. <i>Lab: No lab.</i>	14
8	18	The Milky Way.	15
	20	The Galactic Center. Galaxies	15,16
	22	AGNs and SMBHs. <i>Lab: Structure and Motion of Spiral Galaxies</i>	16
9	25	The Distance Ladder.	16
	27	The Expanding Universe.	16
	29	Thanksgiving, no class. <i>Lab: No lab.</i>	
10	Dec. 2	The Fate of the Universe.	18
	4	The Big Bang.	17
	6	JWST and Astro News. <i>Lab: Expansion of the Universe</i>	
11	13	Final Exam	