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

**Syllabus – Fall 2022**
**Lab Website**: Canvas
**Astronomy Lab Room**: Nielsen Physics Room 108
**Additional Lab Website for Online Labs**: NMSU's GEAS Project (This is a link)
**Required Download:** University of Nebraska, Lincoln NAAP Astronomy Simulations
**Telescope Lab Sign-Up Sheets**: *To be created when T-labs begin*

| Lab Section | Lab Instructor | Email | Office & Lab Report Review Hours |
|---|---|---|---|
| **001**<br>**Thursday**<br>**3:00 - 4:55 pm** | **Nil Mukherjee** | nmukher2@vols.utk.edu | ***Office:*** |
| **002**<br>**Thursday**<br>**10:20 am - 12:15 pm** | **Chris Howard** | chowar45@vols.utk.edu | ***Office:*** |
| **003**<br>**Thursday**<br>**5:40 - 7:35 pm** | **Chris Howard** | chowar45@vols.utk.edu | ***Office:*** |
| **004**<br>**Friday**<br>**10:20 am - 12:15 pm** | **Nil Mukherjee** | nmukher2@vols.utk.edu | ***Office:*** |
| **005**<br>**Thursday**<br>**12:40 - 2:35 pm** | **Daniel Murphy** | rmurph16@vols.utk.edu | ***Office:*** |

**Each lab class will be taught by one of the lab instructors 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

Dr. Lindsay's Office Hours for the astronomy labs are by appointment. Email him for scheduling any meetings with him. Please make use of your Lab Instructor's office hours and/or email inbox 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.

## 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

## 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.*

## Lab Class Policies

- **You are expected to complete every lab report on time. Lab reports are due at 11:59 pm one week from when you had the lab (except in cases of holidays or two-week labs).** 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 most 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. Leaving the lab early without permission will result in your being marked absent.

- **All labs count.** No labs will be dropped.
- We cannot guarantee make-up labs, but we will try to have make-up sessions at the end of the semester. We understand that some of you will miss labs for legitimate reasons over the course of the semester. If it is a true emergency, please contact your instructor letting them know what has happened (you can be vague in cases where privacy is important). In these cases, they will be happy to help you.
- **Four unexcused absences** will result in an automatic failure of this lab.
    - **You will be sent a warning after missing 3 labs**
- **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).
    - If you sign up for 3 or more T-lab sessions that are canceled, you will be offered a make-up

## Grade Categories and Weights

**Your grade in this lab is**

- **70% is lab reports associated with each lab.**
    - Two-week labs are worth twice the points as one-week labs
- **15% Attendance**
- **10% is a full write-up scientific lab report on the Parallax Lab.**
- **5% is the Telescope Lab (T-lab).**

## Excused & Unexcused Absence Policies

Excused absences require a Dean of Students Excused Absence notification from the University. You can submit your information to them here: https://dos.utk.edu/absence-notifications/

- If you have an excused absence, you will be given an opportunity to make up the lab. Since each lab has its own set up requirements, you will get make-up instructions from your instructor.
- If you have an unexcused absence, you will not get attendance points for that day. You may ask your instructor for permission to complete as much of the lab as you can on your own. In this case, you will be awarded 60% of what you earn.

# Schedule of Labs

**Lab materials are due at 11:59 pm Eastern Time one week after the lab.**

| Date | Week No. | Lab (See Your Canvas Page for Lab Materials) | Date |
|---|---|---|---|
| 24 - 26 Aug. | Week 1 | — No ASTR 154 Labs — | 24 - 26 Aug. |
| 29 - 2 Sept. | Week 2 | — No ASTR 154 Labs —<br>Due to Thursday Night Vols Game | 29 - 2 Sept. |
| 6 - 9 Sept | Week 3 | ASTR 154 Orientation with Lab Instructor<br>+<br>**Lab 1 - *The Planetarium Lab:*** *Our Current Night Skies* | 6 - 9 Sept |
| 12 - 16 Sept | Week 4 | **Lab 2- *Motions in the Sky with Stellarium*** | 12 - 16 Sept |
| 19 - 23 Sept | Week 5 | **Lab 3 - *Scientific Data Analysis Using Excel*** | 19 - 23 Sept |
| 26 - 30 Sept | Week 6 | **Lab 4 - *1st Week of* Fundamentals of Measurement Error and Analysis.** | 26 - 30 Sept |
| 3 - 5 Oct | Week 7 | **— No ASTR 154 Labs —**<br>**Fall Break** | 3 - 5 Oct |
| 10 - 14 Oct | Week 8 | **Lab 4 - 2nd *Week of* Fundamentals of Measurement Error and Analysis.** | 10 - 14 Oct |
| 17 - 21 Oct | Week 9 | **Lab 5 - *Working with the Thermal Radiation Laws (A154 version)*** | 17 - 21 Oct |

| | | | |
|---|---|---|---|
| 24 - 28 Oct | Week 10 | **Lab 6 - *Exploring Spectroscopy*** | 24 - 28 Oct |
| 31 Oct - 4 Nov | Week 11 | **Lab 7 - *Intensity vs Distance*** | 31 Oct - 4 Nov |
| 7 - 11 Nov | Week 12 | **Lab 8 - *Parallax Measurements and Determine Distances*** | 7 - 11 Nov |
| 14 - 18 Nov | Week 13 | **Lab 9** - ***Hertzsprung-Russell (HR) Diagrams Lab Part 1 - Stellar Spectral Classes*** | 14 - 18 Nov |
| 21 & 22 Nov | Week 14 | **Lab 10 -** ***Hertzsprung-Russell (HR) Diagrams Lab Part 2 - Spectroscopic Parallax*** **+** ***Introduce Full Parallax Lab Report*** | 21 & 22 Nov |
| 28 Nov - 2 Dec | Week 15 | **— No ASTR 154 Labs —** *Thanksgiving Holiday* | 28 Nov - 2 Dec |
| 5 - 7 Dec | Week 16 | **Working on Parallax Lab Report** **Parallax Lab Report Due by Friday, 2 Dec.** | 5 - 7 Dec |
| | | **Make-up Lab Week if available** | |

## 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 11:59 pm (Eastern Time) one week after 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 and PDF digital copies to all labs conducted this semester are provided to you on your lab's Canvas page.** 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 via your lab's Canvas page

**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.

| **Grading Scale** | |
|---|---|
| **Grade** | **Score (%)** |
| 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 Spring 2022, we plan to conduct telescope labs. Due to the Omicron 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 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.

In cases of cheating, the lab instructor, and Instructor of Record (Dr. Lindsay) will agree upon a grade penalty in proportion to the degree of violation. All evidence of the event will be gathered, documented, and the student will be informed of the accusation and recommended penalty. After the student responds with an explanation, if the matter still is a case of cheating, all documentation will be reported to the office of Student Conduct and Community Standards for official investigation. We will then act in accordance with the findings of their investigation. Grade penalties may range from 0 on the lab report to failure of the entire lab class.

## Disability Statement

The University of Tennessee, Knoxville, is committed to providing an inclusive learning environment for all students. If you anticipate or experience a barrier in this course due to a chronic health condition, a learning, hearing, neurological, mental health, vision, physical, or other kind of disability, or a temporary injury, you are encouraged to contact Student Disability Services (SDS) at 865-974-6087 or sds@utk.edu. An SDS Coordinator will meet with you to develop a plan to ensure you have equitable access to this course. If you are already registered with SDS, please contact your instructor to discuss implementing accommodations included in your course access letter.