

AST 3722: OBSERVATIONAL TECHNIQUES

Spring 2020

Instructor:	Prof. Adam Ginsburg	Time:	T/Th 16:05 – 16:55, W 18:15-
Email:	adamginsburg@ufl.edu	Place:	Rm 6, Bryant Space Science Center
		Office Hours:	17:00 - 18:00 T/Th

TA:	Sarik Jeram	Office Hours:	Wednesdays 16:00-17:00
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Course Pages:

1. <https://ufl.instructure.com/courses/387625>

Office Hours: As stated above, by appointment, or post your questions in the chat room on the Canvas page.

Main References: This is a restricted list of various interesting and useful books that will be touched during the course. You need to consult them occasionally.

- 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:

- Labs (30%)
- Class Assignments and participation (30%)
- Observing Projects (30%)
- Final Presentation (10%)

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 TA 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 Policy:

- We will use Canvas for announcements and other digital communication, so you are expected to regularly check Canvas.
- We may use GitHub classroom for some assignments.
- Regular attendance 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/>.

Class Demeanor

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 Proposal: Feb 4th
3. Optics Lab: Feb. 20th
4. Photometry Lab: Mar. 19th
5. Spectroscopy Lab: Apr. 14th
6. Observing Project Report: Apr. 25th (presentations Apr 14, 16, 21)

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

- Week 1 (Jan 7, 8, 9): Basics of Observational Astronomy // Intro to Python
Lab: Introduction to CTO
- Week 2 (Jan 14, 15, 16): Intro to Python // Coordinates and Time
Lab: Introduction to CTO // Python in the Lab
- Week 3 (Jan 21, 22, 23): Planning Observations (Observation Planning workbook)
Lab: Introduction to CTO // Python in the Lab
- Week 4 (Jan 28, 29, 30): Basic Astronomical Optics (geometric optics)
Lab: Optics
- Week 5 (Feb 4, 5, 6): Statistics and Error Analysis
Lab: Optics
- Week 6 (Feb 11, 12, 13): Atmosphere
Lab: Optics
- Week 7 (Feb 18, 19, 20): Photometry
Lab: Optics
- Week 8 (Feb 25, 26, 27): Photometry, Exposures, Filters, CCD Image Acquisition
Lab: Photometry

- Week 9 (Mar 10, 11, 12): Exposures, Filters, CCD Image Acquisition
Lab: Photometry
- Week 10 (Mar 17, 18, 19): Guest lectures: Topic & Presenter TBD
Lab: Photometry
- Week 11 (Mar 24, 25, 26): Color Images
Lab: Spectroscopy
- Week 12 (Mar 31, Apr 1, 2): Spectroscopy
Lab: Spectroscopy
- Week 13 (Apr 7, 8, 9): Telescopes and Detectors
Lab: Spectroscopy
- Week 14 (Apr 14, 15, 16): Final project presentations
Lab: Spectroscopy
- Week 15 (Apr 21, 22): Final project presentations
Lab: None

General topics covered

- 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