

AST 3722: OBSERVATIONAL TECHNIQUES

Fall 2021

Instructor:	Prof. Adam Ginsburg	Time:	T/Th 16:05–16:55, W 18:00–22:00
Email:	adamginsburg@ufl.edu	Place:	Rm 7, Bryant Space Science Center, Campus Teaching Observatory, and Zoom
		Office Hours:	W 17:00–18:00, or by appointment

TA:	Karolina Garcia	Office Hours:	TTT and by appointment
Email:	karolina.garcia@ufl.edu		

Timing / Structure:

The course will be taught primarily in person. The lectures will be recorded and distributed before class. Classtime will be used for exercises & ‘homework’.

Wednesday evening is the official in-person lab/observing times. On observing and lab nights, you will be expected to spend 4 hours in lab or at the observatory (18:00–22:00). However, the lab components of the course will be scheduled by sign-up to minimize crowds at the observatory and to ensure access to clear nights. Observing is weather-dependent! While the lab classes are officially Wednesday, you may have opportunity to observe and do labs on other nights.

The class will be taught ‘flipped’ to accommodate different learning styles. This means that in-class work will primarily consist of exercises and Q&A sessions.

Course Pages:

1. <https://ufl.instructure.com/courses/437613>

Communication:

Communication will be via Canvas, Zoom, and Slack. Join the class slack: https://join.slack.com/t/slack-h4n3567/shared_invite/zt-u77mckmv-KwTrwVq40HkCDv48uitxjw

Office Hours:

Office hours will be primarily virtual and held via Slack, with escalation to Zoom as needed.

Main References:

- C.R. Kitchin, “Astronomical Techniques”, 7th edition,
<https://ui.adsabs.harvard.edu/abs/2013aste.book.....K/abstract> (link is to 6th ed)
- Bevington & Robinson, “Data Reduction and Error Analysis for the Physical Sciences”,
http://hosting.astro.cornell.edu/academics/courses/astro3310/Books/Bevington_opt.pdf
- Stuart Littlefair, “PHY241: Observational Astronomy”
<http://slittlefair.staff.shef.ac.uk/teaching/phy241/>
- Matt Craig and Lauren Chambers, *CCD Data Reduction Guide*,
<https://mwcraig.github.io/ccd-as-book/00-00-Preface.html>

Objectives: You will learn to:

- Operate an optical telescope and CCD system
- Plan an observing run
- Process (“reduce”) CCD data using python
- Perform astronomical photometric measurements

Course Outline:

Learning goals of the course:

1. Use python for astronomy
2. Plan an observation
3. Execute an observation
4. Reduce an imaging observation
5. Perform a photometric measurement
6. Understand a telescope

Ancillary goals:

1. Meet your peers in the astronomy track (network)
2. Write a scientific paper
3. Practice public speaking

Grading Policy:

- Class Assignments and participation, homework (40%)
- Labs and Observing Projects (60%)

The late policy is 10% credit lost per day. However, I generally will give extensions if late assignments are well-justified and excused in advance.

More information on grades and grading policies is here: <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx> and here <https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading>

Letter grades are:

Letter	Minimum %
A	93
A-	90
B+	87
B	84
B-	80
C+	77
C	74
C-	70
D+	67
D	64
D-	60

I reserve the right to curve the class such that your scores improve if the final score distribution is lower than I expect. This can only help your grades; I will not apply a curve to reduce your score before the raw score.

Attendance

Attendance is required for both the class sessions and the labs. Part of your grade for the semester is based upon class participation during the class sessions, and the lectures cover material that will be important for the labs and observing projects. We will not permit you to make up a lab unless permission is granted beforehand or there is a serious emergency. If you feel that you have a situation that may allow for a make-up, contact the professor immediately via email. If you are absent without being excused you will receive a zero for the lab.

Note that, because many of the labs are done at the observatory and require good weather, it may not be possible to make up a lab. There are not many clear nights per semester.

Excused absences are consistent with university policies in the undergraduate catalog (<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>) and require appropriate documentation.

Course Communication Policy:

- We will use Canvas for announcements and other digital communication, so you are expected to regularly check Canvas.
- We may use Slack for live communication and office hours.
- Regular attendance on zoom or in person is essential and expected.

Students Requiring Accommodations

Students with disabilities requesting accommodations should first register with the UF Disability Resource Center (352.392.8565) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodations. Students with disabilities should follow this procedure as early as possible in the semester

Course Evaluation

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

Health absence / COVID policies

We will have face-to-face instructional sessions to accomplish the student learning objectives of this course.

- You are required to wear approved face coverings at all times during class and within buildings.
- If you are experiencing any symptoms of respiratory disease (cold, flu, covid), please do not attend class.
- If you are sick, course materials will be provided to you with an excused absence, and you will be given a reasonable amount of time to make up work. Find more information in the university attendance policies.

Our in-person meetings will be at the Campus Teaching Observatory (CTO) and in the lab room. Lab room occupancy is limited to 24 at a time. CTO occupancy is not explicitly limited as long as we are outdoors. Observing is outdoors and observing stations are separated by more than 6 feet.

Online Teaching Policy

Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the “chat” feature, which allows students to type questions and comments live. The chat will not be shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

Students are requested, but not required, to keep their video on during Zoom meetings. During breakout sessions and interactive work sessions held on zoom, both audio and video participation will be required. Students must have a functional webcam and microphone.

Class Demeanor (in person)

Students are expected to arrive to class on time and behave in a manner that is respectful to the instructor and to fellow students. Please avoid the use of cell phones and restrict eating to outside of the classroom. Opinions held by other students should be respected in discussion, and conversations that do not contribute to the discussion should be held at minimum, if at all.

Materials and Supplies Fees

There are no additional fees for this course.

University Honesty Policy

UF students are bound by The Honor Pledge which states, ‘*We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity by abiding by the Student Honor Code. On all work submitted for credit by Students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.”*’ The Honor Code (<https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct->) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TA in this class.

Counseling and Wellness Center

Contact information for the Counseling and Wellness Center: <http://www.counseling.ufl.edu/cwc/Default.aspx>, 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Lab Report and Project Due Dates (subject to change)

Submit via Canvas before the Lecture

1. Intro to the Campus Teaching Observatory (CTO): Sep 3
2. Observing Plan: Sep 17
3. Optics Lab: Oct 1
4. Imaging Lab (observing): Oct 15
5. Photometry Lab (observing): Nov 5
6. Photometry Data Reduction lab: Nov 19
7. Photometry Project: Dec 17

Preliminary Schedule for Class & Lab Topics (subject to change)

Dates are Monday of the week; we meet T/Th

- Week 1 (Aug 23): Basics of Observational Astronomy // Intro to Python
Lab: Introduction to CTO
- Week 2 (Aug 30): Coordinates and Time // Planning Observations (Observation Planning workbook)
Lab: Introduction to CTO // Python in the Lab
- Week 3 (Sep 6): Planning Observations // CCDs
Lab: Introduction to CTO // Python in the Lab
- Week 4 (Sep 13): Basic Astronomical Optics (geometric optics)
Lab: Optics
- Week 5 (Sep 20): Statistics and Error Analysis
Lab: Optics
- Week 6 (Sep 27): Atmosphere
Lab: Optics

- Week 7 (Oct 4): Photometry, Exposures, Filters, CCD Image Acquisition, Calibration
Lab: Optics
- Week 8 (Oct 11): Photometry, Exposures, Filters, CCD Image Acquisition, Calibration
Lab: Imaging, Alignment, Mosaicing
- Week 9 (Oct 18): Exposures, Filters, CCD Image Acquisition
Lab: Imaging, Alignment, Mosaicing
- Week 10 (Oct 25): Image Alignment, Mosaicing, Astrometry
Lab: Imaging, Alignment, Mosaicing
- Week 11 (Nov 1): Color Images
Lab: Photometry
- Week 12 (Nov 8): [Holiday on Nov 11] Spectroscopy
Lab: Photometry
- Week 13 (Nov 15): Telescopes and Detectors
Lab: Photometry
- Week 14 (Nov 22): [Vacation on Nov 25] Research, careers, observing proposals
Lab: Photometry
- Week 15 (Dec 6): Photometry project presentations
Lab: None
- Week 16 (Dec 13): Reading week: work on final projects
Lab: None

General topics covered

- Python for astronomy: astropy, jupyter
- Visualization tools for astronomy: ds9, glue
- Basics of Observational Astronomy: Coordinates and Time, Planning Observations, Atmospheric Effects, Sky Brightness
- Acquiring Astronomical Data: Basic Techniques, Calibration Images, Filters, Exposure times, Dithering
- Optics and Telescopes: Geometric Optics, Lens Equation, Telescope Designs, Practical Telescope Considerations
- Detectors: Types of Detectors, Fundamentals of Charge Coupled Devices, Read Noise, Dark Current, Exposure Times
- Photometry: Magnitude Systems, Photometric Calibration, Impacts of Atmosphere Spectroscopy: Science Applications, Dispersive Elements, Spectrograph Designs
- Data Analysis: Statistics and Error Analysis

- Photometry and Data Analysis: Tools in Python, astropy
- Presenting Astronomical Results: Color Images, Presentation Skills, Literature Searches
- Special Topics: TBD depending on presentation topics