

# Physics 108: Astronomy: Stars, Galaxies and the Big Bang

## Professor: Lyle Hoffman

### Spring 2020

<b>Month</b>	<b>Date</b>	<b>Topic</b>	<b>Reading</b>	<b>Work Due</b>
Jan.	27	Introduction and overview	Ch. 1	<i>No lab</i>
	29	Telescopes & observatories	Ch. 6	Question
	31	Solar structure	Ch. 14:1	
Feb.	3	LAB I: Geometrical Optics		
	5	Power source of the Sun	Ch. 14:2	Question
	7	Properties of stars	Ch. 15:1	Homework I
	10	LAB II: Spectral Lines		
	12	Hertzsprung-Russell diagram	Ch. 15:2-3	Question
	14	Star birth	Ch. 16:1-2	Homework II
	17	Lab III: Blackbody Radiation		
	19	Initial Mass Function	Ch. 16:3	Question
	21	Stellar evolution: low-mass stars	Ch. 17:1-2	Homework III
	24	Stellar evolution: high-mass stars	Ch. 17:3-4	<i>No lab</i>
	26	White dwarfs and neutron stars	Ch. 18:1-2	Question
	28	General relativity	Ch. S3	Homework IV

Mar.	2	LAB IV: Star Probe		
	4	Black holes	Ch. 18:3-4	Question
	6	The Milky Way	Ch. 19:1-2	Homework V
	9	Center of our Galaxy	Ch. 19:3-4	<i>No lab</i>
	11	Review	Chs. 1,6,14-19,S3	
	13	<b>MIDTERM EXAM</b>		
	16-20	<i>Spring Break</i>		
	23	Distances to galaxies	Ch. 20:1-2	
	25	Hubble's Law	Ch. 20:3	Question
	27	Galaxy evolution	Ch. 21:1-2	Homework VI
	30	LAB V: Galaxy Morphology		
Apr.	1	Active Galactic Nuclei	Ch. 21:3	Question
	3	Dark matter	Ch. 23:1-2	Homework VII
	6	LAB VI: Galaxy Collisions		
	8	Large-scale structure	Ch. 23:3	Question
	10	Cosmological models	Ch. 23:4	Homework VIII
	13	Lab VII: Radio astronomy		
	15	Quantum mechanics	Ch. S4	Question
	17	The Big Bang	Ch. 22:1	Homework IX
	20	LAB VIII: HI Radio Emission		
	22	Cosmic microwave background	Ch. 22:2	Question
	24	Nucleosynthesis	Ch. 22:2	Homework X
	27	LAB IX: Digital Image Processing		
	29	Inflation	Ch. 22:3-4	Question

May	1	Relics from the first millisecond		Homework XI
	4	SETI	Ch. 24:1-5	<i>No lab</i>
	6	Eschatology (The End)		Question
	8	Review	Chs. 20-24,S4	Homework XII
		<b>Final Exam</b>	Scheduled by Registrar	

In the event of inclement weather or other crises:

- Call the professor's voice mail, 610-330-5211, and check email

Learning goals. Upon completion of this course, each student should be able:

- to understand the scientific method and how it can be applied to the universe as a whole;
- to understand that the universe evolves along with everything in it;
- to gain perspective on the place of humankind in the cosmos;
- to discuss, in general terms, the nature and evolution of stars;
- to discuss, in general terms, the nature and evolution of galaxies;
- to discuss, in general terms, the conditions that prevailed at much earlier times in the expansion of the observable universe;
- to understand that the goal of physics is to comprehend phenomena in the physical world;
- to demonstrate the ability to formulate a testable hypothesis based upon acquired physical data;
- to collect and analyze experimental data relevant to testing a hypothesis;
- to evaluate whether the evidence supports, refutes, or leads to the revision of the hypothesis;
- to create, interpret, and critically evaluate graphs, tables and models of physical data;
- to understand scientific uncertainty and how it is reduced with additional data acquisition and hypothesis testing;
- to distinguish between scientifically testable ideas and opinion.

Texts:

- Bennett, Donahue, Schneider & Voit, *The Cosmic Perspective: Stars, Galaxies & Cosmology*, 9th Ed. with MasteringAstronomy (ISBN 978-0-134-99078-1). If you did not purchase *MasteringAstronomy* with the text, you can buy it online at <http://www.MasteringAstronomy.com/>.
- *Physics 108 Laboratory Manual*.

**Requirements:**

- Midterm exam, in class, consisting of essay questions. Dean's excuse required for makeup or advance exam.
- Final exam, scheduled by the registrar, also entirely essay questions. Dean's excuse required for makeup or advance exam.
- Nine in-class laboratory exercises, 1:10-4 pm on Mondays as scheduled on the syllabus. Reports to be submitted at the end of the lab.
- Weekly responses to questions based on readings from your texts and observatory Web pages.
- Full participation in class discussions.
- Each Wednesday, each student is expected to bring to class at least one question in writing either about the current in-class discussion or about the reading assigned for the current week; these questions will be graded for their relevance and depth of understanding. Questions that can be answered directly from the reading or lecture notes will be accepted, but with less favor than those which probe beyond the assigned material.

**Academic Honesty:**

- *Discussion* of homework questions with your classmates is encouraged.
- *Copying* of another student's responses is of no use to anyone. Papers that appear to have been copied from one another will be considered to be instances of academic dishonesty and will be submitted to the Dean of the College for adjudication.
- Conspiring with another student to submit identical responses will be treated as copying.
- Please refer to the statement on "Principles of Intellectual Honesty" in the Student Handbook.

**Registrar's Mandatory Privacy Statement:**

- Moodle contains student information that is protected by the Family Educational Right to Privacy Act (FERPA). Disclosure to unauthorized parties violates federal privacy laws. Courses using Moodle will make student information visible to other students in this class. Please remember that this information is protected by these federal privacy laws and must not be shared with anyone outside the class. Questions can be referred to the Registrar's Office.

**Federal Credit Hour Compliance Statement:**

- The student work in this course is in full compliance with the federal definition of a four credit hour course.

Your grade will be based on:

- Lab reports: 20% total
- Homework: 20% total
- Questions: 10% total
- Midterm and final exams: 25% each

*This page is maintained by [Lyle Hoffman](#)*