

# INTRODUCTION TO ASTRONOMY

Meeting Times: MWF 10am - 10:50am | Room: PAI 3.02 | Unique Number: 46135

## How can I contact my professor or TAs?

### Professor:

Dr. Keely Finkelstein  
Dept. of Astronomy  
Office: PMA (RLM) 16.206

Email:  
[keelyf@astro.as.utexas.edu](mailto:keelyf@astro.as.utexas.edu)

### Instructor Weekly Help

**Sessions:** Wednesdays  
2:30 - 3:30pm, Thursdays  
12:30 - 1:30pm or by appt.  
in Dr. Finkelstein's office,  
PMA (RLM) 16.206

### TA: Jayanth

Raghavendraro

### Help Session Hours:

Tuesdays & Thursdays  
2-3pm PMA (RLM) TBD

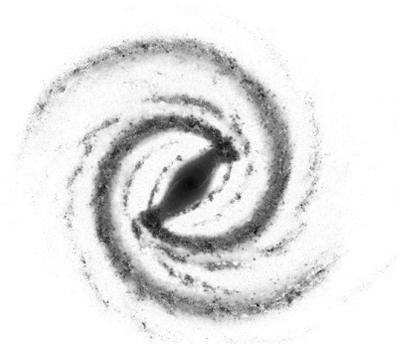
### TA: Ching-Da Wu

Help Session Hours: TBD

## 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.



## What are the Required Materials?

**Textbooks:** We will use two textbooks for AST 301: "Lecture Tutorials for Introductory Astronomy", Prather et al. 3rd Edition (this can be purchased at the Co-Op or online).

And good news: the second textbook, "Astronomy" from OpenStax, for this course is available for free online, in web view and PDF format!

[www.openstax.org/details/astronomy](http://www.openstax.org/details/astronomy)

It will also be available in PDF format on Canvas. You can also purchase a print version, if you prefer, via OpenStax on Amazon.com.

You can use whichever formats you want. **Web view** is recommended -- the responsive design works seamlessly on any device. If you buy on Amazon, make sure you use the link on your book page on openstax.org so you get the official OpenStax print version.

## Other Required / Recommended materials:

**In-class response system** - we will be using a system through Canvas, called **InstaPoll**. Be prepared to bring a device to class each day which will allow you to respond to instructor questions and get immediate feedback.

## Course Learning Objectives:

Core course themes and learning objectives are centered around the following, and *by the end of the semester students 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 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.
- Develop a model of the Sun's annual path through the observer's sky.
- 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

## Course Website:

Canvas page for this course:

[https://  
utexas.instructure.com/  
courses/1239367](https://utexas.instructure.com/courses/1239367)

## Where can I find... ?

Canvas will have the following:

1. Lecture slides
2. Weekly reading assignments / modules
3. Weekly quizzes
4. List of Learning Objectives
5. HW assignments
6. Gradebook
7. Important Announcements
8. Access to the ebook (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.*

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.

## What is expected of me in this class?

- Complete the weekly online reading assignments and quizzes.
- Attend class and participate! Work collaboratively in groups in class on the assigned lecture tutorials.
- Look over the Learning Objectives for each class
- Practice and complete the assigned Homework Problems. You will have access to the answers and explanations in Canvas
- Review the material covered in Lecture (see Lecture slides) and in the Lecture Tutorials.

## What happens in Lecture?

- You will prepare for every class by doing the assigned reading and practice quiz problems, as needed.
- Every class meeting has specific Learning Objectives associated with it. We will focus on these Learning Objectives during Lecture Class time.
- During class, I will talk about key aspects of the Learning Objectives, and you will solve problems and answer questions using Canvas.
- You will have the opportunity to ask your peers, your TA, and me questions about the material.
- Note that while web-enabled devices are required for the course (to use Canvas InstaPoll response system), I expect you to stay focused on the class content. If you use the device for unapproved activity (texting, surfing, shopping!) will receive a

### 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

warning. A second violation will result in the loss of remaining Voting points for the semester since you will no longer be allowed to use your device to class.

- Lectures will be captured using the [Lecture Online System](#). You'll be able to review / re-watch the slides and lectures afterwards on Canvas. Links for the recordings will appear in the Lectures Online tab on the Canvas page for this class.

### How is my performance in this class assessed?

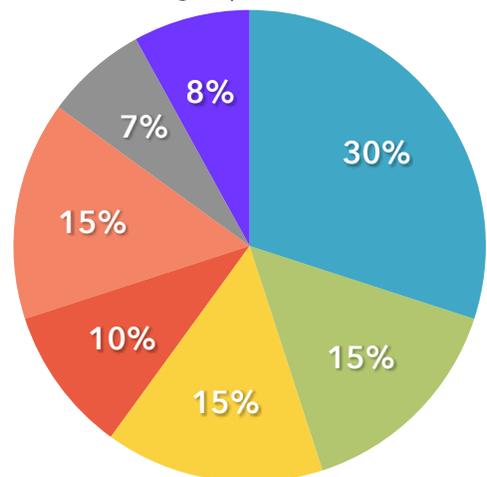
There will be 3 midterm exams, your lowest midterm will be dropped and your Midterm Exam course grade will be based on your two highest Midterm Exams. There will be a comprehensive Final Exam in the course which cannot be dropped. The midterm exams will consist of short answer problems and multiple choice questions, and will be given during class time (see schedule). The highest two midterm exam scores will be 30% of your final course grade. The Final Exam score will be 15% of your final course grade. We will also have weekly quizzes, in-class Lecture Tutorials, periodic HW assignments, and Canvas Voting questions to provide feedback on your progress between exams.

There are two other required assignments that will be due towards the end of the semester but can be turned in at any point in the semester: a Moon Journal and Observing Report.

### Your final course grade will be determined as follows:

- 30% - Combined score of the 2 out of 3 highest midterm grades (one midterm dropped automatically).
- 15% - Final Exam (cannot be dropped)
- 15% - Weekly Canvas Module Quizzes (drop 1 of -14)
- 10% - Canvas Voting / in class participation
- 15% - HW Assignments (drop 1 of -4)
- 7% - Moon Journal
- 8% - Astronomical Observing Report

- Midterm Exams - 2 Highest Scores
- Final Exam
- Canvas Module Quizzes
- Voting / In-class Participation
- HW
- Moon Journal
- Observing Report



## What are other policies on exams, assignments, and other course structure?

- **Midterm Exams:** According to UT policy, make-up exams may be given only if there is proper documentation of a UT-sanctioned reason (serious illness, death in the family, but not planned vacations, weddings, over-slept, etc). Please email Prof. Finkelstein to discuss.
- **Weekly Quizzes:** You are allowed to miss one quiz assignment without penalty. Late assignments will not be accepted. Your lowest quiz score will automatically be dropped. Quizzes will be part of the weekly assigned module on Canvas.
- **Lecture class participation:** We will be using the Canvas InstaPoll tool for in-class polling and participation. You will receive credit for this component by answering in-class think-pair-share questions through InstaPoll on your device. This grade will be calculated as an average of the grade for each class day, where each class' grade is equal to the percentage of questions you submit an answer to. Some fraction of the questions you will receive credit for just by answering, other questions you will only receive the points if you get the correct answer, but by being in class and discussions with peers you will have the opportunity to answer those questions correctly. Although makeup participation points will not allowed, I realize that you may need to occasionally miss class, or have a technical problem submitting a question. For this reason, Canvas will automatically drop your 3 lowest participation class grades. *As a reminder: Responding to the InstaPoll questions from outside the classroom is a form of academic fraud.*
- **Assigned HW:** HW will be assigned every 2-3 weeks. You are allowed to miss one HW assignment without penalty. Late assignments will not be accepted. Your lowest HW grade will automatically be dropped. You are encouraged to discuss the homework, however each student must do their own work: write it up in your own words, and turn in your own work.
- **Other required assignments:** Moon Journal and Astronomical Observing Report - both of these assignments are required and may not be dropped. Both assignments are due at the end of the semester no later than December 3rd, but can be turned in at any point. Late assignments will not be accepted.
  - **Moon Journal - Assignment details:** Go outside find and sketch the Moon for at least 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 turn it in to complete your assignment.
  - **Astronomical Observing:** To do this, you will need 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 (RLM) 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, where the object was in



the sky, and how you found the object. You will also research the object you observed, and include a discussion in your write-up. You must attach a sketch of the object and night sky around this object. 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 nights, and this assignment *will not be excused*.

- **Academic accommodations (SSD):** The university is committed to creating an accessible and inclusive learning environment consistent with university policy and federal and state law. Please let me know if you experience any barriers to learning so I can work with you to ensure you have equal opportunity to participate fully in this course. If you are a student with a disability, or think you may have a disability, and need accommodations please contact Services for Students with Disabilities (SSD). Please refer to SSD's website for contact and more information: <http://diversity.utexas.edu/disability/>. If you are already registered with SSD, please deliver your Accommodation Letter to me as early as possible in the semester so we can discuss your approved accommodations and needs in this course.
- **Course Conduct:** Please silence cell phones before you enter the classroom, no texting or using your cell phone during class except for use in classroom voting / response system. No cell phones may be present during any exam. Also, please do not pack up or leave class early unless you have talked to me in advance, as a consideration to me and your fellow students. If you bring a laptop computer, don't surf. If I see inappropriate laptop or cell phone behavior, I will have to amend these rules. Be respectful of others especially during in-class peer discussion times, even if you disagree with them.

## University Policy:

**Academic integrity:** The core values of The University of Texas at Austin are learning, discovery, freedom, leadership, individual opportunity, and responsibility. Each member of the university is expected to uphold these values through integrity, honesty, trust, fairness, and respect toward peers and community. Students who violate University rules on scholastic dishonesty are subject to disciplinary penalties. Ethical conduct is expected at all times. For example, answering Voting Questions to receive credit when you are not in class is unethical. Incidences of academic dishonesty will be reported to Student Judicial Services. For more specific information go to: <http://deanofstudents.utexas.edu/conduct/academicintegrity.php>.

- **Online Sharing of course materials:** You cannot share any assignment, handout, or document related to this class. Sharing any class materials online in any form, including lecture slides, homework and assignments you submitted, without my express approval is considered academic dishonesty. If something is found online which you have posted, you will be reported for academic dishonesty to S

**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 class, you should 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.

**Religious Days:** A student who is absent from a class or examination for the observance of a religious holy day will be permitted to make up the missed work, if notice is given at least fourteen days prior to such an absence.

**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	Reading & HW Assign.
Week 1 - Jan. 22/24	Intro/Overview, course goals, overview of the universe	Module 1 due Mon. Jan. 27th
Week 2 - Jan. 27/29/31	Motions of the Sky / The Ecliptic	Module 2 due Friday Jan. 31st
Week 3 - Feb. 3/5/7	Path of the Sun / Phases of the Moon	Module 3 due Friday Feb. 7th; <b>HW 1 due Friday Feb. 7th</b>
Week 4 - Feb. 10/12/14	Eclipses & Tides / Review for Exam 1 / <b>Exam 1 (Friday Feb. 14th)</b>	
Week 5 - Feb. 17/19/21	Seasons / Copernicus & Kepler / Galileo & Newton	Module 4 due Friday Feb. 21st
Week 6 - Feb. 24/26/28	Gravity & Newton cont. / Telescopes / Nature of Light	
Week 7 - March 2/4/6	Light Cont. / Atoms & Spectra / Solar System	<b>HW 2 due Wed. March 4th</b>
Week 8 - March 9/11/13	Exam 2 Review / <b>Exam 2 (March 11th)</b> / Solar System - Part 2.	
Week 9 - March 16-21 Spring Break	Spring Break - No Classes!	

Dates	Topics	Reading & HW Assign.
Week 10 - March 23/25/27	Earth / Sun / Intro to Stars	
Week 11 - March 30/ April 1/3	The HR Diagram / Lives and Deaths of Stars	<b>HW 3 due Friday April 3rd</b>
Week 12 - April 6/8/10	Exoplanets / More Exoplanets / Review for Exam 3	
Week 13 - April 13/15/17	<b>Exam 3 (Monday April 13th)</b> / Intro to The Milky Way / Intro to Galaxies	
Week 14 - April 20/22/24	Distant Galaxies / The Expanding Universe / Hubble's Law	<b>HW 4 due Wednesday April 22nd</b>
Week 15 - April 27/29/ May 1	Mysteries of the Universe / The Big Bang	<b>Moon Journal due Monday April 27th</b>
Week 16 - May 4/6/8	The Big Bang cont. / Are we alone? / Review for Final Exam	<b>Observing Report due Wed. May 6th</b>
Final Exam Week:	<b>Final Exam - Thursday May 14th - 9am!</b>	