

Physics 308 – Observational Astronomy – Fall 2023

Instructor

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Information

This is a basic course in observational astronomy with an emphasis on optical astronomy. The prerequisite is a course in introductory physics. Familiarity with elementary astronomy or astrophysics will be very helpful but is not required. Necessary materials will be provided, usually through the class websites and Blackboard. It is scheduled to meet in person on Mondays in the Natural Science 312 astronomy conference room from 2:00 to 2:50 PM. During the weeks of Labor Day (September 4) and Mid-term Break (October 9) there will be no class or assignments. While we will meet on the Monday of Thanksgiving week (November 20), we will not meet on the Monday of the last day of classes (December 4).

We will emphasize optical astronomy from the ground and from space with the goal of developing your understanding of how the data are acquired, how to access data, and the use of physics and computing to understand its meaning. The course is organized to cover a new topic in each of 13 weeks. There will be corresponding assignments on Blackboard each week to help you learn the material. We hope to offer optional opportunities for you to use a telescope on the roof of the building for observing the Moon and planets this fall, to visit Moore Observatory in Oldham County, and to join by Zoom in remote data acquisition using our telescopes in Arizona and Australia. If you are interested in a small research project as part of this class or independently, please let us know.

Objectives

This course in observational astronomy builds on experiences with hands-on, live remote, and robotic astronomy for students to

- develop skills enabling research in observational astronomy
- learn how to explore large sets of data for new discoveries

- reinforce studies of fundamental astrophysics
- connect basic knowledge to contemporary astrophysics research
- understand the relationship of technology and engineering to scientific discovery
- propose critically reasoned tests of new ideas
- prepare and present reports on scientific work

We will use simple assignments and activities as well as classroom instruction to meet these goals.

Websites

The course will operate through Blackboard which will provide links to other resources on our servers

<https://prancer.physics.louisville.edu/classes/308>

<https://prancer.physics.louisville.edu/moodle>

The U of L astronomy homepage with links to the observatories and weather information is

<https://www.astro.louisville.edu>

Requirements

The ideas we discuss in our class meetings are supported by online content with astronomical data and tools for analysis that will require a laptop or desktop computer with network access. Assignments will be submitted through the University's Blackboard system.

Assignments and grading

The class will have 13 assignments or virtual lab activities, one each week based on the class content and other online resources. These assignments will be available on Blackboard in advance of class for that week, and due at the end of the day the following Monday. You are expected to do each one and submit them on time. Our class teaching assistant will assess your work and offer suggestions for revisions as needed before a score is given. These assignments are not intentionally difficult, but we will drop the lowest one and the average will set a letter grade based on A (90 to 100); B (80 to 89); C (70 to 79); and D (60 to 69) without the \pm option.

Title IX/Clery Act Notification

Sexual misconduct (including sexual harassment, sexual assault, and any other non-consensual behavior of a sexual nature) and sex discrimination violate University policies. Students experiencing such behavior may obtain confidential support from the PEACC Program (502.852.2663), Counseling Center (502.852.6585), and Campus Health Services (502.852.6479). To report sexual misconduct or sex discrimination, contact the Dean of Students (502-852-5787) or University of Louisville Police (502.852.6111).

Disclosure to University faculty or instructors of sexual misconduct, domestic violence, dating violence, or sex discrimination occurring on campus, in a University-sponsored program, or involving a campus visitor or University student or employee (whether current or former) is not confidential under Title IX. Faculty and instructors must forward such reports, including names and circumstances, to the University's Title IX officer.

For more information, see the Sexual Misconduct Guide.

<http://louisville.edu/hr/employeerelations/sexual-misconduct-brochure>

Weekly topics

August 21 The night sky: Stellarium

August 28 Observing stars: magnitudes, coordinates, precession, parallax, proper motion

September 4 *Labor Day holiday*

September 11 Astronomical time keeping: gravity and light travel time

September 18 Astronomical optics: telescopes

September 25 Physics of photometry and imaging detectors: photons, electromagnetic spectrum, blackbody radiation

October 2 Observing in our solar system: our Moon and artificial satellites, planets and their satellites, asteroids, comets

October 9 *Mid-term break*

October 16 Evolving stars: colors, Hertzsprung-Russell diagrams, and star clusters

October 23 Astronomical spectroscopy: spectrum of stars, composition, radial velocity, rotation, magnetic fields

October 30 Variable stars: Cepheid variables, delta Scuti stars, and asteroseismology

November 6 Extrasolar planets: discovery from the ground and space, TESS

November 13 Transiting planets: confirmation and characterization, AstroImageJ

November 20 Emission nebulae: physics of excitation revealed in spectra and images
Thanksgiving week

November 27 Observational cosmology: Hubble Law

December 4 *Last day of classes: no meeting, all homework due*