Astronomy 111: The Solar System and Its Origin

Prof. Kelly Douglass

Fall 2025

Astronomy 111 is an honors-level course that will introduce us to the tools, methods, and concepts of astronomy, along with the observational basis for understanding the Solar System and extrasolar planetary systems. We will use single-variable calculus, classical mechanics, Newton's laws of gravity, and the ideal gas law to aid us in this course. We will discuss the structure and composition of individual planets and smaller Solar-System bodies in addition to the orbital dynamics and overall structure of the Solar System. The course is intended for science majors who have had beginning calculus or are taking it concurrently. As a consequence, we will be using mathematical formulations of physics to describe the planetary phenomena.

Prerequisites: You must be enrolled in one of MATH 161–165 or MATH 171–174, or have completed one of these sequences, to take ASTR 111.

Instructor Prof. Kelly Douglass

Email kellyadouglass@rochester.edu

Phone number 5-5549

Office B&L 425

Office hours Monday 1–2PM, Thursday 12:30–1:30PM, or by appointment *in advance*

TI Julia Largett

Email jlargett@u.rochester.edu

Office POA Library

Office hours Sunday 1–2PM

TI James McKeown

Email jmckeown@u.rochester.edu

Office POA Library

Office hours Monday 3–4PM

TI Ethan Seman

Email eseman@u.rochester.edu

Office POA Library

Office hours Monday 7–8PM

Website

The course website can be found at http://www.pas.rochester.edu/~kdouglass/Classes/Astr111/; this is the main reference for the course. Complete lecture presentations, problem sets, workshop assignments, exams (both practice and real), and other helpful resources can be found here.

Textbooks

Required: *An Introduction to the Solar System*, 3rd edition by D.A. Rothery, N. McBride, and I. Gilmour.

Here is a list of supplemental recommended texts for your reference. They will sometimes be referenced during the lectures. You should not feel compelled to buy any of these; all, included the required text above, are on reserve for your use in the Physics-Optics-Astronomy (POA) Library (B&L 374).

J.K. Beatty & C.C. Petersen	*The New Solar System*, 4th edition
Jack Lissauer & Imke de Pater	*Fundamental Planetary Science: Physics, Chemistry, and Habitability*
Guy Consolmagno & Martha Schaefer	*Worlds Apart*
William Hartmann	*Moons and Planets*
Frank H. Shu	*The Physical Universe*

Lectures

Tuesdays and Thursdays from 11:05AM–12:20PM in Dewey 2110E, conducted by Prof. Douglass. All students are expected to attend all lectures. Complete electronic copies of each lecture will be available to you on the website, for your browsing, downloading, and annotation pleasure.

Workshops

Julia, Ethan, and James will conduct the workshop sections. You may go to any workshop section, but you are expected to attend one workshop each week. During workshops, you will work through calculations and derivations similar to those assigned in the homework, work in groups on larger/longer homework questions, coordinate the Observing Project, and review for exams. See the Workshops page on our website for details.

Day	Time	Location	TA
Thursday	2–4:40PM	B&L 203H	James
Thursday	6:15–8:55PM	B&L 203H	Julia
Friday	2–4:40PM	B&L 203H	Ethan

Attendance & class participation

All members of the class are expected to attend all lectures and one workshop each week. This is, of course, for your own benefit. To emphasize the importance of coming to and being an active member of class, class participation will comprise 5% of your final grade for the course. Your class participation score will be based upon your attendance in the workshops.

Extra help

Office hours are listed on the course website; if you cannot make the hours, appointments are available. Please come in and talk to us. We will also answer questions via email and will often be electronically accessible late into the night when problem set due dates and exams approach. We are happy to answer any questions you have concerning the course by any of these means.

Questions from those who find the material confusing enough that they do not know what to ask are most welcome.

Observing project

You will have the opportunity to use the 24-inch telescope and advanced, large-format CCD camera with a variety of filters at the C.E.K. Mees Observatory to complete an observing project as part of this course. The observations will require at least one nighttime observing trip to Mees. The Mees trips depart from campus around 6PM and return around 2AM. Students will form teams (2–3 people each) to design and conduct the observations; they will operate the telescope and camera themselves under the supervision of the instructor and TIs. Naturally, the schedule for these observing trips will have to be set based upon the weather and schedules of the team members involved. We will plan for all observations to be complete by the middle of October, before the clouds and snow set in. Data must be analyzed by November 22, and observing reports are due on December 14; the observing project is worth 15% of your final grade. You must participate on an observing team, and submit an observing report, in order to pass the class.

Homework assignments

Problem sets will be due most every week on Tuesdays at the beginning of lecture. Each problem set will be 2% of your final grade; with ten total assignments throughout the semester, this means that your problem sets count for 20% of your final grade for the course.

We strongly encourage you to work together with your fellow classmates on the problem sets. The solutions you submit, however, must be your own thought and expressed in your own words, in accordance with the University's academic honesty policies.

To help solidify good homework habits that will benefit you throughout your education, each problem set should abide by the Homework Guidelines posted on the course website (https://www.pas.rochester.edu/~kdouglass/Classes/Astr111/HW_guidelines.pdf). We will give you feedback on the guidelines on your first two problem sets; for the remaining eight problem sets, we will subtract 5% for each item on the list of guidelines that is not followed.

Exams

There will be two midterm exams given throughout the course, given during the normal lecture times on Thursday, October 9 and Tuesday, November 18. Each exam will focus on the material covered since the last exam. Each midterm is worth 20% of your final grade for this course.

One final exam will be given during the University's final exam week, on Wednesday, Dec. 17 from 4–7PM. This exam will be cumulative. You must take all three exams in order to pass the course. The final exam is worth 20% of your final grade for this course.

To each exam, you are allowed to bring writing utensils (pencil, pen with blue or black ink), a calculator, and one 8.5"×11" sheet of paper on which *you* have written whichever formulas, physical constants, and notes you think you will find helpful for the exam. Computers and graphing calculators into which you can download text or graphics are *not* allowed. The best way to study for an exam is by doing the homework and working through the sample exams on the course website (made available a few days before each exam).

If you miss an exam due to illness or emergency, a make-up exam can be scheduled. All make-up exams will be oral examinations of the same duration as the original exam. Oral exams will be administered and graded by Prof. Douglass.

Grading

As outlined above, your grade for this course will be calculated as follows:

Homework	20%
Observing project	15%
Midterm 1	20%
Midterm 2	20%
Final exam	20%
Class participation	5%

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	F

Academic honesty

You are welcome and encouraged to collaborate during workshops, observations, and on the set-up of homework problems. However, all exams, observation reports, and problem sets must be your own work, written solely by you. According to the UR Academic Honesty Policy, cheating consists of submission of homework or exam solutions that are not your own work, or submissions of solutions under someone else's name. 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 would 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, either for your assignments or for any purpose involving upload of ASTR 111 material into an LLM. Such use counts as cheating and risks violation of copyright law; infractions would be handed over for investigation by the Board on Academic Honesty and/or the Office of Counsel.

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 workshops that meet for approximately three academic hours per week.

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 challenging. 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.

