

**PHYS 230 –Astronomy
Spring 2009**

Room: MA 52	Lectures: 1:20 – 2:15 pm MWF
Credit: 4 semester hours	Lab: 6:30 – 8:20 pm Tuesday

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Astronomy 230 is a one-semester introductory course. We will explore a wide variety of topics, including constellations and their origins, the life cycles of stars, recent discovery of planets around other stars, our Milky Way galaxy, black holes, and the evolution of the universe to name just a few. Astronomy, like all sciences, is an ongoing process of questioning and discovery. Thus, emphasis in this course will be placed as much on *how* astronomers learn about the universe as on *what* they learn.

Goals:

At the end of the course students will be able to:

1. Describe our place in the universe. Be able to clearly articulate how we fit into the cosmic environment of stars, galaxies, gas clouds, black holes, etc.
2. Be able to identify prominent stars, constellations, and planets in the night sky. Describe in detail the daily, lunar, seasonal, and planetary cycles. When possible, students will acquire this knowledge through direct observations.
3. Demonstrate a conceptual understanding of the physical processes that shape the universe. For example, students should understand why stars can't last forever, why the universe is expanding, or why astronomers believe space contains dark energy.
4. Explain how astronomers arrived at their knowledge. This goal requires a solid understanding of the scientific process in which observations and theoretical models are used to advance scientific theories. Students should be able to give concrete and detailed examples of this process and be able to distinguish it from other approaches such as those used in philosophy or religion.
5. Discuss the contribution of major historical figures to the development of modern astronomy and explain the role they played in shaping our understanding of the universe.

Text

Horizons: Exploring the Universe (10th edition), Seeds

Optional electronic version of the text available at: ichapters.com

Supplies: Calculator with scientific notation, text, note taking implements, observing journal

Corequisites: PHYS 230L Astronomy Lab

Satisfies: General Education Physical Science with Lab (ALAB, ANSP, GEPS, GEL)

Evaluation

Your grade for the course will be based on the following:

Participation & quizzes	10%
3 exams @ 15% each	45%
Labs	20%
Observing Journal	10%
Final Project/Paper	15%

Letter grades will be assigned as follows:

A, A-	90 – 100
B+, B, B-	80 – 89
C+, C, C-	70 – 79
D+, D, D-	60 – 69
F	below 60

Participation

You will be expected to keep up with the reading assignments and contribute to class discussions on a regular basis. In-class activities will occasionally be given. Quizzes will be given once every week or two, usually at the beginning of class. I will often announce an upcoming quiz during the previous lecture, but I may also give “pop” quizzes with no advanced notice. No make-up quizzes will be given, but the lowest quiz grade will be dropped at the end of the semester.

Exams

Three one-hour, in-class tests will be given. Tests will cover material from the lectures, textbook, labs, problem sets, and student presentations. Make-up exams will only be given in extremely rare cases. If you must miss class on an exam day, it is your responsibility to contact me well in advance of the exam to discuss your options. There is no final.

Labs

In the labs you will gain hands-on experience using telescopes, identifying objects in the night sky, and working with images and other astronomical data. The labs will take a variety of forms, including evening observing sessions, laboratory experiments, computer-based simulations, and exercises requiring only pencil and paper. At least one of the labs will require travel to an observing site off campus. Each lab will be graded and will be due on the Friday after the lab at the beginning class.

Math

Without math, modern astronomy would not be possible. Mathematics is used by astronomers in every aspect of their work from electronic imaging of celestial objects to posing new theories about the nature of the cosmos. With that said, this course will be largely descriptive and will not contain any advanced math. Simple algebra will be used, and scientific notation and graph-reading skills will be reviewed. Many of the labs will involve simple calculations, so please bring a calculator with you to lab. If you have any difficulty with the math please let me know and I will do all that I can to help. It just takes practice.

Observing Journal

Students will make observations of the night sky throughout the course and record their observations in a journal. The journal should be bound (not spiral bound) with either lined or blank pages. Blank pages are probably best if you like to sketch. Each entry in the journal should include:

- Object observed
- Date, time & location of observation
- Position in the sky (N, NW, W, etc), altitude, etc.
- Position relative to other stars, planets, constellations etc.
- Comparison with your previous observations of this object. For example, is it in a different part of the sky? Has it moved compared with background stars?

Subjects worthy of observation include anything celestial:

- Moon. Sketch and record the phase. Is it rising or setting? Which direction does the sunlight side face? Compare its phase, position in sky, etc. with previous observations. Note any other observations on its appearance.
- Planets. Compare your observations later in the semester to the earlier observations. Can you detect motion relative to the background stars? Comment on this motion. Is it direct or retrograde motion?
- Stars and Constellations. Keep detailed notes of the stars and constellations that you identify.
- Sun (but don't look directly at it!). Notice the position the sunrise or sunset on the horizon. You might pick a fixed location (say your dorm/house) so you can watch how the sun sets relative to different landmarks on the horizon throughout the semester.
- Meteors & Satellites
- Unidentified objects...

The observing journals will be graded on both the quality and quantity of observational entries. To receive a minimum grade of a C, you should have at least one observation per week. To achieve a higher grade, you should focus on the quality and precision of your descriptions and sketches. Observing journals receiving an A will consistently show evidence of exceptional observational abilities, attention to detail, and insightful written descriptions that reflect on your observations.

Final Project

You will write a 5-10 page paper as a final project. You can choose to write a research paper on a particular topic in astronomy, conduct an observational project and then write about the experience, craft a dialogue between two characters as they discuss a controversial subject, or propose your own project. More information about the project will be given later in the course. But it is not too early to start brainstorming ideas now.

Academic Honesty

You are encouraged, and even required at times, to work with your classmates on assignments, labs, and projects. We learn best when interacting with others. Even though collaboration on these activities is encouraged, you will be expected to write up your solutions on your own. Labs or homework that are identical will be viewed as evidence of copying and thus academic dishonesty. It goes without saying that cheating during exams or quizzes is not acceptable. Please refer to the university catalog for academic honesty policies.

Schedule (Subject to Change)

Part I: The Sky		
Week Beginning	Lecture	Lab
Feb. 2	<i>Chapter 1: Scales of the Cosmos</i> Introduction to our cosmic environment. <i>Chapter 2: The Sky</i> Stars, constellations, and the celestial sphere	<i>LAB 0: Telescope Viewing</i>
Feb. 9	<i>Chapter 3: Cycles of the Sky</i> Seasonal changes, motion of Sun, Moon, and planets.	<i>LAB 1: Motion of the Sky</i> Starry Night Pro
Feb. 16	<i>President's Day – No Class</i>	
Feb. 18	<i>Chapter 4: The Origin of Modern Astronomy</i> Early models of the heavens and planetary motion. The nature of scientific models.	<i>LAB 2: Planetary Motion</i> Starry Night Pro
Feb. 23	<i>Chapter 4 (cont.)</i> The Geocentric-Heliocentric debate	<i>LAB 3: Field Trip and Star Party</i>
Mar. 2	<i>Chapter 5: Astronomical Telescopes</i> Optical, Infra-red, radio, and X-ray telescopes TEST 1	<i>LAB 4: Moons of Jupiter</i>
Part II: Stars		
Mar. 9	<i>Chapter 6: Starlight and Atoms</i> Light, color, vision, spectra	<i>Lab 5: Spectroscopy</i>
Mar. 16	<i>Chapter 7: The Sun</i> Exploration of the closest star: structure, dynamics, energy source.	<i>Lab 6: Sunspots and the Rotation Period of the Sun</i>
Mar. 23	<i>Chapter 8: The Family of Stars</i> Distances, colors, temperatures, masses, diameters, luminosities, spectra. HR diagram.	<i>Lab 7: Stellar Spectra</i> Project CLEA
Mar. 30	<i>Chapter 9: The Formation and Structure of Stars.</i> TEST 2	<i>Lab 8: Cluster HR diagram</i>
Apr. 6	SPRING BREAK	
Part III: The Universe of Galaxies		
Apr. 13	<i>Chapter 10: The Deaths of Stars</i> <i>Chapter 11: Neutron Stars and Black Holes</i>	<i>Lab 9: Measuring the Mass of a Galactic Black Hole</i>
Apr. 20	<i>Chapter 12: The Milky Way Galaxy</i> Structure and dynamics of our home galaxy	<i>Lab 10: Galaxy Classification</i>
Apr. 27	<i>Chapter 13: Galaxies</i> Galaxy types and evolution	<i>Lab 11: Field Trip & Star Party</i>
May 4	<i>Chapter 15: Cosmology in the 21st Century</i>	<i>Lab 12: Galactic Zoo</i>
May 11	Class presentations TEST 3	<i>Lab 13: Hubble Law</i>
May 18	Finals Week	