

ASTR368 – Astrophysics II - Spring 2024

Instructor: Dr. Loren Anderson

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Office Hours: W 1:30-2:10, Th 1:30-2:10, F 10:30-11:30

In such a small class, please feel free to stop by whenever

Class times: MWF 12:30-1:20 in G04 White Hall

Learning Outcomes: The main goal of this course is to learn about galaxies and cosmology. We will learn about the structure and kinematics of different types of galaxies, starting with our own Milky Way, how galaxies form and interact, the large scale structure of the Universe, and the basics of cosmology. We will not only discuss what we know, but how we know it. Secondary goals of this course are to understand some current controversies in astrophysics and to learn how to independently research and communicate about astrophysical topics.

In this course, students will be applying physics that they have previously learned along with some new concepts to better understand a range of astrophysical phenomena. This course is designed to prepare students for future studies in astrophysics, but the physics we learn and the approach to problems have a broad range of applications.

Text: The required text for this class is *An Introduction to Modern Astrophysics*, by Carroll & Ostlie (ISBN 0-8053-0402-9). Hopefully you already have this from Astrophysics I. We will be covering Chapters 12, 24-30.

I will also occasionally use material from scientific papers, which I will hand out in class and post on the website.

Website: <https://lorenanderson.faculty.wvu.edu/astr368-spring2024>

Homework: Homework will be assigned roughly once per week in class, on Fridays. Assignments will be due one week from when it was assigned, at the beginning of class.

No late homework will be accepted, but the lowest **two** grades will be dropped. I encourage you to talk with each other about the homework, but the actual solutions must be your own. This last point is very important! Any academic dishonesty will not be tolerated, and punishments will range from failure on the assignment to an unforgivable F in the course.

Attendance: There is no specific attendance requirement. Since we will (hopefully) have lots of class discussion and I will be using some material from sources other than the textbook, you will do a lot better in the course if you attend.

Exams: There will be two midterms and a comprehensive final. If you cannot make it to an exam, you must let me know well in advance so we can schedule a makeup exam.

Grading: Your final grade will be calculated as follows:

Homework	50%
Midterms (each)	15%
Final Exam	20%

You will be guaranteed at least the following letter grades for these percentage grades:

85-100%	A
75-85%	B
65-75%	C
55-65%	D
< 55%	F

Social Justice Policy: <http://catalog.wvu.edu/graduate/law/nonacademic/>

Academic Dishonesty Policy: <https://provost.wvu.edu/governance/academic-standards-resources/academic-integrity-policy>

Class Schedule:

This schedule is subject to change, but the order of course material will stay the same.

Jan. 8, 10, 12: Review of ASTR367; the Interstellar Medium (Chapter 12)

[Jan. 15 – MLK Day, WVU closed]

Jan. 17, 19, 22, 24: The Milky Way: properties, morphology, composition, kinematics. (Chapter 24)

[Jan 26 – Dr. Anderson out of town, no class]

Jan. 29, 31, Feb. 2, 5, 7: Galaxies: morphologies, structure, kinematics of spirals, ellipticals, and dwarfs, correlations of properties. (Chapter 25)

Feb 9, 12: Galaxy Evolution and Formation: the physics of galaxy interactions, formation theories. (Chapter 26)

Feb. 14 Active Galaxies (Chapter 28.1-28.3)

Feb. 16 Midterm #1 review

Feb. 19 Midterm #1

Feb. 21 post-Midterm #1 review

Feb. 23, 26, 28, Mar. 1: Large Scale Structure: distances, expansion of the Universe, clusters. (Chapter 27)

Mar. 4, 6, 8: Cosmology: cosmological principle, Hubble constant, cosmic microwave background, relativistic cosmology, the Big Bang, the history of the Universe. (Chapter 29)

[Mar. 9- 17: WVU Spring break]

Mar. 18, 20, 22: Cosmology continued

Mar. 25, 27, Apr. 1, 3, 5: Early Universe: inflation, the origin of structure (Chapter 30)

[Mar. 29: WVU Spring Recess]

[Apr. 8: Eclipse! No class. Go see it!]

Apr. 10 Midterm #2 review

Apr. 12 Midterm #2

Apr. 15 post-Midterm #2 review

Apr. 17, 19, 22: Physical Processes in the Solar System: tidal forces, energy balance, escape velocity. (Chapter 19)

Apr. 24, 26: Astronomy research at WVU: pulsars, FRBs, gravitational waves, star formation & Galactic structure

May 1: Final Presentation, 2:00pm-4:00pm, G04