

Observational Astronomy

PHYS 304 - Spring 2023

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Overview and basic info

Course info

Classroom: Hugel 017

Time: 11:00am - 12:15pm TR

Office Hours: 2-3pm WF (Hugel 142), other times TBD

Fourth hour: typically outdoors in the evening, scheduled weekly as weather allows

Textbooks (all available for free):

- [To Measure the Sky](#) (Chromey) - 1st or 2nd edition
- [OpenStax Astronomy, 2nd Edition](#) (Franknoi et al.)
- [A Beginner's Guide to Working with Astronomical Data](#) (Poessel/Pössel)
- [CCD Data Reduction Guide](#) (Craig & Chambers)
- [AAVSO Guide to CCD/CMOS Photometry](#) (AAVSO)

This is my first time teaching this class! It has not been taught for several years, and last time they did not use the college's telescopes at all. Astronomical observing is heavily weather-dependent, and things may take longer than originally planned. Therefore, the schedule and assignments will almost certainly change; I will notify you in a timely manner.

Instructor

Dr. Stephanie Douglas

Please call me "Professor Douglas" or "Doctor Douglas" or "Professor"

My pronouns are she/her/hers

Email: douglste@lafayette.edu

Office: Hugel 022 (but office hours will be in Hugel 142)

Course Policies

Attendance is expected but not graded; alert me about absences

I am not grading attendance, but I do expect you to attend classes and fourth hour sessions, and to actively participate. Observational astronomy is best learned by doing. There is only so much you can gain from reading or listening to a lecture.

If you will miss a class, let me know ASAP. **Please do not attend class if you are experiencing COVID-19 symptoms.** If you will miss multiple classes or assignments due to any serious illness, let me know ASAP and work with Bailey Health Center to obtain a Dean's Excuse. Dean's Excuses are also available for other disruptive life events.

If you will miss class or an assignment deadline due to a religious holiday, **please contact me by the add/drop deadline** so that we can make plans for you to complete the relevant work.

Masks required

Wearing a mask is known to reduce the transmission of SARS-CoV-2, the virus responsible for COVID-19. Regardless of your vaccination status, to protect the health of our class, masks must be worn during class. Masks should be made of a tightly woven cloth or non-woven synthetic filtering material, and should be worn properly over the nose and mouth and secured on the chin. Food and drink must also be consumed outside of the classroom (*brief* mask removal to drink water will be permitted as long as nobody abuses this). Students who show up to class without a mask will be asked to return to class wearing one in order to protect the health of our classroom community. In the event that you do not have access to a mask to wear during the class session, please let me know and I will help you obtain one.

Contact and office hours

Open drop-in “contact” or “office” hours are listed above. You do not need an appointment to stop by! If you would prefer to meet virtually for office hours, I will also keep a Zoom link open.

I also have blocks of time each week for one-on-one meetings; if these times don’t work for you, please email me. One-on-one meetings will be virtual unless we both agree otherwise.

I generally check email between 10-6 on weekdays, and reply by the end of the next weekday. You may send me an email at any time! I just don’t guarantee a response outside these hours.

I expect you to check email (and read any announcements) at least once between each class.

The Fourth Hour - outdoor observations

We will typically use the “fourth hour” for outdoor observations with telescopes. One hour is not a ton of time to set up and observe, particularly if we travel offsite. Furthermore, weather may prevent us from going outside on a given week. Therefore, I expect we will use 2-3 hour blocks, on average every other week. We will adjust the fourth hour plan as needed during the semester.

Contingency plan for virtual meetings

Ideally we will be able to maintain in-person classes this semester. However, COVID-19 or weather may temporarily require us to switch to Zoom meetings. I will let you know as far in advance as possible if this is necessary. The Zoom link will be posted to Moodle.

Hopefully we’re all familiar with virtual class etiquette by now. Mute your mic when you’re not speaking, etc. I would appreciate it if you keep your cameras on - if this isn’t possible, please [set up an appropriate profile picture](#) so that I’m at least not talking to blank squares.

Accommodations: flexible, let me know as early as possible

My policy: Your success in this class is important to me. If you need reasonable accommodations for any reason, please speak with me privately ASAP. I am happy to consider creative solutions as long as they do not compromise the learning goals of the activity. Requests for extra testing time must be made through the [Office of Accessibility Services](#).

Mandatory statement for any Lafayette course with a disability policy: Lafayette College is committed to creating a learning environment that meets the needs of its diverse student body. If you anticipate or experience any barriers to learning in this course, you are welcome to discuss your concerns with me. If you have a disability, or think you may have a disability, please meet with the [Office of Accessibility Services](#), to begin this conversation or request an official accommodation. If you have already been approved for accommodations through the Office of Accessibility Services, please meet with me so we can develop an implementation plan together.

Collaboration and Plagiarism

You are expected to abide by the principles of intellectual honesty outlined in the [Lafayette College Student Handbook](#). All answers must be given in your own words, not copied from the textbook or any other resources. Copying solutions from another source is a violation of the [Academic Integrity Policy](#). This includes Chegg, Bartleby, CourseHero, or similar websites; instructor/publisher solutions; the work of past students; or anything else you can find on Google.

Science is a social enterprise, and I encourage you to collaborate with your peers on homework, in-class activities, labs, studying, etc. “Collaboration” does not mean “copying.” You must understand and individually write out your own answers, and you must turn in your own copy of each assignment.

You may not work collaboratively on projects or tests, unless explicitly noted.

Evidence of plagiarism or other academic dishonesty will be reported to the College.

Commitment to Inclusion and Equity

Lafayette College is committed to creating a diverse community: one that is inclusive and responsive, and is supportive of each and all of its faculty, students, and staff. The College seeks to promote diversity in its many manifestations. These include but are not limited to race, ethnicity, socioeconomic status, gender, gender identity, sexual orientation, religion, disability, and place of origin. The College recognizes that we live in an increasingly interconnected, globalized world, and that students benefit from learning in educational and social contexts in which there are participants from all manner of backgrounds. The goal is to encourage students to consider diverse experiences and perspectives throughout their lives. All members of the College community share a responsibility for creating, maintaining, and developing a learning environment in which difference is valued, equity is sought, and inclusiveness is practiced.

If you are experiencing discrimination or harassment in this class, please do not hesitate to reach out to me so that I can help resolve the issue.

Do not repost learning materials, do not create your own recordings

All course materials are proprietary and for class purposes only. This includes posted recordings of lectures, worksheets, discussion prompts, and other course items. Such materials should not be reposted, and should be deleted at the end of the semester. Online discussions should also remain private and not be shared outside of the course. If you have any questions about proper usage of course materials feel free to ask me. You may not record classes yourself.

Moodle privacy statement

Moodle contains student information that is protected by the Family Educational Right to Privacy Act (FERPA). Disclosure to unauthorized parties violates federal privacy laws. Courses using Moodle will make student information visible to other students in this class. Please remember that this information is protected by these federal privacy laws and must not be shared with anyone outside the class. Questions can be referred to the Registrar's Office.

Assignments and grading

Unless otherwise noted, all assignments should be submitted to Moodle as PDFs. Work that is uploaded as an image straight from your camera will not be graded.

Course Grade Components

- Weekly problem sets and classwork: 40%
- APOD presentations: 10%
- Vocab Tests: 20% (2 x 10%)
- Group project: 10%
- Final project and presentation: 20%

Three 48-hour free passes to extend deadlines

Over the course of the semester, you will have three 48-hour passes that you can use to extend deadlines for homework or projects, no questions asked. You may combine 2 or 3 of these passes on a single assignment, but you may not subdivide the 48-hour increments. The only exception is the final project - you may only use 1 pass on the final. To use a pass, just email me (either ahead of time, or when you turn the assignment in), indicating the number of passes you would like to use.

Late work policy: 3% off per 24 hours late

If you do not use the time bank, late assignments will be penalized by 3 percentage points per 24 hours after the assigned deadline, up to 25% of the total points for that assignment. **Late**

work will still be accepted after that with instructor approval; you're on your honor not to get solutions from your classmates. Students who have submitted the assignment on time are on your honor not to share the solutions with anyone else.

Weekly problem sets and classwork (40%)

Every week, you'll be assigned 5-7 hours of homework consisting of conceptual questions, sketches, diagrams, math problems, and other tasks that suit the content from the previous week. You will also need to complete and write up any classwork from the previous week. Later in the semester, this will transition into small projects started in class and completed as part of homework each week.

I encourage you to work together on homework, but you must turn in your own copies of each assignment. It must be clear that short answer/essay questions were written in your own words.

Homeworks will be due on Thursdays at the beginning of class (11:00 am), as a PDF upload to Moodle. Here are some guidelines for what your homework should look like when you turn it in:

- On the first page (or a cover sheet), acknowledge everyone you have collaborated with on the assignment. This includes any other fellow students, faculty, etc. (anyone who you consulted or worked with), except for Prof. Douglas.
- Each problem should start on a new page. This is as much for you than for me - it will make it much easier for you if you need to go back and change something on a long problem solution.
- Write out the problem (or an abbreviated version containing all relevant information).
- Draw and use pictures/diagrams generously.
- Clearly work out the problem, commenting on your work as you go. Problem sets should never contain just math; use words to describe what you are doing and to reference where an equation came from and why it is relevant.
- Box your final solution. This makes it easier to grade and also tells me that you know what the problem was asking for. You may wish to underline, star, or otherwise highlight other major milestones as you do the problem.
- Comment on the significance of your answer. (Does it make sense? Is it what you expected? Why or why not? If it is a complicated algebraic expression, are there special cases you can consider for a "sanity check"?)
- Scan or save your work as a PDF, and upload it to Moodle

APOD presentations (10%)

You will do three 4-5 minute presentations based on images from the Astronomy Picture of the Day website, <http://apod.nasa.gov>. These will take place at the beginning of class each day, starting the second week of class.

Vocab tests (2 x 10% = 20%)

There will be two tests focusing on conceptual elements of the class, primarily vocabulary. These will be closed book and closed notes, consisting of multiple choice and short answer questions, designed to take about 1 hour. Both tests will take place during class time.

Tests will be in-person. If the COVID-19 situation requires us to move online during a test, I will provide an alternative virtual/take-home test.

Group project (10%)

You will complete a group project at midterm time on planning an observation. This will involve selecting targets, identifying an appropriate observing time and location, and justifying your choice in a short paper. More information will be distributed at a later date.

Final project (20%)

You will also complete a final project, either individually or in pairs, likely consisting of observations with our telescopes that you reduce and analyze yourself (e.g., constructing a CMD or measuring the brightness of a star over a short period of time). The last 2-3 weeks of the semester will be dedicated to observing and working on these projects during class time, including peer review and feedback. I expect everyone to attend and fully participate during these weeks. You will also present your final project during finals week. More information about the final project will be distributed at a later date.

Extra credit (up to 5%)

Extra credit assignments must be submitted on or before the last day of classes. For everyone's sake, submitting them earlier in the semester is preferable!

Options:

- Attend a campus event relevant to this class, including physics colloquia. Check with me ahead of time about events outside the physics department. (0.5% for attendance, and an additional 0.5% if you write a 1-page report aimed at other undergraduate physics/engineering majors.)
- Carry out additional light pollution observations and submit them to Globe at Night (0.5% per observation from campus, 1% per observation if you go elsewhere)
- Help run an evening observing session for PHYS 108 (intro astro) students, or for the department. Details/scheduling to come (1-2% per event, depending on event size)

More options may be added as the semester progresses.

Course Outcomes

After completing this course, each student should be able to...

- Use small optical telescopes

- Reduce astronomical data
- Use astronomical coordinate systems and time scales
- Use modern tools for astronomical calculations
- Communicate results to other astronomers

The student work in this course is in full compliance with the federal definition of a four credit hour course.

Planned course schedule (subject to change)

Chromey: [To Measure the Sky](#) (Chromey) - 1st or 2nd edition

OpenStax: [OpenStax Astronomy, 2e](#) (Franknoi et al.)

Poessel/Pössel: [A Beginner's Guide to Working with Astronomical Data](#)

Craig & Chambers: [CCD Data Reduction Guide](#)

AAVSO: [Guide to CCD/CMOS Photometry](#)

Wk	Dates	Reading	Topic	Other notes
1	Jan 24 - 28	Chromey Ch 1 OpenStax Ch 5	Light, light pollution	
2	Jan 31 - Feb 4	Pössel Ch 1, 5-8 Chromey Ch 2	Python Uncertainty review	
3	Feb 7 - 11	OpenStax 2.1 Chromey 3.1, 3.3	Positions on the sky Planning an observation	
4	Feb 14 - 18	Chromey 3.2, 3.4 <i>Skim</i> Ch 4 OpenStax 19.1-2	Parallax and Distances Large catalogs (e.g., Gaia)	
5	Feb 21 - 25	Chromey 5.1-5.3	Brightness of stars Geometric optics	
6	Feb 28 - Mar 4	Chromey 5.3-5.5 Chromey Ch 6	Optics, aberrations, and telescopes	
7	Mar 7 - 11			Test 1 on Tuesday Group project starts on Thursday
8	Mar 14 - 18			Spring break!
9	Mar 21 - 25			Group project continues
10	Mar 28 - Apr 1	Chromey 8.1-2 C&C Ch 1	Detectors/CCDs Digital Images	
11	Apr 4 - 8	C&C Ch 2-5 AAVSO Ch 4	Digital image reduction	You can also skim Ch9 of Chromey
12	Apr 11 - 15	Chromey Ch10 AAVSO Ch5	Photometry and filters	
13	Apr 18 - 22	AAVSO Ch 6-7	Standardization and time-domain science	
14	Apr 25 - 29			Final Project working time Test 2 on Thursday
15	May 2 - 6			Final Project working time
	Finals Week			Final project presentations during exam time, scheduled by the registrar