Astronomy 153: A Journey Through the Solar System Lab

Syllabus – Spring 2020
Lab Website: astrolab.phys.utk.edu
Astronomy Lab Room: Nielsen Physics Building - Room 108

Lab Instructors

T.A.	Email	Lab Sections	Tutoring Hour
Aaron Lackey-Stewart	**alackeys@vols.utk.edu**	001: M 10:10 am – 12:05 pm 002: M 2:30 – 4:25 pm	
Noah Crum	**ncrum@vols.utk.edu**	003: M 4:40 – 6:35 pm 004: M 12:20 – 2:15 pm	

Each lab class will be taught by one of the listed T.A.'s. 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
  Office Hours: (Nielsen Physics Room 215) Tuesday & Thursday: 2 – 5 pm
- 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.
- The Instructor of Record is not frequently in the individual lab classes

Course Description

Principles for interpretation of astronomy as a science and astronomical observations are reinforced in laboratory. The content parallels the material covered in Astronomy 151 – A Journey Through the Solar System. 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 151 and ASTR 153 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 151.
(RE) Corequisite(s): 151.

Lab Resources and Information

Lab Manual

All of the labs are available on our website: astrolab.phys.utk.edu. Students are expected to read the labs prior to showing up for each week's meeting. If it becomes apparent that you are not coming to class prepared, pre-lab questions or reading quizzes will be assigned. The bulk of the work is done in lab, but I (Dr. Lindsay) am currently building in take-home questions that will accompany each lab to reinforce the course material. All lab materials will be provided to you.

The Three Lab Reports

A critical part of engaging in science is communicating how experiments were performed, what data was collected, what results were found, and putting those results in larger context. In the professional science world, this is done through publishing scientific articles in peer-reviewed journals. In this class, we will simulate the professional process by having three lab reports, which will cover the basic content required of scientific writing. The reports should be clearly written without an excessive amount of fluff. The general rule of science writing is every sentence and every word count.

The three lab reports required in this lab are:

1. **The Lunar Observation Lab Report**
   - The Lunar Observation Lab Report will summarize the observations you made for the out-of-class Lunar Observation Lab. You are required to describe how you made your observations, a summary of all the observations, and a reflection on how the observations relate to the material you learned in the Phases of the Moon Lab.
   - A rubric of what to included will be available on the Astrolab website.
2. **Telescope Lab Report 1: Naked-eye Observations**
   - This is the first of the Telescope Lab reports. In this report, you will describe the naked-eye observations you made to create your own sky map for observing on the rooftop of Nielsen Physics and Astronomy Building. You will compare the sky map you made during the T-lab to one for our latitude at the time of observation, one two months before or after your observation, and one for the equator (a different latitude). You will discuss the effects of light pollution, how the sky changes with latitude, and how the sky changes throughout the year.
   - A rubric of what to included will be available on the Astrolab website.
3. **Telescope Lab Report 2: Telescopic Observations**
   - This is the second of the Telescope Lab reports. In this report, you will describe the observations you made with our telescopes, including both the eye-piece observations, the black-and-white CCD images, and the color CCD images. You will do research on five of the objects you observed and write up what you learn about those objects.
   - A rubric of what to included will be available on the Astrolab website.

ASTR 153 Final Grading Scale	
Grade	**Score (%)**
A	> 90.0
B+	87.5 – 89.9
B	80.0 – 87.4
C+	77.5 – 79.9
C	70.0 – 77.4
D+	67.5 – 70.0
D	60.0 – 67.4
F	< 60.0

ASTR 153 Grade Rubric	
% of Grade	**Course Component**
70%	In-Class Labs
5%	Lunar Observation Lab
5%	LOL Lab Report
10%	Telescope Lab Session
5%	T-lab: Naked Eye Report
5%	T-lab: Telescope Obs. Report

Class Policies & Procedures

- **ATTENDANCE POLICY:** ***Students are required to be present for every lab. Missing three or more labs will result in failure of this lab section.***
- All labs can be found at astrolab.phys.utk.edu.
- No late work will be accepted more than one week after the set due date for completed labs.
- Food and drink are not allowed in room 108 or on the roof.
- No cell phones out during class. Put away and on silent.
- Be on time for class; tardiness will result in difficulty in completing labs in a timely fashion. Late arrivals to T-Labs will not be admitted to the roof and will need to reschedule.
    - Repeated offenses of tardiness will result in grade penalties to the lab of the day.
- It is difficult to set up some of the labs to allow a single student to make up a lab they missed with an excused absence. Instead of a make-up lab, excused absences will excuse you from having that lab material counted in the calculation of your final average.
- Your lowest, non-zero lab grade will be dropped

In-Class Labs (70% of Grade)

We will have 11 in-class labs this semester. Attendance and remaining for the entire lab session are required to receive credit. Missing THREE or more in-class labs will result in an automatically failure of the lab course. Make up labs are only available in certain circumstances that do not include regular illness, Greek events, tardiness due to traffic or accidents, work-conflicts, disciplinary action, and family emergencies. If you have extreme circumstances of any of those (e.g., extreme illness or death in the family) that result in missing one or more lab, please contact your lab instructor and Dr. Lindsay, the Instructor of Record. Given the circumstances, you may qualify for a make-up lab (if possible) or a dropped zero for the missed lab session.

The 11 in-class labs are designed to reinforce the tougher concepts covered in lab. As much as possible, Dr. Lindsay has attempted to make the labs as hands on as possible that get you engaged with how astronomers approach understanding the universe. Some of the labs simulate how astronomers obtain data and interpret observations, while others have you go through core concepts or historical observations. The Scientific Measurements & Data lab focuses on a fundamental process of science itself: data collection and interpretation of that data.

A schedule of the in-class labs is given below:

Schedule of Labs for Fall 2019

Week	Meeting Number	Lab Title
8 - 10 Jan	No Labs	----
13 - 17 Jan	1	Unit Conversion & Scaling
20 - 24 Jan	No Labs	----
27 - 31 Jan	2	Tools for the Night Sky
3 - 7 Feb	3	Scientific Measurement & Data
10 - 14 Feb	4	Phases of the Moon
17 - 21 Feb	5	Kepler's Laws
24 - 28 Feb	6	Thermal Radiation Laws - Planets
2 - 6 March	7	Spectroscopy
9 - 13 March	8	Extrasolar Planets
16 - 20 March		----
23- 27 March	9	Orbit of Mercury 1
30 March - 3 April	10	Orbit of Mercury 2
6 - 10 April	11	Astrophotography
13 - 17 April	No Labs	----
20 - 24 April	No Labs	T-lab Reports Due

Telescope Laboratories (20% of Lab Grade)

Part of this course includes participation in our Telescope Labs (T-Labs). The lab portion of this course requirement involves taking part in naked-eye and telescope observations from our Rooftop Observing Platform, located on the rooftop of the Nielsen Physics and Astronomy Building. You should have completed all work required to our first lab "Tools of the Night Sky" before you sign up for a T-Lab session.

T-Lab Sessions will be made available a few weeks after the beginning of the course. We run sessions for 6-7 weeks picking the nights that look best suited to the weather on a week-by-week basis. Sign-up sheets will be posted at least 24 hours prior to a session.

You must sign-up for the T-Lab sessions. The sign-up sheets will be made available to you via Google Forms linked on the Astrolab website.

YOU MUST ATTEND AT LEAST ONE T-LAB SESSION THIS SEMESTER!

The T-Lab Session

You will meet at the posted time in the Astronomy Laboratory, Room 108 in Nielsen Physics and Astronomy for the T-Lab Sessions. All required materials will be given to you at this time.

The T-Lab Session is broken into two primary components: Naked-Eye Observations and Telescopic Observations. Each one of these T-Lab Session components requires a written Lab Report to be turned in at the end of the semester.

The Naked-Eye Observations component will have you identifying common constellations and asterisms observable from Knoxville, TN. You will also be instructed on how to locate the star Polaris (a.k.a., The North Star) so you can always find North and be able to determine your latitude on Earth. During this part of the T-Lab session, you will create your own "Sky Chart" to the best of your ability. Located near downtown Knoxville, and Neyland Stadium, our observing location is heavily influenced by light pollution. You will compare your sky chart to an official sky chart to make comments on the effects of light pollution on astronomical observations for the written lab report, "T-lab: Naked Eye Report."

The Telescopic Observations component will have you using our telescopes to observe astronomical objects. As you will learn in class and this lab, what is observable changes based on the time of year, but the common targets include planets, star clusters, planetary nebulae, supernova remnants, and galaxies. You will make observations both by looking through a telescope eye-piece and using CCD cameras mounted to the telescope for astrophotography and/or photometric data collection. For each observation, you will identify the object and make a drawing of what you observed. Later, you will have to look up the RA and Dec. coordinates of the object observed and do a bit of background research on what the object is. A summary of how the observations were made and details on the objects observed comprises the written lab report, "T-lab: Telescope Obs. Report," for the Telescopic Observations component of the T-Labs

T-Lab Policies and Advice to Students

- T-lab sign-up forms are posted on the Astrolab website.
- Signing up and then not showing up for 2 T-lab sessions without an excuse will result in your receiving a 0 for the T-lab Activity.
- Signing up as early in the semester as possible is highly recommended as East TN weather is not known for great astronomy. Nights that are cancelled due to weather do not count against you in any way, but you will need to try again on another night.
- **Do not be late!** Late students will meet a locked door. Bring a flash drive to store images and a jacket to keep warm. If you cannot come on the night that you signed up for, send an email to Mu-Hung Chang (mchang8@vols.utk.edu). If weather conditions force us to cancel night-time observations on the night that you signed up for, sign up for another night.

Lunar Observation Labs (10% of Grade)

The Lunar Observation Lab (LOL) is an outside-of-class lab that requires you to make a series of observations of the Moon over a 2 to 3-week period. The LOL will be assigned after you have completed the "Phases of the Moon" in-class lab.

Your lunar observations will be made in a systematic way. After the LOL is assigned, you will make at least EIGHT observations of the Moon noting its location in the sky and its phase. For the observations, you will pick a time of day to make your observations at for every observation that you make. To the best

of your ability, you will face DUE SOUTH for your observations at your time. Your TA will aid you in picking a time to make the observations because when the Moon is up depends on what phase it is in. A goal of this lab is to get you familiar with when the Moon is up given its phase.

At least SIX of EIGHT of your observations need to be on nights when you can locate the Moon. The weather in East TN is known for being cloudy. If it is cloudy, try making your observation an hour later than normal. If it is still cloudy, you can report that as a CLOUDY night.

The time the Moon rises and sets depends on the phase of the Moon. You may reach a point in your observations when the Moon has not yet risen or has already set at your observation time. If this is the case, report MOON HAS NOT RISEN or MOON HAS SET as your observation and determine a new time to make the remainder of your observations. Note the change in your observation time on your LOL Observation Sheet marked with MOON HAS NOT RISEN or MOON HAS SET.

You can report MOON HAS NOT RISEN, MOON HAS SET, or CLOUDY for a maximum of TWO of your EIGHT observations.

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/.

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."

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.