

# *Astronomy 154: Stars, Galaxies, and Cosmology Lab*

Syllabus – Fall 2021

Lab Website: Canvas and UTK AstroLabs Website: [Lab Exercises Website](#) (currently out of date)

Additional Lab Website for Online Labs: NMSU's [GEAS Project](#) (This is a link)

**Required Download:** University of Nebraska, Lincoln [NAAP Astronomy Simulations](#)

## **Lab Instructors**

<b>Lab Section</b>	<b>T.A.</b>	<b>Email</b>	<b>Office &amp; Lab Report Review Hours</b>
<b>001</b> <b>Thursday</b> <b>3:10 - 5:05 pm</b>	<b>Colter Richardson</b>	<b>Cricha80@vols.u tk.edu</b>	
<b>002</b> <b>Thursday</b> <b>10:30 am - 12:25 pm</b>	<b>Benjamin Luna</b>	<b>bluna1@utk.edu</b>	
<b>003</b> <b>Thursday</b> <b>5:45 - 7:35 pm</b>	<b>Colter Richardson</b>	<b>Cricha80@vols.u tk.edu</b>	
<b>005</b> <b>Thursday</b> <b>12:50 - 2:45 pm</b>	<b>Daniel Murphy</b>	<b>rmurph16@vols. utk.edu</b>	

**Each lab class will be taught by one of the listed T.A.'s listed above. They are in charge of running their labs, so please give them the respect they deserve. The set of labs is standardized between all lab sections.**

**Instructor of Record:** Dr. Sean Lindsay, Astronomy Coordinator

· Email: [slindsay@utk.edu](mailto:slindsay@utk.edu)

Dr. Lindsay's Office Hours for Lab are by appointment. Email for scheduling. Please make use of your Lab Instructor's office hours before contacting him.

· The Instructor of Record is responsible for managing the laboratory room and instructors. They are also ultimately responsible for any materials reported to the university and arbitrating any disputes between laboratory instructor and student. You should contact him if you have any issues or questions.

## Course Description

Principles for interpretation of astronomy as a science and astronomical observations are reinforced in laboratory exercises. The content parallels the material covered in Astronomy 152 – Stars, Galaxies, and Cosmology. While the lecture focuses on general astronomy knowledge and concepts, the lab focuses on digging a bit deeper and engaging with the tougher concepts presented in lecture. As a natural science laboratory, emphasis is placed on investigation through the scientific method to discover how astronomers approach understanding the universe.

ASTR 152 and ASTR 154 must both be completed to earn credit for a single semester of laboratory-based astronomy.

***Satisfies General Education Requirement: (NS with lab) if taken with ASTR 152.***

*(Pre-/Co-) requisite(s): 152.*

### GEAS Login Credentials

The labs make use of the GEAS Project's plotting tools. These tools require a login and access code to use. For this lab course, you must use the following credentials:

**Username** (maybe be listed as Last Name): UTennK

**Access Code:** 0184

## Lab Class Policies

- You are expected to complete every lab report on time. If you think you will not be able to do so for a valid reason, you must contact your instructor to explain why you need an extension. In many cases, you will be asked for some form of proof for why you need an extension.
- Attendance is taken at every lab session. You must stay for the time indicated by your instructor.
- All labs count. No labs will be dropped.
- There are no make-up labs except in very extenuating circumstances. If you must miss a lab for one of these circumstances, contact your instructor ahead of the time you will miss the lab if possible. If it is a true emergency, once you and the emergency have settled down, please contact your instructor. In these cases, they will be happy to help you.
- Missing more than 300 points (equivalently 3 weeks worth of lab sessions) worth of lab reports due to absence/failure to turn in will result in a failing grade for the lab.
- You are expected to complete the T-lab portion of the course. This requires you to sign up and attend at least one telescope session. Sign up early and often. In cases where you are unlucky with multiple weather cancellations, alternatives to the traditional T-lab will be

considered (Do not bank on this policy. You have to provide evidence that you tried to attend a telescope session multiple times, but could not do the observations due to bad weather).

## Grade Categories and Weights

### Your grade in this lab is

- **80% completion of the lab reports associated with each lab.**
  - Two-week labs are worth twice the points as one-week labs
- **15% Attendance**
- **5% is completion of the Telescope Lab (T-lab). Attendance of session + lab report.**

## Schedule of Labs

**Lab materials are due before the start of your next lab session**

Date	Week No.	Lab	Link
18 - 20 August	Week 1	No Lab	
23 - 27 August	Week 2	Orientation with Instructor <b>Lab 1</b> Math Tools for Success in Astronomy	For Lab PDF see your Canvas page  <a href="#">Student Google Sheet</a>  Lab Report Template <a href="#">Link</a>
30 August - 3 September	Week 3	<b>Lab 2-</b> <i>Motions in the Sky with Stellarium</i>	<a href="#">UTK Astrolab Link</a> Lab Report Lab Template - <a href="#">Link</a>
7 - 10 September	Week 4	<b>Lab 3</b> <i>1<sup>st</sup> Week of Fundamentals of Measurement Error and Analysis.</i>	<a href="#">GEAS Lab 1</a>

13 - 17 September	Week 5	<b>Lab 3</b> 2 <sup>nd</sup> Week of Fundamentals of Measurement Error and Analysis.	
20 - 24 September	Week 6	<b>Lab 4</b> Working with the Thermal Radiation Laws	<p>UTK AstroLab <a href="#">PDF Link</a></p> <p>Lab Report Template <a href="#">Link</a></p> <p>Required <a href="#">Google Sheet Template</a></p>
27 - 29 September	Week 7 Fall Break	<b>--No ASTR 154 Lab--</b>	
4 - 8 October	Week 8	<b>Lab 5</b> - Exploring Spectroscopy	<p><a href="#">Lab PDF Link</a></p> <p>Template: To be created</p>
11 - 15 October	Week 9	<b>Lab 6</b> Intensity vs. Distance	<p><a href="#">Lab PDF Link</a></p> <p>Template: To be created</p>
18 - 22 October	Week 10	<b>Lab 7</b> Parallax Measurements and Determining Distances	<a href="#">GEAS Lab 5</a>
25 - 29 October	Week 11	<b>Lab 8</b> - Hertzsprung-Russell Diagrams Lab, Part 1: Stellar Spectral Classes & Learning the HR Diagram	<p><a href="#">UTK Astrolab Link – HR1</a></p> <p>Google Response Forms</p> <p>Nimmitha <a href="#">002</a></p>

			<p>Fennig  <a href="#">001</a>  <a href="#">004</a></p> <p>Ternullo  <a href="#">003</a>  <a href="#">005</a></p> <p>Lab Report  Template <a href="#">Link</a></p>
1 - 5 November	Week 12	<b>Lab 9</b> - Hertzsprung-Russell Diagrams 2: The Power of the HR Diagram	<p><a href="#">UTK Astrolab</a>  <a href="#">Link to Lab 7</a></p> <p>Spectral  Classification &amp;  Temperatures  Spreadsheet  <a href="#">Link</a></p> <p>Lab Report  Template <a href="#">Link</a></p>
8 - 12 November	Week 13	<b>Lab 10</b> <i>1<sup>st</sup> Week of Hubble's Law  and Cosmic Distances</i>	<a href="#">GEAS Lab 7</a>
15 - 19 November	Week 14	<b>Lab 10</b> <i>2<sup>nd</sup> Week of Hubble's Law  and Cosmic Distances</i>	
22 & 23 November	Week 15 Thanksgivi ng Break	--- No ASTR 154 Lab ---	
29 November - 1 December	Week 16	--- No ASTR 154 Lab ---	

## Format of Astronomy Labs

You will have an in-person lab once per week on your scheduled lab date.

The general procedure for labs will be:

- Your Lab Instructor will introduce you to the week's lab/activities. They will provide background information and a description of the what you need to do to complete the in-lab portion of the lab
- Some labs take TWO WEEKS to complete. For these TWO WEEK LABS, you will have a First Week Update that is due before you start the second week.
  - **Updates for the halfway point through two week labs and complete lab reports are due at 10 pm (Eastern Time) the night before your lab.**
  - One Week Labs are worth 100 points; Two Week Labs are worth 200 points. Your First Week Update during Two Week Labs is worth 25 of those 200 points.
- You are expected to stay until you have been dismissed by the instructor. Often, you will be given instructions and then will work on the lab materials collaboratively. Your Lab Instructor will provide guidance and assistance while you work on completing the lab. You will gain the most out of the lab by asking for help when you need it!
- After the session, you will continue to work on your lab report at your own pace. As you answer the required questions for the week, you will receive feedback via comments in the margins from your instructor. You can add comments to your Google Doc lab report by hovering your cursor over the right hand edge of the document. To help make sure your Instructor is aware of the comment on your Google Doc, please tag the instructor by @'ing them.
  - Have questions about the lab or want to see if you are doing something correctly? Add a comment in the margins of your Google Doc for your instructor.
  - Your instructor will set times when they will be reviewing comments. That way you know when to have your comments posted by and when to expect feedback.
  - Dr. Lindsay's suggestion is to add comments early and often. That gives your instructor time to assist. It also notifies them that you are working on the lab, and therefore, they will likely check to give you needed feedback more often.

## Lab Resources and Information

### Lab Manuals

We make use of two different lab manuals for Astronomy Labs. Links to all specific labs conducted this semester are provided in the Schedule of Labs above. All materials will be posted

in a lab-by-lab format on Canvas as well. The goal is to have Canvas be a single resource for you to gain access to all materials.

**Lab Manual 1:** The University of Tennessee, Department of Physics and astronomy Astronomy Lab Manual. This manual is available on our website:

<http://astrolab.phys.utk.edu/LabExercises.php>

**Lab Manual 2:** New Mexico State University's GEAS Project. This manual is available at

<http://astronomy.nmsu.edu/geas/oview/labs.shtml>

- This NASA and NSF funded public astronomy lab resource is used by students around the world. It is designed to offer quality astronomy lab exercises in a remote learning situation. The project started in 2013, and it has had several years of vetting to become one of the best astronomy education resources available.

### **Lab Materials and Technology**

Lab materials for this course will be provided to you during labs. You are not required to do any additional purchases.

The class makes use of Google Drive and Docs, for which UTK provides accounts for every student and faculty member. Some of the labs have Microsoft Excel Spreadsheets. You are not required to download/purchase/install any other specialized software. All of our software is already installed on our Astronomy Lab computers. We realize that not everyone has access to Microsoft products – any spreadsheet, including Google Sheets will work.

<b><u>Grading Scale</u></b>	
<b>Grade</b>	<b>Score (%)</b>
A	> 90.00
A-	89.50 - 89.99
B+	87.50 – 89.49
B	80.00 – 87.49
B-	79.50 - 79.99
C+	77.50 – 79.49
C	70.00 – 77.49

C-	69.50 - 69.99
D+	67.50 – 69.49
D	60.00 – 67.49
D-	59.50 - 59.99
F	< 59.50

## Telescope Lab (T-labs)

### **Telescopic Observations:**

For Fall 2021, we plan to conduct telescope labs. Due to the 4th wave of Covid-19 pandemic, we may terminate these sessions according to university and Physics and Astronomy Department guidance/regulations.

- You must sign-up for a telescope session to attend. Your Lab Instructor will give you instructions on how to sign up
- For the telescope sessions, you will report to Room 108 at the indicated time. You will be given an orientation and instructions on how the T-lab session will be conducted. After orientation, a Telescope Teaching Assistant will bring you to the rooftop.
- T-Lab Telescope Sessions include three types of observations
  - a. **Naked-eye Observations.** You will learn how to find Polaris, the North Star, as well as learn a few constellations and planets (if they are up).
  - b. **Eye-piece Observations.** You will observe celestial objects through a telescope equipped with an eye-piece. We will have safety precautions in place.
  - c. **CCD Camera Observations/Data Collection.** You will take a series of black-and-white and color photographs of celestial objects.

### **Alternative to Telescopic Observations:**

Dr. Lindsay is aware and empathetic that not all students will feel comfortable and safe with any gathering, including telescopic observations with every precaution we can think of in place. For those who feel unsafe with telescope observations, please inform your instructor early in the semester. We will not consider end of the semester reports of “I didn’t feel safe,” being used as a blanket excuse for those who simply failed to complete their T-Labs. For those who truly feel unsafe, we will offer you an alternative simulated T-Lab Observations Lab using the free software Stellarium. Details on this assignment will be given if they are requested.

## **University Coronavirus Policy**

Until otherwise notified, masks are required for all in-person class/lab activities. This is the current University of Tennessee policy, and it will be enforced. If you are not wearing a mask in the lab, you will be given the opportunity to put one on. If you do not, you will be asked to leave the class. Failure to do so will result in a report to Student Conduct and the dismissal of class.

Testing, screening, and contact tracing information: [Link](#)

- The University provides free Covid-19 testing, and can provide you with a free at home Everlywell Covid-19 test.
- Health screening is available at [selfscreen.utk.edu](https://selfscreen.utk.edu) or through the Tennessee app.

Coping and Support Services: [Link](#)

- If you are struggling with your mental health, please consider availing yourself of the services provided by UTK. Please also feel free to reach out to Dr. Lindsay ([slindsay@utk.edu](mailto:slindsay@utk.edu)) and your Lab Instructor if you are comfortable with doing so. We are here to help, and we will be happy to work with you if you are struggling. Letting us know early makes it easier for us to consider how to move forward. We will do what we can to help you succeed.

Quarantine & Isolation Information: [Link](#)

## **UTK's COVID-19 Guidelines**

With the spread of the Delta variant of COVID-19, students, faculty, and staff will be required to wear masks in classrooms, labs, and for indoor academic events required for students such as orientation. This requirement will remain in place until conditions improve and the university communicates new instructions.

The university strongly recommends that all members of the campus community be vaccinated for their own protection, to prevent disruption to the semester, and to prevent the spread of COVID-19. Vaccination information and appointment signups are available at [tiny.utk.edu/vaccine](https://tiny.utk.edu/vaccine). The Student Health Center medical staff is available to students to answer questions or discuss concerns about vaccines, and the center provides vaccines free of charge for anyone 18 years or older who would like one.

If you think you are sick or have been exposed to COVID-19, you should contact the Student Health Center or your preferred health care provider. You can also contact the university's COVID-19 support team for guidance by filling out the COVID-19 self-isolation form at [covidform.utk.edu](https://covidform.utk.edu).

You must not attend class if you have tested positive for COVID-19 and are in the isolation period, if you have COVID-19 symptoms and have not been cleared by a medical provider, or if you are an unvaccinated close contact in the quarantine period.

If you need to miss class for illness, [INSERT INFO FOR CONTACTING THE INSTRUCTOR].

You can find more information and updates at [utk.edu/coronavirus](http://utk.edu/coronavirus).

## **University Civility Statement**

Civility is genuine respect and regard for others: politeness, consideration, tact, good manners, graciousness, cordiality, affability, amiability and courteousness. Civility enhances academic freedom and integrity and is a prerequisite to the free exchange of ideas and knowledge in the learning community. Our community consists of students, faculty, staff, alumni, and campus visitors. Community members affect each other's well-being and have a shared interest in creating and sustaining an environment where all community members and their points of view are valued and respected. Affirming the value of each member of the university community, the campus asks that all its members adhere to the principles of civility and community adopted by the campus: <http://civility.utk.edu/>.

**Online Civility:** We will be operating online this semester. Students are expected to behave in a civil manner on Canvas discussion boards and in interactions with assigned lab partners. Sexist, racist, and other inappropriate language and behavior in violation of the University Civility Statement will not be tolerated. Severe violations will be treated as a violation of the Student Code of Conduct and reported to the Office of Student Conduct.

## **Academic Integrity Pledge**

“An essential feature of the University of Tennessee, Knoxville is a commitment to maintaining an atmosphere of intellectual integrity and academic honesty. As a student of the university, I pledge that I will neither knowingly give nor receive any inappropriate assistance in academic work, thus affirming my own personal commitment to honor and integrity.”

The goal of this lab is to offer a different learning environment that depends on students being honest with their engagement and not cheating. You will be offered ample opportunity to arrive at answers to the lab questions that will earn you full credit. Please choose that route in your efforts this semester and hopefully grow as a student and in your scientific ability.

## **Disability Statement**

Any student who feels he or she may need an accommodation based on the impact of a disability should contact the Student Disability Services (SDS) at 865-974-6087 at 915 Volunteer Blvd in 100 Dunford Hall to document their eligibility for services. SDS will work with students and faculty to coordinate reasonable accommodations for students with documented disabilities.