

INTRODUCTION TO ASTRONOMY

Meeting Times: MWF 12:30pm - 1:45pm | **Where:** WEL 2.246 | **Unique Number:** 48235

How can I contact my professor or TAs?

Professor:

Dr. Keely Finkelstein
Dept. of Astronomy
Office: PMA 16.206
My pronouns: she/her/hers

Email: keelyf@astro.as.utexas.edu

Instructor Weekly Drop-In

Hours: Wednesdays
11:30-12:30 (*in-person or via zoom*); Thursdays 2-3pm (*in-person*); or by appt.

TAs:

Arun Narayanan
Email: arun.n@utexas.edu
Office / Drop-In hours: TBD

Vignesh Sankaran
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Office / Drop-In hours: TBD

See Canvas Calendar for details & zoom links when available.

Welcome to AST 301!

Welcome to AST 301. I'm so glad you're here.

I would like to take a few moments to share some insight on the purpose of this course. We hope to foster a supportive and intellectually stimulating environment for learning more about astronomy and the universe around us. As a student in this course, you will be expected to master a decent amount of information about the ideas and scientific practices that take place in Astronomy. We have worked hard to ensure that you have ample opportunities to work through these concepts with peers and instructors, while learning from any mistakes or confusions that occur along the way. I want you to know that I firmly believe everyone here has the potential to do well and succeed in this class. Some of you will already be familiar with some of this material, and for others of you it may be largely new. But ALL of you can do well and learn this material.

I look forward to getting to know you and working with you throughout the semester.

- Prof. Keely Finkelstein

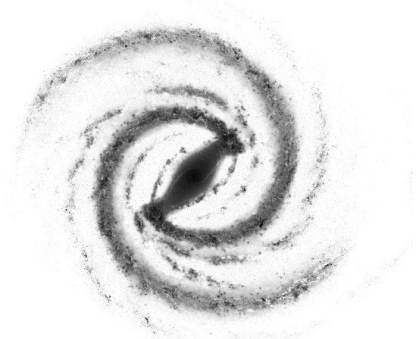


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What are the Required Materials?

Textbooks: We will use two textbooks for AST 301:

1.) "Learning Astronomy By Doing Astronomy", Palen & Larson - 4th Edition. This book is available through the Longhorn Textbook Access (LTA) program. You can access this book through the "My Textbooks" tab in Canvas, as well as Canvas modules. More information about the LTA program is available at: <https://www.universitycoop.com/longhorn-textbook-access#>

The e-textbook comes with access to an online learning platform, Smartworks - which we will be using for weekly mini HW's.

2.) "Astronomy" from OpenStax, And good news, this second textbook is available for free online, in web view and PDF format! www.openstax.org/details/astronomy

You will also be able to access it on Canvas.

Devices:

Bring a device with you to class each day, to be able to access the e-workbook and In-class response system. We will be using a system through Canvas, called **InstaPoll**. Be prepared to answer polling questions in real time during class.

What is this course about?

This course is an introductory survey course into general Astronomy. Topics will cover everything from stars, planets, and galaxies. We will focus on conceptual understanding, rather than memorization of facts, although you do need to remember some fundamental ones. You will learn how science works, and develop critical thinking skills while you gain insight into how the Universe works. You will use physical, quantitative, and graphical models to explain and understand natural phenomena in the cosmos. These skills should help you understand news about incredible scientific discoveries, whether they are true, or just a hoax.

Astronomy is an observational science. This class will discuss how observations are made, discussion of "natural phenomena" and some of the needed ideas from physics to help us understand these observations. We will also introduce many of the areas of physics necessary to appreciate the origin and evolution of stars, planets, and galaxies.

This course carries the *Quantitative Reasoning flag*. Quantitative Reasoning courses are designed to equip you with skills that are necessary for understanding the types of quantitative arguments you will regularly encounter in your adult and professional life. You should therefore expect a substantial portion of your grade to come from your use of quantitative skills to analyze real-world problems.

Course Learning Objectives:

Core course themes and learning objectives are centered around the following, and *by the end of the semester you will be able to:*

Theme: Cosmic perspective, specifically:

- Demonstrate an understanding of the nature, scope, and evolution of the Universe, and where the Earth and Solar

Course Website:

Canvas page for this course:

Where can I find... ?

Canvas will have the following:

1. Lecture slides
2. Weekly reading assignments / modules
3. Weekly Check for Understanding Quizzes
4. List of Learning Objectives
5. Course Assignments (access to SmartWorks) / Projects
6. Gradebook
7. Important Announcements
8. Access to the ebooks (Workbook & main course textbook)



Canvas will always be our main form of communication, so please make sure to check it regularly and stay up to date on assignments and communications.

System fit in.

- Demonstrate an understanding of related subjects / content (e.g., gravity, light, spectra) and use “tools” from related subjects such as mathematics and physics.
- Use critical thinking and quantitative reasoning skills, and gain an understanding of the importance of them in the broader context of the scientific process and scientific theory.

Theme: Gravity and Motions of the Sky, specifically:

- Apply Kepler's laws in our Solar System and other planetary systems.
- Discuss objects in the night sky and explain how its appearance changes with time and position on Earth.
- Explain the origin of seasons on Earth.
- Examine phases of the moon using models.
- Predict a phase of the moon, or times related to a specific moon phase based on the model.
- Apply Newton's laws of motion and universal law of gravity to common examples, and explain reasoning.
- Be able to reason about magnitude and direction of forces acting on bodies due to the force of gravity.

Theme: An understanding of Stars and Stellar Evolution, specifically:

- Use a Hertzsprung-Russell diagram to describe a given stellar population.
- Explain the origin of elements heavier than helium.
- Describe the death of stars for a range of masses.
- Analyze spectra of different objects and compare their temperatures.
- Combine knowledge of Wien's Law and the Stefan-Boltzmann Law to analyze spectra and estimate the relative sizes of two stars.

Theme: Cosmology: From the Big Bang to the Present Day, specifically:

- Discuss evidence for the Big Bang.
- Describe dark matter and dark energy and articulate the differences between the two.
- Identify different types of galaxies, and discuss how galaxies form and evolve.

Theme: Possibilities and implications of life in the Universe, specifically:

- List necessary ingredients for life.
- Determine if a planet is in the habitable zone.

Content / Lecture Delivery:

- The pre-class content and materials will be shared with you as readings and some pre-recorded mini videos. These will be assigned to you as weekly module content and posted in the Modules section on Canvas.
- After reading the material and watching the video(s) there will be a short “Check for Understanding” set of questions.
 - Note: ***Class recordings are reserved only for the use of members of this class (students, TAs, and the instructor) and only for educational purposes. Recordings should not be shared outside the class in any form.***
- ***Class Meet-Ups:*** We will meet in-person during our regularly scheduled class times, TTh 12:30 - 2pm.
 - We will use some of the class time to work in small groups on the assigned activities from your workbook and answer practice problems with Instapoll (part of your Course Participation grade).
 - You will have the opportunity to ask your peers, your TAs, and me questions about the material both at regular class time, and at other times (*Drop-In Hours*). See Canvas for scheduled meetings and available times.

General Class Information and Expectations:

Class Format:

AST 301 will be taught in-person in Fall of 2023. Attendance in each class is expected, however if you occasionally need to miss class you can catch up through the posted materials, and there are a number of built in drops for class participation.

Expectations for students in the classroom environment:

Environment: I am committed to providing you with a friendly, productive, and effective learning. There are things that you can do to help with this:

- ***Participate:*** Active, engaged participation from students is extremely important in both environments! You are expected to participate in group discussions, work through problems yourself and in groups, and avoid distractions during class. This helps make the class learning environment more productive and enjoyable for everyone!
- ***Expectations regarding mutual respect:*** Astronomy belongs to all people, independent of race, religion, gender, gender identity, gender expression, or sexual orientation. Incidents of discrimination, assault, harassment, threats, intimidation, profiling, or coercion based on membership or perceived membership will not be tolerated. Show each other respect no matter perceived knowledge or performance in this class, or any other.
- ***Questions During Class:*** I'm always happy to take questions during lecture; please don't hesitate to volunteer, ask a question when something is unclear *you are likely not alone*.

How is my performance in this class assessed?

There will be 3 unit exams. The exams will consist of short answer problems and multiple choice questions, and will be given in class (see schedule). We will also have weekly reading quiz checks (through Canvas), In-class Activities (with pre & post activity questions accessed via SmartWorks through Canvas), and Instapoll Voting questions to provide feedback on your progress between exams.

There are also three course projects that will be due throughout the semester, and each are somewhat different in format: a Moon Journal, an Observing Project, and a Citizen Science Project.

Your final course grade will be determined as follows:

40% - 3 unit exams None of the unit exams are cumulative. All three exams must be taken and will count towards the 40% of your course grade. However, you will have the option to replace one of your three exams by taking the optional final exam. The optional final exam will be cumulative and will be weighted the same amount as one unit exam. If you choose to take the final, then your best 3 out of 4 exams will count towards the total exam grade.

10% - Weekly Canvas Module Checks For Understanding (drop 2 of -14) - There will be short mini quizzes conducted through Canvas each week, as a check for your understanding of the presented Module materials and readings.

25% - Participation & In-Class Activity Questions - Class participation and class activity assessments will have two components: (1) In-class with: Instapoll during regular class meet-ups - 10%. You can miss up to three full class days of participation without penalty. (2) Completing both the pre-activity and post-activity questions that accompany the class workbook activities - 15%.

25% - Class Projects, each project is weighted the same amount, and all are required. See details for each project on Canvas.

- 1.) Citizen Science Project - due Oct. 5th
- 2.) Moon Journal - due Dec. 2nd
- 3.) Observing Project - due Dec. 5th

What is the grading scale?

93 - 100	A
90 - 92.9	A-
87 - 89.9	B+
83 - 86.9	B
80 - 82.9	B-
77 - 79.9	C+
73 - 76.9	C
70 - 72.9	C-
67 - 69.9	D+
63 - 66.9	D
60 - 62.9	D-
< 59.9	F

Course Policies: What are other policies on exams, assignments, and other course structure?

- **Unit Exams:** Conducted in-class roughly every ~4 weeks, will cover the material presented in class, and in weekly modules over that time period. Exams will be 45-minute in-class exams. The class period before each exam there will be an in-class review activity for part of the class.

- **Weekly Module Checks for Understanding:** You are allowed to miss **two** Canvas module Check for Understanding “quizzes” without penalty. Late assignments will not be accepted. Your lowest two module quiz scores will automatically be dropped. These weekly Quizzes will be part of the weekly assigned modules on Canvas, and will help you assess that you understand the information covered in the module.
- **Class Meet-UP times:** Most Lecture Content will be delivered ahead of these meetings as readings and some pre-recorded videos that you will need to watch on your own. We will then use the class meeting times to practice problems, using the Learning Astronomy by Doing Astronomy work book. We will work in small groups to answer questions.
- **Class Participation / Weekly Assignments and Activities:** There are two components for your course participation / class activities grade:
 - Complete the pre- and post-activity assignment questions that accompany each workbook activity that we do in class. These will be assigned through **Smartworks, and will be accessed through “Assignments” in Canvas**. The pre-activity questions should be completed before each class, and typically you will have time in class after doing the group work to complete the post activity questions. These questions will also serve as good study / practice problems for the exams.
 - We will also use the **Canvas Instapoll in-class voting tool** for in-class participation, and progress / feedback on your group work. You must be in person to access and receive participation credit through Instapoll for these questions, but you will be allowed to miss up to three full class participation sets without penalty. We will randomly spot check attendance if you are found to have answered Instapoll questions while not being in class you will not receive credit for those questions. This is also considered a form of academic dishonesty and may be reported to the Dean of Students.
- **Course Projects:** There are three required course projects that will be assigned throughout the semester. You can get started on them at any point, but they will be somewhat spaced out and have different deadlines. Due dates and more details for each project can be found on Canvas.
 - 1.) **Citizen Science Project - Assignment details:** You will have the opportunity to engage with real astronomical data through the zooniverse.org platform. You will choose your own astronomy / space-themed project from a selection of ongoing science project for which to contribute to. You will document your classifications / tasks, and reflect on the process.
 - 2.) **Observing Project - Assignment details:** To do this, you will get to visit the telescope on the roof of Painter Hall during one of the Friday and Saturday night public viewing events, or the roof of PMA during one of the Wednesday night events. Information on these events can be found here: <http://outreach.as.utexas.edu/public/viewing.html> You will then hand in a double spaced, two page summary of what you observed, including details of time of observation, and a researched report of your object. You will make a sketch of the object and include that in your report. You must also include proof of attendance, which can be obtained by the telescope operator. Full details to include

in this report are listed in the Canvas Assignment Details for this project. *I suggest that you start early, as these events are not held during cloudy / bad weather nights!*

- 3.) **Moon Journal - Assignment details:** Go outside find and sketch the Moon for at least ten (10) clear nights over the space of one month. Draw the phase as accurately as you can and include any nearby stars or planets. Do not forget to label the phase (waxing/ waning, new/quarter/full) for each drawing. Make sure you give the time of the observation, as well as the location of the moon in the coordinate system of your choice (i.e., high in the southern sky, low in the SW, etc.). Create a booklet of your drawings to turn in to complete your assignment.

Where can I find University and Course Resources?

- **Academic accommodations - Disability & Access (D&A):** This class respects and welcomes students of all backgrounds, identities, and abilities. If there are circumstances that make our learning environment and activities difficult, if you have medical information that you need to share with me, or if you need specific arrangements in case the building needs to be evacuated, please let me know. I am committed to creating an effective learning environment for all students, but I can only do so if you discuss your needs with me as early as possible. I promise to maintain the confidentiality of these discussions. Any student with a documented disability who requires academic accommodations should contact Services for Students with Disabilities at 471-6259 (voice) or 512-410-6644 (Video Phone) as soon as possible to request an official letter outlining authorized accommodations. For more information, visit: <https://diversity.utexas.edu/disability/current-students/> I am happy to meet in-person or virtually over Zoom to discuss more.
- **Counseling and Mental Health Center:** Do your best to maintain a healthy lifestyle this semester by eating well, exercising, getting enough sleep and taking some time to relax. This will help you achieve your goals and cope with stress. All of us benefit from support during times of struggle. You are not alone. There are many helpful resources available on campus and an important part of the college experience is learning how to ask for help. Asking for support sooner rather than later is often helpful. If you or anyone you know experiences any academic stress, difficult life events, or feelings like anxiety or depression, we strongly encourage you to seek support. <http://www.cmhc.utexas.edu/individualcounseling.html>
- **The Sanger Learning Center:** Did you know that more than one-third of UT undergraduate students use the Sanger Learning Center each year to improve their academic performance? All students are welcome to take advantage of Sanger Center's classes and workshops, private learning specialist appointments, peer academic coaching, and tutoring for more than 70 courses in 15 different subject areas (including Astronomy). For more information, please visit <http://www.utexas.edu/ugs/slc> or call 512-471-3614 (JES A332).

Frequently Asked Questions:

How do I succeed in this class?

Your success in this class is important to me. We all learn differently, and everyone struggles sometimes. You are never the only one having difficulty! If there are aspects of this course that prevent you from learning or exclude you, please let me know as soon as possible. Together we will develop strategies to meet both your needs and the requirements of the course.

One of the best ways to succeed is to prepare and participate. Do the modules ahead of time, and take the time to work through them in full. When in class, buy in and **participate!** The workbook is *your* textbook and you are the author. If you don't work hard on it, you won't have it to study from!

How do I study for the unit exams?

- 1) Study the class activities / workbook. Don't just read them, re-do them! Cover your old answers, then check your new answers against them. Work in a group if you can!
- 2) Go over the in-class PDFs, and practice the think-pair-share questions from class and weekly check for understanding quizzes on Canvas.
- 3) Re-read / re-watch the relevant module materials, determine concepts which you feel less secure on, find those concepts in the book, and read up.
- 4) Come to Drop-In Hours / Help Sessions!!!

I missed a unit exam, when can I make it up?

There are no makeup exams. However, you will have the opportunity to take the optional cumulative final that can replace one exam score. The only exception to this will be:

- 1) If you have a major life event, **and you notify me ahead of time**. Depending on the situation, I may ask you to contact Student Emergency Services for assistance.
- 2) I am contacted by Student Emergency Services, and they request a makeup.
- 3) You are absent for a university-sponsored event, **and** you notify me ahead of time.

I'm sick, and can't come to class today, what do I do?

Depending on the case / issue, you don't need to email me! Stay home and get better (you can miss 3-4 classes, and still receive a full participation grade). Still do the module materials (by week's end), and after class, download the PDF to see what you missed. Do the missed workbook activity, in a group if you can find some classmates, or on your own. If you have to miss multiple consecutive classes, please contact me and Student Emergency Services, and we can make a plan for missed classes.

Its two days before the moon journal is due, and I haven't started!

There's really nothing I can do to help you. Don't let this be you - make sure to start this early in the semester!

I got a zero in the gradebook for something I did or turned in!

We can make mistakes when inputting 100+ grades! If you believe there is a mistake in the gradebook, stay calm, just send myself or one of the TA's an email, and we'll be happy to help and check it out / fix it.

University Policies:

Academic integrity: Each student in the course is expected to abide by the University of Texas Honor Code: “As a student of The University of Texas at Austin, I shall abide by the core values of the University and uphold academic integrity.” Plagiarism is taken very seriously at UT. Therefore, if you use words or ideas that are not your own (or that you have used in previous class), you must cite your sources. Otherwise you will be guilty of plagiarism and subject to academic disciplinary action, including failure of the course. You are responsible for understanding UT’s Academic Honesty and the University Honor Code which can be found at the following web address: <https://deanofstudents.utexas.edu/conduct/standardsofconduct.php>

- **Sharing of Course Materials is Prohibited:** No materials used in this class, including, but not limited to, lecture hand-outs, videos, assessments (quizzes, exams, papers, projects, homework assignments), in-class materials, review sheets, and additional problem sets, may be shared online or with anyone outside of the class unless you have my explicit, written permission. Unauthorized sharing of materials promotes cheating. It is a violation of the University’s Student Honor Code and an act of academic dishonesty. I am well aware of the sites used for sharing materials, and any materials found online that are associated with you, or any suspected unauthorized sharing of materials, will be reported to Student Conduct and Academic Integrity in the Office of the Dean of Students. These reports can result in sanctions, including failure in the course.
- **Class Video Recordings:** Class recordings are reserved only for the use of members of this class (students, TAs, and the instructor) and only for educational purposes and are protected under FERPA. Recordings should not be shared outside the class in any form. Violation of this restriction could lead to Student Misconduct proceedings.

Personal or Family Emergencies: If you experience a personal or family emergency (death in the family, protracted sickness, serious mental health issues) that prevents you from attending an exam or forces you to miss multiple days of classes, contact Prof. Finkelstein, and you should also contact Student Emergency Services in the Office of the Dean of Students <http://deanofstudents.utexas.edu/emergency/>. They will work with you to communicate with your professors and let them know of your situation.

Core curriculum: This course may be used to fulfill three hours of the natural science and technology component of the university core curriculum and your successful participation addresses the following four core objectives established by the Texas Higher Education Coordinating Board: communication skills, critical thinking skills, teamwork, and empirical and quantitative skills.

Schedule of Topics / Due Dates (subject to some changes):

Dates	Topics & Synchronous Class Meeting Activities	Assignment Due Dates
Week 1 - Aug. 22 / 24	<i>Tuesday:</i> Intro/Overview, course goals; <i>Thursday:</i> activities on Celestial Sphere	Module 1 materials due Friday Aug. 25th
Week 2 - Aug. 29/ 31	<i>Tuesday:</i> Celestial Sphere cont. - Where on Earth; <i>Thursday:</i> Phases of the Moon	Module 2 Materials due Friday Sept. 1st
Week 3 - Sept. 5 / 7	<i>Tuesday & Thursday:</i> Kepler's Laws / Newton's Laws / Extraterrestrial Tourism	Module 3 Materials due Friday Sept. 8th
Week 4 - Sept. 12/14	<i>Tuesday:</i> Light & Spectra; <i>Thursday:</i> 51 Peg & review for Exam 1	
Week 5 - Sept. 19/21	<i>Tuesday:</i> Exam 1 + Planet Formation; <i>Thursday:</i> Planetary Climates	Exam 1 - Sept. 19
Week 6 - Sept. 26/28	<i>Tuesday:</i> Stars; <i>Thursday:</i> Distances to Stars	
Week 7 - Oct. 3/5	<i>Tuesday:</i> Sun's Evolution; <i>Thursday:</i> Stuff between Stars	Citizen Science Project due 10/5
Week 8 - Oct. 10/12	<i>Tuesday:</i> Crab Nebula; <i>Thursday:</i> Life cycle of Massive Stars + review for Exam 2	
Week 9 - Oct. 17/19	<i>Tuesday:</i> Exam 2 + star clusters; <i>Thursday:</i> Bent Space & Black Holes	Exam 2 - October 17
Week 10 - Oct. 24/26	<i>Tuesday:</i> Dark Matter; <i>Thursday:</i> Galaxies	
Week 11 - Oct. 31/ Nov. 2	<i>Tuesday;</i> <i>Thursday:</i> Hubble's Law & Age of the Universe	
Week 12 - Nov. 7/9	<i>Tuesday:</i> Gravitational Waves & Merging Black Holes; <i>Thursday:</i> Distant Galaxies	
Week 13 - Nov. 14/16	<i>Tuesday:</i> Super massive black hole in the Milky Way + review for Exam 3; <i>Thursday:</i> Exam 3 + Big Bang	Exam 3 - November 16
Week 14 - Nov. 20-24	<i>No Classes: Thanksgiving Break</i>	
Week 15 - Nov. 28/30	<i>Tuesday:</i> Big Bang; <i>Thursday:</i> Finding Habitable Worlds	Moon Journal due in class Thursday 11/30
Week 16 - Dec. 5 (last class day)	<i>Tuesday:</i> Cosmic Calendar + Wrapping up the semester Friday - December 8th - Optional Final (8am-10am)	Observing Project Due in class Tuesday 12/5; Optional Final exam - Friday 12/8 (8-10am)