AST 3722: Observational Techniques

Spring 2020

Instructor:	Prof. Adam Ginsburg	**Time:**	T/Th 17:10–18:00
Email:	adamginsburg@ufl.edu	**Place:**	Rm 6, Bryant Space Science Center, Campus Teaching Observatory, and Zoom
		Office Hours:	17:00 - 18:00 W
TA:	Sarik Jeram	**Office Hours:**	Mondays 16:00-17:00
Email:	sarik93@ufl.edu		
TA:	Nicholas Barth	**Office Hours:**	Mondays 16:00-17:00
Email:	nbarth@ufl.edu		

Timing / Structure:

The course will be taught remotely. Lectures for both sections will be on Tuesday and Thursday. Lectures will include interactive components that require live attendance.

The lab components of the course are scheduled any day of the week and will take place in evenings. To avoid overcrowding during the pandemic, lab sessions will be scheduled in advance, but will not be on a fixed schedule - observing is weather-dependent!

Course Pages:

1. https://ufl.instructure.com/courses/419396

Communication:

Communication will be via Canvas, Zoom, and Slack. Join the class slack: https://join.slack.com/t/ast3722spring2021/shared_invite/zt-khjv19o4-0kxEDA7cQClM26JI4x9vuQ

Office Hours:

Office hours will be 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%)

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

Attendance

Attendance is required for both the lectures and the labs. Part of your grade for the semester is based upon class participation during the lectures, 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.

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 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/.

COVID policies

We will have face-to-face instructional sessions to accomplish the student learning objectives of this course. In response to COVID-19, the following policies and requirements are in place to maintain your learning environment and to enhance the safety of our in-classroom interactions.

- You are required to wear approved face coverings at all times during class and within buildings. Following and enforcing these policies and requirements are all of our responsibility. Failure to do so will lead to a report to the Office of Student Conduct and Conflict Resolution.

- This course has been assigned a physical classroom with enough capacity to maintain physical distancing (6 feet between individuals) requirements. Please utilize designated seats and maintain appropriate spacing between students. Please do not move desks or stations.

- Sanitizing supplies are available in the classroom if you wish to wipe down your desks prior to sitting down and at the end of the class.

- Follow your instructors guidance on how to enter and exit the classroom. Practice physical distancing to the extent possible when entering and exiting the classroom.

- If you are experiencing COVID-19 symptoms (Click here for guidance from the CDC on symptoms of coronavirus), please use the UF Health screening system and follow the instructions on whether you are able to attend class. Click here for UF Health guidance on what to do if you have been exposed to or are experiencing Covid-19 symptoms.

- 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 6 at a time. CTO occupancy is not explicitly limited as long as we are outdoors, but we will ensure that each individual is well-separated from each other. 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 lecture. 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-code/ 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): Jan. 23rd

2. Observing Plan: Feb. 4th

3. Optics Lab: Feb. 20th

4. Imaging Lab: Mar. 19th

5. Photometry Lab: Apr. 10th

6. Photometry Project Report: Apr. 25th

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

- Week 1 (Jan 11): Basics of Observational Astronomy // Intro to Python
  Lab: Introduction to CTO

- Week 2 (Jan 18): Intro to Python // Coordinates and Time
  Lab: Introduction to CTO // Python in the Lab

- Week 3 (Jan 25): Planning Observations (Observation Planning workbook)
  Lab: Introduction to CTO // Python in the Lab

- Week 4 (Feb 1): Basic Astronomical Optics (geometric optics)
  Lab: Optics

- Week 5 (Feb 8): Statistics and Error Analysis
  Lab: Optics

- Week 6 (Feb 15): Atmosphere
  Lab: Optics

- Week 7 (Feb 22): Photometry, Exposures, Filters, CCD Image Acquisition, Calibration
  Lab: Optics

- Week 8 (Mar 1): Photometry, Exposures, Filters, CCD Image Acquisition, Calibration
  Lab: Imaging, Alignment, Mosaicing

- Week 9 (Mar 8): Exposures, Filters, CCD Image Acquisition
  Lab: Imaging, Alignment, Mosaicing

- Week 10 (Mar 15): Image Alignment, Mosaicing, Astrometry
  Lab: Imaging, Alignment, Mosaicing

- Week 11 (Mar 22): Color Images
  Lab: Photometry

- Week 12 (Mar 29): Spectroscopy
  Lab: Photometry

- Week 13 (Apr 5): Telescopes and Detectors
  Lab: Photometry

- Week 14 (Apr 12): Research, careers, observing proposals
  Lab: Photometry

- Week 15 (Apr 19): Photometry project presentations
  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