
Astronomy 244/444: Advanced Astrophysics Laboratory

Prof. Kelly Douglass

Spring 2026

Astronomy 244/444 is the astronomy-only version of our Advanced Laboratory, in which challenging observing projects and analyses are carried out using the 24-inch Cassegrain telescope and its research-grade instrument suite at the C.E.K. Mees Observatory. The semester is front-loaded with ten introductory lectures on instruments, observations, and image processing. Afterwards, most of the effort will go into planning and executing observations, analyzing the data, and writing papers about the results.

Prerequisites ASTR 111 or ASTR 142; MATH 281, PHYS 227, and PHYS 218 completed or concurrently enrolled, and permission of the instructor.

Instructor Prof. Kelly Douglass

Email kellyadouglass@rochester.edu

Phone number 5-5549

Office B&L 425

Office hours By appointment *in advance*

Website

The course website can be found at <http://www.pas.rochester.edu/~kdouglass/Classes/Astr244/>; this is the main reference for the course. Complete lecture presentations and observing project descriptions, as well as other helpful resources, can be found here.

Blackboard

Grades for all reports will be posted on Blackboard throughout the semester.

Textbooks

There is no required textbook for this class.

Software

Largely provided for you; accessible by remote login to a server devoted to Mees observing. We will use several specialized programs such as CCDStack and SAOImage DS9, the programming environment IDL which enables programs like ATV and XStarfinder, and broadly useful commercial applications such as Photoshop. We also encourage the use of Python and the astropy module.

Electronic communication

Via email and Slack (astr244s26.slack.com). We will also use Zoom to communicate with one another during observations.

Lectures

Tuesdays and Thursdays from 3:25–4:40PM in B&L 203H, conducted by Prof. Douglass. Our Tuesday meetings will largely be devoted to introductory lessons on telescopes and data analysis and processing, and our Thursdays will comprise of observational planning and data reduction.

Observing

Whenever it is clear, some will observe remotely from B&L 203H. A great deal of spontaneity and schedule flexibility will be demanded to take advantage of clear nights; such is astronomical life in the cloudy Northeast. Coordination is also necessary, as ASTR 244/444 will share the telescope with the more numerous students of ASTR 142.

Projects

Executed by pairs of students, with each student conducting two (ASTR 244) or three (ASTR 444) projects chosen from a palette which includes:

- Globular clusters, “cluster variable” stars, and stellar evolution
- Observations and modeling of transiting exoplanets
- HII regions and high-mass star formation
- Seyfert galaxy nuclei: the retrospective discovery of black holes
- Herbig-Haro objects and low-mass star formation

It is preferable for you to have different partners for each project. Groups that choose the same project should choose different targets when possible. (There are many globular clusters, galaxies, exoplanets, etc.)

Those taking the course as ASTR 444, and thus doing three projects, must do their third project as a solo effort.

Project reports

Each pair of students will write a complete description of each project — motivation, observations and reduction, analysis, scientific discussion, conclusions, contributions of each author — in the style of articles in *The Astrophysical Journal*, and at approximately 15-page length. You are welcome to write the reports in L^AT_EX (especially via UR’s site license to [Overleaf](#)), but it is not required.

After the last observations for a project have been completed, the various components of the data reduction, analysis, and reports are due according to the following timeline:

Length of time after last observations	What is due
Two weeks	First pass of data reduction and analysis
Three weeks	Report draft
Four weeks	Final report

Grading

Your grade for each project will be calculated as follows:

Observing	10%
Data analysis	20%
Report draft	20%
Final report	50%

Your scores for the observing, data analysis, and report draft components are each based only on completeness. Project reports will be graded according to the quality and correctness of the planning, observations, reduction, analysis, scientific discussion, and the quality of the writing as well.

Each author will share the score a respective component with their project partner for their work in common. Scores on projects will be averaged to produce each student's final grade.

No extra credit assignments will be assigned that are not available to the entire class. Final letter grades will be assigned based on an absolute scale and not by a curve. The grading scale will be as follows:

Percentage score	≥ 80	≥ 75	≥ 70	≥ 65	≥ 60	≥ 55	≥ 50	≥ 45	≥ 35	< 35
Final grade	A	A-	B+	B	B-	C+	C	C-	D	E

Academic honesty

This class is designed to be a collaborative effort. However, all project reports must be your own work, written solely by you and your partner. According to the UR Academic Honesty Policy, cheating consists of submission of written assignments that are not your own work, submissions of assignments under someone else's name, or identical submission of your own previous work (i.e., self plagiarism). By University rules, any detected act of cheating that is not the result of a simple misunderstanding will be handed over to the Board on Academic Honesty for investigation.

You may **not** use any extra-UR academic-help services, including but not limited to Bartleby, Brainly, Chegg, Course Hero, and Slader. Any access to any of these sites counts as cheating, and thus is also an academic-honesty violation; it will be handed over for investigation by the Board on Academic Honesty.

You may **not** use any large-language-model (LLM) artificial intelligence-like tools, including but not limited to ChatGPT, Gemini/Bard, Copilot, or Titan, for reports, or code-writing, or for any purpose involving upload of ASTR 244/444 material into an LLM. Such use counts as cheating, and risks violation of copyright law; infractions will be handed over for investigation by the Board on Academic Honesty and/or the Office of Counsel.

Extra help

Appointments are available, and when Prof. Douglass is in her office and not in a meeting, you are welcome to walk in. Please come in and see me. I will also answer questions via email and Slack and will often be electronically accessible late into the night. I am happy to answer any questions you have concerning the course by either means. Questions from those who find the material confusing enough that they do not know what to ask are most welcome.

Credit hour policy

This course follows the College credit hour policy for four-credit courses. This course meets two times weekly for three academic hours per week. The course also includes observations for an average of one academic hour per week. In this course, students will plan and execute the observations and the associated activities, including data analysis and the completion of associated reports.

Statement of inclusion

The University of Rochester, this course, and its teaching staff are committed to inclusion and welcome students of all backgrounds and abilities. Services and reasonable accommodations are available to students with temporary and permanent disabilities, to students with DACA or undocumented status, to students facing mental health issues, other personal situations, and to students with other kinds of learning needs. Please feel free to let any of us know if there are circumstances affecting your ability to participate in class or your full participation in this course. Some resources that might be of use include:

- Undocumented/DACA Student Support Contacts <https://www.rochester.edu/college/ccas/undergraduate/daca/index.html>
- University of Rochester CARE network <https://www.rochester.edu/care/>
- Office of Disability Resources (see below)

Disability resources

The University of Rochester respects and welcomes students of all backgrounds and abilities. In the event that you encounter any barrier(s) to full participation in this course due to the impact of a disability, please contact the Office of Disability Resources. The access coordinators in the Office of Disability Resources can meet with you to discuss the barriers that you are experiencing and explain the eligibility process for establishing academic accommodations. You can reach the Office of Disability Resources at disability@rochester.edu; (585) 276-5075; Taylor Hall; www.rochester.edu/college/disability.

Mental health services

Managing your mental and physical health while keeping up with all the academic responsibilities may be especially challenging, given the ongoing pandemic. The University offers support services in a variety of areas and has adapted to supporting students both in-person and online. We encourage you to review the services offered and reach out should you find yourself struggling. You can find a list of services, with descriptions, at <https://www.rochester.edu/college/first-year/guide/support/index.html>.