

# AST6725C-2654(24400) - Observational Techniq

## AST 6725 - Prof. Eikenberry Observational Techniques for Astronomy Syllabus for Fall 2020

**Instructor:** Prof. Stephen Eikenberry

**Web site:** [www.astro.ufl.edu/~eiken/teaching.html](http://www.astro.ufl.edu/~eiken/teaching.html) (<http://www.astro.ufl.edu/~eiken/teaching.html>)+ CANVAS

**Text:** *Astrophysical Techniques* by C. R. Kitchin, 5th Edition. CRC Press

**Class meetings:** Tues 9 (4:05-4:55 PM)  
Thurs 5PM-10PM

**Office hours:** Thurs 9 (Zoom appt only)

**Course Teaching Assistant:** Sarik Jeram  
[sarik93@ufl.edu](mailto:sarik93@ufl.edu)

**Office Hours:** TBC

This course is primarily intended for PhD students in astronomy and astrophysics, and will provide a detailed introduction into the techniques used in modern observational astrophysics. The primary focus of the course will be on electromagnetic observations, with particular emphasis on optical/infrared ground-based observations, though we will cover the full EM spectrum as well as multi-messenger astrophysics (including particle astrophysics and gravitational wave astrophysics).

### Course goals:

The goal of this course is to provide a foundation in observational techniques both for the student who intends to become an observational astronomer as well as for the student who must use observations and analyses carried out by others and who must therefore be able to judge their quality and validity.

What we'll cover:

1. Detectors
2. Optical/IR Imaging
3. Optical/IR Spectroscopy
4. Radio Observations
5. High Energy Observations
6. Other Topics (multi-messenger, adaptive optics, interferometry)

### Requirements:

1. Assigned reading prior to class
2. Homework, Class Participation, & In-class "Pop" Quizzes (10% of final grade)  
Homework is occasional, as-needed (3-4 per semester).  
Quizzes are short and easy (4-5 per semester).

3. CCD Lab Report (10% of final grade)
4. Radio Observing Project (15% of final grade)
5. Optical Observing Projects (50% of final grade)
6. Observing Proposal Exercise (15% of final grade)

### **Observing Projects:**

Each student with one or more partners, will carry out two optical observational programs with the CCD imagers/spectrograph at the Rosemary Hill Observatory (RHO) 14-inch and 30-inch reflecting telescopes located about 30 miles southwest of UF near the town of Bronson. A project report on each program will be due the last day of class.

As noted above, the reports count for one-half of the course grade, so start your planning and observing early in the semester. A detailed description of the project requirements and procedures will be provided early in the semester. The course graduate teaching assistant Sarik Jeram will oversee the observing projects. You will work as teams, but your project and report must reflect your own work.

Note - due to the COVID-19 situation, this offering of AST 6725 will be unlike any other in the past. We are planning/hoping to get all of the Gainesville-resident students out to RHO for in-person observing at least once during the semester. Details are still TBD - bear with us!

This year we will also have a new radio observing project, facilitated by Prof. Adam Ginsburg. This includes a site characterization exercise (5%) and data acquisition/analysis. The latter will include a report, similar to the optical observing reports and CCD lab, worth 10% of the final grade. We hope to distribute radio receivers to the locally-based students for the data acquisition - students will NOT be penalized if they are non-local or unable to carry out the observations due to COVID-19 issues.

### **Observing Proposal to a Major Observatory:**

Each student must write a request for observing time at a major observatory (e.g., GTC, Gemini, Keck, IRTF, ALMA, HST, etc.). You will need to obtain the appropriate application forms from the observatory website and explore the observatory's available instrumentation complement. You must carry out the detailed analysis that justifies the requested observing time; i.e., familiarize yourself with the pertinent instrumentation and performance characteristics, which must be reflected in the observing proposal. A realistic science justification must be presented, although it will not be necessary to submit the proposal to the observatory. For those of you who have already prepared proposals for observatories, you must choose an observatory for which you have not previously prepared proposals. Be adventurous.

### **Grading:**

Given the above scoring (total of 100 points), the following grades will be assigned:

Grade	Minimum Score
A	93
A-	90
B+	87
B	83
B-	80
C+	77
C	73
C-	70
D+	67
D	63
D-	60

Note that I reserve the right to "curve" scores up, if I determine that the class score distribution indicates a mismatch between performance and my expectations. This can ONLY improve your numerical score and corresponding letter grade -- I will never apply a curve to reduce a student's score below the raw score.

UF's grading policy, including calculation of grade points and GPA is available at <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

#### Contact Info:

Prof. Stephen Eikenberry  
404 Bryant Space Science Center  
352-294-1833  
eiken@ufl.edu

#### Policy Items:





Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation.












Make-ups for missed exams, quizzes, or other items will be provided ONLY with written medical excuse from licensed medical professionals or for official University activities with written excuse from appropriate UF personnel (i.e. UF athletic team coach, UF professor, etc.). Without such an excuse, any missed exams, quizzes, or other work will be given a grade of ZERO. This includes in-class pop quizzes, which are unannounced.














I do not normally take attendance in class, but students are responsible for any material covered which they missed. Also, see above regarding missed graded assignments.

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 recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

## Course Summary:

Date	Details	
Tue Sep 1, 2020	 <a href="https://ufl.instructure.com/calendar?event_id=1562573&amp;include_contexts=course_408712">AST6725C-2654(24400) - Observational Techniq (https://ufl.instructure.com/calendar?event_id=1562573&amp;include_contexts=course_408712)</a>	4pm to 5pm
Thu Sep 3, 2020	 <a href="https://ufl.instructure.com/calendar?event_id=1562595&amp;include_contexts=course_408712">AST6725C-2654(24400) - Observational Techniq (https://ufl.instructure.com/calendar?event_id=1562595&amp;include_contexts=course_408712)</a>	5pm to 10pm
Tue Sep 8, 2020	 <a href="https://ufl.instructure.com/calendar?event_id=1562574&amp;include_contexts=course_408712">AST6725C-2654(24400) - Observational Techniq (https://ufl.instructure.com/calendar?event_id=1562574&amp;include_contexts=course_408712)</a>	4pm to 5pm
Thu Sep 10, 2020	 <a href="https://ufl.instructure.com/calendar?event_id=1562596&amp;include_contexts=course_408712">AST6725C-2654(24400) - Observational Techniq (https://ufl.instructure.com/calendar?event_id=1562596&amp;include_contexts=course_408712)</a>	5pm to 10pm

Date	Details	
Tue Sep 15, 2020	 <a href="https://ufl.instructure.com/calendar?event_id=1562575&amp;include_contexts=course_408712">AST6725C-2654(24400) - Observational Techniq</a>	4pm to 5pm
Thu Sep 17, 2020	 <a href="https://ufl.instructure.com/calendar?event_id=1562597&amp;include_contexts=course_408712">AST6725C-2654(24400) - Observational Techniq</a>	5pm to 10pm
Tue Sep 22, 2020	 <a href="https://ufl.instructure.com/calendar?event_id=1562576&amp;include_contexts=course_408712">AST6725C-2654(24400) - Observational Techniq</a>	4pm to 5pm
Thu Sep 24, 2020	 <a href="https://ufl.instructure.com/calendar?event_id=1562598&amp;include_contexts=course_408712">AST6725C-2654(24400) - Observational Techniq</a>	5pm to 10pm
Tue Sep 29, 2020	 <a href="https://ufl.instructure.com/calendar?event_id=1562577&amp;include_contexts=course_408712">AST6725C-2654(24400) - Observational Techniq</a>	4pm to 5pm
Thu Oct 1, 2020	 <a href="https://ufl.instructure.com/calendar?event_id=1562599&amp;include_contexts=course_408712">AST6725C-2654(24400) - Observational Techniq</a>	5pm to 10pm
Tue Oct 6, 2020	 <a href="https://ufl.instructure.com/calendar?event_id=1562578&amp;include_contexts=course_408712">AST6725C-2654(24400) - Observational Techniq</a>	4pm to 5pm
Thu Oct 8, 2020	 <a href="https://ufl.instructure.com/calendar?event_id=1562600&amp;include_contexts=course_408712">AST6725C-2654(24400) - Observational Techniq</a>	5pm to 10pm
Tue Oct 13, 2020	 <a href="https://ufl.instructure.com/calendar?event_id=1562579&amp;include_contexts=course_408712">AST6725C-2654(24400) - Observational Techniq</a>	4pm to 5pm
Thu Oct 15, 2020	 <a href="https://ufl.instructure.com/calendar?event_id=1562601&amp;include_contexts=course_408712">AST6725C-2654(24400) - Observational Techniq</a>	5pm to 10pm
Tue Oct 20, 2020	 <a href="https://ufl.instructure.com/calendar?event_id=1562580&amp;include_contexts=course_408712">AST6725C-2654(24400) - Observational Techniq</a>	4pm to 5pm
Thu Oct 22, 2020	 <a href="https://ufl.instructure.com/calendar?event_id=1562602&amp;include_contexts=course_408712">AST6725C-2654(24400) - Observational Techniq</a>	5pm to 10pm
Tue Oct 27, 2020	 <a href="https://ufl.instructure.com/calendar?event_id=1562581&amp;include_contexts=course_408712">AST6725C-2654(24400) - Observational Techniq</a>	4pm to 5pm
Thu Oct 29, 2020	 <a href="https://ufl.instructure.com/calendar?event_id=1562603&amp;include_contexts=course_408712">AST6725C-2654(24400) - Observational Techniq</a>	5pm to 10pm

Date	Details	
Tue Nov 3, 2020	 <a href="https://ufl.instructure.com/calendar?event_id=1562582&amp;include_contexts=course_408712">AST6725C-2654(24400) - Observational Techniq</a> ( <a href="https://ufl.instructure.com/calendar?event_id=1562582&amp;include_contexts=course_408712">https://ufl.instructure.com/calendar?event_id=1562582&amp;include_contexts=course_408712</a> )	4pm to 5pm
Thu Nov 5, 2020	 <a href="https://ufl.instructure.com/calendar?event_id=1562604&amp;include_contexts=course_408712">AST6725C-2654(24400) - Observational Techniq</a> ( <a href="https://ufl.instructure.com/calendar?event_id=1562604&amp;include_contexts=course_408712">https://ufl.instructure.com/calendar?event_id=1562604&amp;include_contexts=course_408712</a> )	5pm to 10pm
Tue Nov 10, 2020	 <a href="https://ufl.instructure.com/calendar?event_id=1562583&amp;include_contexts=course_408712">AST6725C-2654(24400) - Observational Techniq</a> ( <a href="https://ufl.instructure.com/calendar?event_id=1562583&amp;include_contexts=course_408712">https://ufl.instructure.com/calendar?event_id=1562583&amp;include_contexts=course_408712</a> )	4pm to 5pm
Thu Nov 12, 2020	 <a href="https://ufl.instructure.com/calendar?event_id=1562605&amp;include_contexts=course_408712">AST6725C-2654(24400) - Observational Techniq</a> ( <a href="https://ufl.instructure.com/calendar?event_id=1562605&amp;include_contexts=course_408712">https://ufl.instructure.com/calendar?event_id=1562605&amp;include_contexts=course_408712</a> )	5pm to 10pm
Tue Nov 17, 2020	 <a href="https://ufl.instructure.com/calendar?event_id=1562584&amp;include_contexts=course_408712">AST6725C-2654(24400) - Observational Techniq</a> ( <a href="https://ufl.instructure.com/calendar?event_id=1562584&amp;include_contexts=course_408712">https://ufl.instructure.com/calendar?event_id=1562584&amp;include_contexts=course_408712</a> )	4pm to 5pm
Thu Nov 19, 2020	 <a href="https://ufl.instructure.com/calendar?event_id=1562606&amp;include_contexts=course_408712">AST6725C-2654(24400) - Observational Techniq</a> ( <a href="https://ufl.instructure.com/calendar?event_id=1562606&amp;include_contexts=course_408712">https://ufl.instructure.com/calendar?event_id=1562606&amp;include_contexts=course_408712</a> )	5pm to 10pm
Tue Nov 24, 2020	 <a href="https://ufl.instructure.com/calendar?event_id=1562585&amp;include_contexts=course_408712">AST6725C-2654(24400) - Observational Techniq</a> ( <a href="https://ufl.instructure.com/calendar?event_id=1562585&amp;include_contexts=course_408712">https://ufl.instructure.com/calendar?event_id=1562585&amp;include_contexts=course_408712</a> )	4pm to 5pm
Thu Nov 26, 2020	 <a href="https://ufl.instructure.com/calendar?event_id=1562607&amp;include_contexts=course_408712">AST6725C-2654(24400) - Observational Techniq</a> ( <a href="https://ufl.instructure.com/calendar?event_id=1562607&amp;include_contexts=course_408712">https://ufl.instructure.com/calendar?event_id=1562607&amp;include_contexts=course_408712</a> )	5pm to 10pm
Tue Dec 1, 2020	 <a href="https://ufl.instructure.com/calendar?event_id=1562586&amp;include_contexts=course_408712">AST6725C-2654(24400) - Observational Techniq</a> ( <a href="https://ufl.instructure.com/calendar?event_id=1562586&amp;include_contexts=course_408712">https://ufl.instructure.com/calendar?event_id=1562586&amp;include_contexts=course_408712</a> )	4pm to 5pm
Thu Dec 3, 2020	 <a href="https://ufl.instructure.com/calendar?event_id=1562608&amp;include_contexts=course_408712">AST6725C-2654(24400) - Observational Techniq</a> ( <a href="https://ufl.instructure.com/calendar?event_id=1562608&amp;include_contexts=course_408712">https://ufl.instructure.com/calendar?event_id=1562608&amp;include_contexts=course_408712</a> )	5pm to 10pm
Tue Dec 8, 2020	 <a href="https://ufl.instructure.com/calendar?event_id=1562587&amp;include_contexts=course_408712">AST6725C-2654(24400) - Observational Techniq</a> ( <a href="https://ufl.instructure.com/calendar?event_id=1562587&amp;include_contexts=course_408712">https://ufl.instructure.com/calendar?event_id=1562587&amp;include_contexts=course_408712</a> )	4pm to 5pm
Thu Dec 10, 2020	 <a href="https://ufl.instructure.com/calendar?event_id=1562609&amp;include_contexts=course_408712">AST6725C-2654(24400) - Observational Techniq</a> ( <a href="https://ufl.instructure.com/calendar?event_id=1562609&amp;include_contexts=course_408712">https://ufl.instructure.com/calendar?event_id=1562609&amp;include_contexts=course_408712</a> )	5pm to 10pm
Tue Dec 15, 2020	 <a href="https://ufl.instructure.com/calendar?event_id=1562588&amp;include_contexts=course_408712">AST6725C-2654(24400) - Observational Techniq</a> ( <a href="https://ufl.instructure.com/calendar?event_id=1562588&amp;include_contexts=course_408712">https://ufl.instructure.com/calendar?event_id=1562588&amp;include_contexts=course_408712</a> )	4pm to 5pm