

# ASTR1903: Astronomy Lab I

## Spring 2023 Syllabus

<b>Instructor:</b>	<b>Office:</b>	<b>Email:</b>
Shifra Mandel	Pupin 1333	ss5018@columbia.edu

**Time:** Wednesdays 6:00-9:00 p.m.

**Location:** Astronomy Library, Pupin 1402

**Office hours:** By appointment

## Class Overview

Welcome to Astronomy Lab I! The objectives of this lab are for you to learn how to:

1. Use the tools of scientific research, including
  - Quantifying astronomical phenomena using **scientific units**
  - Quantifying the **uncertainty** of a measurement
  - Identifying possible **sources of error** in a measurement
  - Using **graphs, plots, and equations** to represent and interpret data
  - Using data and the scientific process to critically **evaluate the quality** of arguments
2. Experience the scientific process firsthand, as follows:
  - Identify existing gaps in knowledge to **form a research question**
  - Propose and execute a method to **answer an open-ended research question**
  - Use multiple pieces of evidence to **form a well-justified hypothesis**
  - Clearly **communicate** methodology and results in written and verbal format

By the end of the course, you will

- Recognize the importance of scientific literacy
- See yourself as capable of applying scientific reasoning in everyday life

There will be 10 labs throughout the semester. There will be no lab work assigned outside of class. The final class will be devoted to student presentations.

Don't shy away from discussions with your peers and instructors. Don't hesitate to ask questions and don't be afraid to make mistakes; done appropriately, those are very effective ways to learn. And importantly, don't forget to have fun!

## Lab Materials

Please bring the following to each lab session (including the first):

- **A lab notebook:** This can be a bound notebook, but feel free to use a digital version instead; if you choose the latter, make sure to have your device with you and ready to use.
- **Writing/drawing tools:** Pen, pencil, eraser, ruler, etc. Colored pens/pencils may come in handy but are not required.
- **Scientific calculator:** A calculator capable of performing trigonometric functions, logarithms, exponents, roots, etc. A graphing calculator is not required.
- **Laptop:** Laptops will be a necessity for many of the labs. A limited number of laptops will be available for students who don't have their own.

## Grading

### Lab Write-ups

Each lab will clearly denote what you should record in your write-up for that lab. Lab responses can be recorded in either a bound physical notebook or an electronic document. You may submit your work either as a **PDF** to CourseWorks (strongly preferred), or hand in your lab notebook to the instructor at the end of class, to be returned at the beginning of the following lab. All submissions will be due by midnight on the day of the lab.

While we strongly recommend you work with a partner, each of you should keep your own records. The entire goal of the write-ups is to explain to the instructor **what** you did during the lab, **how** you did it, and **why** you did it — we are much more concerned with the coherence of your arguments/chain of reasoning than we are about the format. At the end of each session we will ask that you write a brief paragraph reflecting on the lab we completed that day: what you learned, anything that stood out to you or surprised you, and/or what part of the lab you found most interesting (and why). No write-up will be required for the final session, which will be dedicated to student presentations. Your lowest lab grade will be dropped when determining your final grade.

**Lab write-up guidelines:**

- Each lab's write-up should begin on a new page and have your name, your partner's name, lab title, and the date at the top.
- State specifically and in detail what your assumptions, methods, calculations, observations and conclusions are.
- Clearly mark (e.g. underline/highlight/put a box around) your final answer. However, note that the exact value is less important than the methods you used to obtain it.
- Always include units! Using them throughout your calculations will help you keep track of what you're doing and prevent careless mistakes.
- Units should be appropriate for the object evaluated; e.g. don't measure the Sun in centimeters (unless instructed to do so). The values of any constants must match your units!
- Plots should have both axes labelled with units, and a legend or other indication of what each symbol/line represents.
- Ensure that your handwriting is legible. If we cannot read it easily, we won't be able to grade it and you will not get any credit.

**Participation:**

Participation is an essential part of this lab. You will often work in pairs or groups of three. Your participation grade will be based on how well you work with your group, if you come to lab prepared and on time, the number of questions you ask, initiation of class discussions, and attempts at answering any questions that the instructors or other students pose. Please do not use your phone during class (unless absolutely unavoidable).

**Final Presentations:**

For the final session, each student will give a 10-minute presentation followed by a 5-minute discussion with the class. A list of topics related to astronomy and science in society will be rolled out; you are also welcome to submit your own suggested topics for instructor approval. The presentation will be worth the weight of two lab sessions.

Your final grade will be determined as follows:

- 70% Lab write-ups
- 15% Participation
- 15% Final presentation

## Policies:

### Attendance

It is important that you are present **on time**. Since your grade incorporates 9 out of 10 labs, you may either miss one class (without a valid excuse) or have your lowest lab grade dropped. We strongly recommend the latter. By department policy, more than two unexcused<sup>1</sup> absences will result in automatic failure of the course. We understand that extenuating circumstances may arise; in cases of family emergencies, serious illness, quarantine requirement, or religious holidays, please notify the instructor *before* the missed lab to arrange a make-up lab.

### Accommodations

If you have an identified disability, we encourage you to register with the Office of Disability Services early in the semester to ensure access to any necessary resources; registration is confidential.

<https://health.columbia.edu/services/register-disability-services>

<https://barnard.edu/disability-services>

### Academic honesty

Do not falsify data. Give credit to others' work. Do not present text verbatim from other sources as if it were your own; do not otherwise plagiarize. Please ask if you are unsure what's acceptable. Academic honesty is taken very seriously and will lead to penalties if not adhered to. Information on academic integrity policies at Columbia can be found at <https://www.college.columbia.edu/academics/academicintegrity>.

### Mandatory reporting

Instructors are required to report allegations of “gender based misconduct, discrimination, or harassment” to Columbia’s administration. While we are more than willing to listen and seek out resources (including confidential counselors) on your behalf, we cannot ourselves provide confidentiality in matters involving such allegations. Please don’t hesitate to reach out for more details.

## Other astronomy related events at Columbia:

Public lectures and observing sessions: <http://outreach.astro.columbia.edu/>

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<sup>1</sup>Unexcused absences are non-medical, non-quarantine-related, and not due to religious restrictions or extreme personal circumstances. Check with me privately if you are unsure whether an absence will be excused. For excused absences, a make-up lab may still be required.