

ASTR1115L: Introduction to Astronomy Lab Spring 2021
(Labs overseen by Prof. Jessica Dowell, jldowell@unm.edu)

Spring 2021 TAs:

Your TA is your course instructor. You should feel free to contact your TA regarding any questions that you have about the class materials, assignments, or grading. If you have questions regarding registration issues, grade mode/drops, or other issues that your TA is unable to answer, please contact Dr. Dowell, the lab coordinator.

Sara Jeffries, sjeffreys@unm.edu (Sections 006 and 007)
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Course Description

Welcome to ASTR1115L online.

The main goal of this lab is for students to discover how astronomers use physics and observations with telescopes to gain an understanding of how the universe works. To that end, you will learn the process of doing astronomical observations, measurements, and analysis, applying many physics concepts that arise in astronomy. The class is divided into weekly modules, which generally consist of computer-based labs. You will also be required to carry out projects involving naked-eye observations. Please read all the information here carefully, and check it before contacting me or your TA with questions.

Course Objectives

The course objectives below are taken from the UNM core course assessment that is mandated by department. Each lab, and the Discussion Forums, will have specific learning objectives listed on the Overview Page for the weekly module. The activities in each weekly module are developed so that you can demonstrate that you have met these objectives:

Objective 1: Knowledge of Basic Laws of Physics Related to Astronomy and Use of Units

Students will be able to demonstrate that they can use basic laws of physics related to astronomy to estimate answers to various problems, and recognize metric units and the correct units in which to measure various astronomical properties. Addresses NM HED Area III competency 2 and 4: Solve problems scientifically. Apply quantitative analysis to scientific problems including showing familiarity with the metric system.

Objective 2: Basic Astronomical Phenomena

Students will be able to explain basic everyday concepts like seasons, the rising and the setting of the Moon and its appearance, and our place in the universe, and a recognition of valid explanations of these phenomena. Addresses NM HED Area III competency 3. Communication of scientific information.

Objective 3: Origin and Nature of the Universe

Students will be able to summarize the theory of the origin and nature of the universe--- subjects with relevance to contemporary societal issues. Addresses NM HED Area II competency 3 and 5. Communicate scientific information. Apply scientific thinking to real world problems.

Prerequisites and Corequisites

Pre- or corequisite: ASTR 1115 online or otherwise

Specific Course Requirements

Please note that Astronomy 101L is a math-based course. It is much more math-intensive than the lecture, and you will be doing many calculations. You will be expected to know algebra and geometry, and you will be making use of it in nearly every class. If you cannot solve the equation below for x , you will have a great deal of difficulty passing this class:

$$5x - 3 = 7$$

Many questions will ask you to compare two numbers. This means understanding their ratio. It does not mean subtracting one from the other. For instance, in comparing the mass of Jupiter with the mass of the Earth, we are asking how many times more massive is Jupiter than the Earth (the answer is 318 times).

You will also be making many measurements of physical quantities and doing calculations with them. It is important to understand the units of each measurement, and to be able to convert between different units. For instance, you may be asked:

“If two galaxies approach each other at 1000 km/s and they are 1 million parsecs apart, how long (in years) will it take them to collide?”

First convert parsecs to km (such conversions you will learn): a parsec is 3.1×10^{13} km, so 1 million parsecs is 3.1×10^{19} km. Since velocity equals distance divided by time, divide this

distance by 1000 km/s to get 3.1×10^{16} seconds, which when converted to years is about 100 million years.

If you are having trouble following this calculation, please contact your TA. You will also be using math equations in physical contexts. For instance, you should know how to answer the following problems:

If a car goes 5 miles in 10 minutes, what is its average speed in miles per hour? If a car travels at 10 miles per hour for 6 minutes, how many miles does it go?

Finally, you will need a ruler and a calculator.

Technical Skills

In order to participate and succeed in this class, you will need to be able to perform the following basic technical tasks:

- Use UNM Learn (help documentation located in "How to Use Learn" link on left course menu, and also at <http://online.unm.edu/help/learn/students/>).
- Use a web browser
- Download, save, print and upload PDF files.
- Download files for use in online applets.

Technical Requirements

Computer:

- A high speed Internet connection is highly recommended.
- Supported browsers include: Internet Explorer, Firefox, and Safari.
- Detailed Supported Browsers and Operating Systems:
<http://online.unm.edu/help/learn/students/>
- Any computer capable of running a recently updated web browser should be sufficient to access your online course. However, bear in mind that processor speed, amount of RAM and Internet connection speed can greatly affect performance.
- Many locations offer free high-speed Internet access including UNM's Computer Pods.
- Microsoft Office products are not needed but are available free for all UNM students (more information on the UNM IT Software Distribution and Downloads page:
<http://it.unm.edu/software/index.html>)

For UNM Learn Technical Support: (505) 277-0857 or use the "Create a Support Ticket" link in your course.

Tracking Course Activity: UNM Learn automatically records all students' activities including your first and last access to the course, the pages you have accessed, the number of discussion messages you have read and sent, web conferencing, discussion text, and posted discussion topics. This data can be accessed by the instructor to evaluate class participation and to identify students having difficulty.

Textbook and Supplementary Materials

There are no required textbooks.

Your Introduction to Astronomy textbook (whichever one is used) can be useful for background material. A link to a free online introductory textbook is included on the Course Information page in case you don't have one anymore.

Coursework and Participation

Instructor Response Time: Your TA instructor's main role is to provide you with help understanding the concepts presented in the labs. You should not hesitate to contact your TA with your questions! Use the Course Message tool or email to contact your TA. It is your TA's responsibility to you that you shouldn't have to wait more than 24 hours during the week or 48 hours on weekends for a response. Labs should generally be graded within one week of the due date.

Live Lab Sessions and How to Get Help:

You will be allowed to work on the lab material at your own pace; however, live sessions with your TA instructor will be held in Zoom each week during a portion of the scheduled class time window. These sessions will last approximately an hour. Please see the schedule posted in UNM Learn for times. Please note that if for some reason you are not able to attend the session with your TA, you are welcome to attend any of the other scheduled sessions with another TA. During these live sessions, the TA will provide a short intro to the concepts discussed in the lab. Following the TA's introduction, you have the option to work on the lab for the remainder of the time, and the TA will be available to answer questions and provide assistance in real time. You may also use this time to connect with other students in the class and work together with a lab partner. Attendance for the live sessions will be recorded but will not be required; however, attendance is **very strongly** recommended for success in the course.

There are also other resources available if you need help in the lab. CAPS at UNM offers free tutoring to students. The Physics department also provides free tutoring sessions with our astronomy graduate students. Links to these resources will be available in Learn. Last but not least, don't hesitate to contact your TA if you are struggling – they are there to answer your questions!

If you have questions about your grade or accommodations and need to have a confidential conversation with your TA, please contact them by email to request a Zoom appointment. Please note that for privacy and security reasons, you should use your UNM email for all correspondence. TAs will not respond to requests for confidential information from external email addresses.

Procedures for Completing Coursework: The course consists of 15 laboratory modules, Lab 0 to Lab 14

❖ There is also a Discussion Forum that runs all term. As mentioned above, each week's module contains an Overview which describes what you will be studying, what the learning goals are and how they relate to the above Objectives, and links for the labs due that week and the Discussion Forum.

Labs and Discussion Board

Labs

Check the Schedule for the lab due dates, but typically one lab is assigned every week and is due at the end of the weekend. In the first week, read about the Observing Projects in Lab 0 (see below), and start planning for them. The labs will become visible to you two weeks in advance of their due date (so you can get ahead a bit if you want), and remain visible after their due date (for reference).

To start a lab, click on the link within the weekly module. You will see a Table of Contents on the left side of the page, where there will be links to an Introduction, the Problems page for this lab, and the lab content itself. The lab content includes the reading you need to do and the questions you will need to answer.

To record your answers, you must click on the Problems link and enter them there. Click on "Save Answer" after answering each question. Be careful not to close the problems tab until you are finished and want to submit or your answers may be lost and you will have to re-enter your answers. Check your work carefully. There is no time limit except the due date for the lab, so you can return to the lab later in the week if you want. When you are ready to finish, click on "Save and Submit". After that, you cannot change your answers.

All of the material needed to answer the questions should be in the labs, but you are of course welcome to consult other sources, such as the ASTR 1115 textbook if you are taking the lecture class, or the free one mentioned above. You will also find a useful Reference Sheet on the Course Information page that contains a summary of some of the fundamental mathematical concepts and equations that will arise in most of the labs.

Of course, please ask for help! The lab TAs will also be available during the live lab sessions and through email, and will be providing weekly feedback on the lab problems that students had

the most difficulty with, in order to address misunderstandings and misconceptions. Pay particular attention to Lab 0 – Observing Projects. It describes two observing projects that you must do. Observing Project 1 is due three weeks into the class and Observing Project 2 is due near the end of the semester. These involve naked-eye observations that can be done from anywhere, BUT YOU NEED TO PLAN YOUR TIME IN CASE YOU RUN INTO PERIODS OF BAD WEATHER!

For Observing Project 2, you need to do just one of the four possible projects. For the exact due dates of the Observing Projects, check the Schedule document. Look at the Observing Projects carefully and decide which ones you want to do and plan your time! Sheets you need to fill out for the Observing Projects are provided in Learn. You will need to upload your completed pages in .pdf or .jpeg format using the “Submit Observing Projects” link (see Lab 0 for details). Lab 0 also has a brief set of Problems to do that are due the end of the first week.

If you run into a technical problem (such as a Learn crash) that prevents you from completing the lab at any time during the week, create a Support Ticket (see Course Menu) and send your TA a Course Message right away, and they can give you another chance once the problem is fixed. I recommend for the first lab that you start the process early so that you have time to fix any problems that might occur.

Late Lab Policy

You will be expected to complete all of the assigned labs for the semester, and you should turn in all assigned work on time. However, it is understood that sometimes circumstances beyond your control will prevent you from completing a lab before the due date. Consequently, each student will be given two “late passes” for the semester. Using a late pass will allow you to turn in a lab after the due date with no grade penalty. After you have used your final late pass, all late work will receive a zero.

In order to use a late pass, you should submit your lab assignment in Learn, and then you must email your TA to let them know that you wish to use a late pass. Please include the name of the assignment in your message. Your TA will keep track of the number of late passes that you use. You are responsible for notifying your TA. If you do not notify your TA about the submission of a late lab, it may not be graded and you may receive a zero. **The absolute final deadline for submitting ALL late work and for notifying your TA of late submissions is Friday, May 7th at midnight.** No late work will be accepted after this deadline.

It is fine to work with someone else on the labs but make sure that each person is contributing substantially to the effort. And each person should do their own calculations. Many questions require written answers. Make sure that these are in your own words---this is how we learn. No proctoring will be used in this class.

Discussion Forums

There is an initial, ungraded discussion forum which gives you a chance to introduce yourself to the class. Why are you taking the class and what are you majoring/might you major in? Feel free to respond to each other's posts.

As this lab is about astronomical observations, the main discussion forum focuses on forefront telescopes and observations. For telescopes, start a thread by writing a post about a current or future forefront telescope. Get credit for a post by describing some of its capabilities in terms of the following:

- ❖ angular resolution
- ❖ what part of the spectrum does/will it observe
- ❖ what kinds of objects emit in that part of the spectrum
- ❖ how faint an object can/will it see?
- ❖ does/will it do imaging, spectroscopy, or both?
- ❖ ground-based or space-based (or even balloon based)?

You don't have to address all of these but just ones you find interesting and accurate information on. You can get credit by replying to a post if you address questions above that haven't been addressed in previous posts. Note that more than one post can address such questions by adding new information.

For observations, write a post about an astronomy observation you read about in the news. Try to give a good background and put it into context.

- ❖ what telescope was used and why?
- ❖ what can you find out about the instrument used on the telescope?
- ❖ what questions were the astronomers trying to address?
- ❖ what is new about the discovery?

Note that "telescope" can be interpreted broadly to include facilities such as gravitational wave detectors.

You must make two posts during the term to this forum. To get credit (and there is no partial credit), posts must be "substantial" ---i.e. at least 100 words, and reflect that you have done some real research into the telescope or that you have understood the observation. Your instructor is good at detecting "filler." If you don't get credit for a substantial post, you can try

again as often as you want until you get credit for two. Grading is described in Grading Procedures below. This forum is available all semester (check the closing date in the Schedule). The forum addresses Objectives 1 and 3.

Here are examples of insubstantial and substantial contributions for an observation:

Insubstantial: “I read about a project which found that the Milky Way is warped, not flat”

Substantial: “I read about a project which found that the Milky Way is warped, not flat. The astronomers used observations of a class of stars called Cepheids, observed with NASA’s Wide-Field Infrared Survey Explorer satellite. It used infrared cameras to image essentially the whole sky and found over a thousand Cepheids in the outskirts of the galaxy. They wanted to study the shape of the layer of stars in the galaxy to see if it is flat or warped. The Cepheids showed that the stellar layer is warped, like the layer of gas. But now they have characterized the warp better because the location of each Cepheid can be very well determined.”

This post provides information about the discovery, the telescope and instrument, and why it is new and important. Your TA will be providing feedback on your posts. As I’m sure you will find good items to write about, this feedback will be mostly positive!

Assignments

The Discussion Forum is open all term. Please see the Schedule and the weekly Overview pages for more details. Weekly lab assignments are given below:

Week 1:

Lab 0 – Observing Projects (*note due dates for Observing Projects 1 and 2*)

Week 2:

Lab 1 – Foundations

Week 3:

Lab 2 – Properties of Planets

Week 4:

Lab 3 – Kepler’s Laws

Week 5:

Lab 4 – Parallax

Week 6:

Lab 5 – Astro-Photometry and Imaging

Week 7:

Lab 6 – Spectra and Atoms

Week 8:

Take a break week! – Nothing Due

Week 9:

Lab 7 – Properties of Stars (plus tutorial)

Week 10:

Lab 8 – Stellar Evolution

Week 11:

Lab 9 – Binary Stars

Week 12:

Lab 10 – Star Clusters and the Milky Way

Week 13:

Lab 11 – Galaxies & Cepheids

Week 14:

Lab 12 – Cosmology

Week 15:

Thanksgiving Week – Nothing Due

Week 16:

Lab 13 – Quasars

Lab 14 – Extraterrestrial Life

Week 17 (Finals Week):

There is no final for this lab and nothing is due.

Expectations for Participation

- ❖ students are expected to spend 3-5 hours per week on this class
- ❖ students are expected to learn how to navigate in Learn
- ❖ students are expected to keep abreast of course announcements
- ❖ students are expected to use the Learn course messages as opposed to regular email
- ❖ students are expected to keep instructor informed of class related problems, or problems that may prevent the student from full participation
- ❖ students are expected to address technical problems immediately
- ❖ students are expected to observe course netiquette at all times

Netiquette

In following with the UNM Student Handbook, all students will show respect to their fellow students and instructor when interacting in this course. Take Netiquette suggestions seriously. Flaming is considered a serious violation and will be dealt with promptly. Postings that do not reflect respect will be taken down immediately.

This course encourages different perspectives related to such factors as gender, race, nationality, ethnicity, sexual orientation, religion, and other relevant cultural identities. The course seeks to foster understanding and inclusiveness related to such diverse perspectives and ways of communicating.

Link to Netiquette document: <http://online.unm.edu/help/learn/students/pdf/discussion-netiquette.pdf>

Grading Procedures

Most of the 15 lab quizzes are worth 100 points. Labs 3, 4 and 5 are worth 50 points each. Lab 7 is worth 70 points, but there is an additional tutorial worth 30 points. Point values of individual questions can be seen in each quiz.

The Observing Projects are worth a total of 300 points. Rubrics for grading these are included in the Week 1 module.

Each substantial (see above) post you make in the discussion forum is worth 50 points, up to a maximum of 100 for the class. This means that you need to make two substantial posts over the entire class to get the maximum possible score. They can be in either forum and at any time. You can have as many attempts as you like to make a substantial post. Of course, I hope you continue to contribute posts after you reach 100 points, although there is no extra credit. This all adds up to a total of 1750 points. Grading is on a standard scale, i.e. 97-100% = A+, 93-97% = A, 90-93% = A-, etc.

You will be able to see your grade on the problems, and see all the correct answers, once the due date has passed and they have been graded. We expect to have this done by one week after the due date. Discussion forum posts will be graded once a week.

UNM Policies

Title IX: Gender Discrimination

In an effort to meet obligations under Title IX, UNM faculty, Teaching Assistants, and Graduate Assistants are considered “responsible employees” by the Department of Education (see pg. 15 <http://www2.ed.gov/about/offices/list/ocr/docs/qa-201404-title-ix.pdf>). This designation requires that any report of gender discrimination which includes sexual harassment, sexual misconduct and sexual violence made to a faculty member, TA, or GA must be reported to the Title IX Coordinator at the Office of Equal Opportunity (oeo.unm.edu). For more information on the campus policy regarding sexual misconduct, see: <https://policy.unm.edu/university-policies/2000/2740.html>

Copyright Issues

All materials in this course fall under copyright laws and should not be downloaded, distributed, or used by students for any purpose outside this course.

Accessibility

The American with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodations of their disabilities. If you have a disability requiring accommodation, please contact the UNM Accessibility Resource Center in 2021 Mesa Vista Hall at 277-3506 or <http://arc.unm.edu/>. Information about your disability is confidential.

- Blackboard’s Accessibility statement: <http://www.blackboard.com/accessibility.aspx>

- Mastering: <https://support.pearson.com/getsupport/s/article/Mastering-Accessibility-for-Userswith-Disabilities>
- Microsoft: <https://www.microsoft.com/enable/microsoft/mission.aspx>

Academic Misconduct

You should be familiar with UNM's Policy on Academic Dishonesty and the Student Code of Conduct which outline academic misconduct defined as plagiarism, cheating, fabrication, or facilitating any such act.

Drop Policy:

Students who have not completed any work after the first three weeks will be dropped (i.e. receive a grade of W). Students who complete less than 30% of the labs by the end of the term will also be dropped.

UNM Policies: This course falls under all UNM policies for last day to drop courses, etc. Please see <http://www.unm.edu/studentinfo.html> or the UNM Course Catalog for information on UNM services and policies. Please see the UNM academic calendar for course dates, the last day to drop courses without penalty, and for financial disenrollment dates.

UNM Resources

There are a variety of ways UNM supports students academically in their classes. Please visit <http://sstrio.unm.edu/>.

UNM's CAPS, the Center for Academic Program Support, also offers free online tutoring for introductory astronomy. Online services include the Online Writing Lab, Chatting with or asking a question of a Tutor. See <http://caps.unm.edu/services/online-tutoring/index.php>.

UNM Libraries

<http://library.unm.edu/>

Student Health & Counseling (SHAC) Online Services

<http://online.unm.edu/help/learn/support/shac>