AST 3722: Observational Techniques

Fall 2025

Instructor:	Dr. Triana Almeyda	**Time:**	Th 16:05–16:55, M 17:10-22:10
Email:	trianaa@ufl.edu	**Place:**	Rm 7, Bryant Space Science Center, Campus Teaching Observatory,
		Office Hours:	TBD; BRT 314 or by appointment

TA:	Francisco Mendez	**Office Hours:**	W 1-2pm & Th 10-11am; Undergrad Lounge, BRT 221
Email:	fmendez@ufl.edu		

Timing / Structure:
Currently, the plan is for this course to be taught mainly in person. Should COVID or some other situation encourage a change, we will use Zoom and other online tools.

On observing and lab nights, you will be expected to spend 5 hours in lab or at the observatory (17:10-22:10). Observing is weather-dependent! While the lab classes are officially Monday, if the weather is consistently bad on Mondays, you may have the opportunity to observe on other nights.

Course Pages:

1. https://ufl.instructure.com/courses/500519

Communication:
Communication will be via Canvas or email.

Office Hours:
Office hours will be available in person, or over Zoom, if requested. You may also email if you require assistance or need to meet at a time not during the usual office hours. Please include the course number in your email subject line.

Materials: Access to a computer will be essential for this course. You will also need a notebook for taking notes during labs (any notebook type is fine). Having a phone or tablet, and a flash drive, in addition to a laptop may also be helpful. If any of this is an issue, please talk to the instructor or TA.

Main References:
No textbook is required for this class. For additional information, you are welcome to consult any outside references including:

- 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 CMOS system
- Plan an observing run
- Process ("reduce") CMOS 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 an observing proposal
3. Practice communication

Grading Policy:

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

More information on grades and grading policies is here: https://https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/ and here https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/#gradingpoliciestext

Requests for extensions must be submitted by email or via Canvas to the instructor. Otherwise, we will take up to 10% off for each undiscussed full day late.

As long as you have completed each lab, your lowest lab score will be dropped.

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 below the raw score.

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. In general, making up a lab will require prior permission or an emergency situation. 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 and email for announcements and other digital communication, so you are expected to regularly check Canvas.
- Regular attendance is essential and expected.

Students Requiring Accommodations

Formally, students with disabilities requesting accommodations should first register with the UF Disability Resource Center (https://disability.ufl.edu/; 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. You may also come talk to the instructor about accommodations that will help you achieve the learning objectives in this course.

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/.

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 orally in class are agreeing to have their voices recorded. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

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. When working in groups, be respectful to your fellow students. Please avoid the use of cell phones and limit activities that can be distracting to other students.

Materials and Supplies Fees

There are no additional material and supply fees for this course.

University Honesty Policy During this course, you will be working together in groups. It is fine to discuss ideas and even look at each other's code. You are also allowed to use the internet to help you debug your code. However, I expect you to understand and be able to explain the purpose of every line of code you submit. Additionally, when I ask for written thoughts, analysis, etc. I expect those to be entirely your own words, with sources properly cited, and not duplicated from anyone else's or entity's work. 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. This includes the use of AI: no student is allowed to use any AI tools (e.g., including Grammarly, chatGBT, etc.) to assist with any assignments in this course. Doing so will be considered a violation of the student honor code. 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.https://counseling.ufl.edu/, 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 by 5:00 pm

1. Intro to the Campus Teaching Observatory (CTO): Sept. 26
2. Detector Characterization: Sept. 12
3. CMOS Observations: Oct. 10
4. Color Images: Nov. 7
5. Observing Proposal: Oct. 31
6. Photometry Project: Dec. 5
7. Optics lab: (1.5 weeks after bad weather)

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

- Week 1 (Aug 18): Introduction to Observational Astronomy // Introduction to Python
  Lab: No lab this week
- Week 2 (Aug 25): Introduction to Python // Detectors
  Lab: Introduction to CTO // Python in the Lab
- Week 3 (Sept 1): Planning Observations
  Lab: No lab this week
- Week 4 (Sept 8): Astronomical Optics
  Lab: Introduction to CTO // Python in the Lab
- Week 5 (Sept 15): Astronomical Optics
  Lab: CMOS Observations
- Week 6 (Sept 22): Statistics and Error Analysis
  Lab: CMOS Observations
- Week 7 (Sept 29): Atmosphere
  Lab: CMOS Observations
- Week 8 (Oct 6): Magnitudes and Colors
  Lab: CMOS Observations
- Week 9 (Oct 13): Observing Proposal
  Lab: Color Images
- Week 10 (Oct 20): Stellar Astronomy
  Lab: Color Images
- Week 11 (Oct 27): Data Reduction
  Lab: Color Images
- Week 12 (Nov 3): Color images
  Lab: Photometry

- Week 13 (Nov 10): Image alignment
  Lab: Photometry
- Week 14 (Nov 17): Photometry
  Lab: Photometry
- (Nov 24): Thanksgiving Break
- Week 15 (Dec 1): Cluster CMDs
  Lab: Photometry
- Week 16 (Dec 8): Finals Week
  Lab: None

General topics covered

- Python for astronomy: astropy, jupyter
- Visualization tools for astronomy
- 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