

INTRODUCTION TO ASTRONOMY

Meeting Times: MWF 10am - 10:50am | **Where:** WEL 3.502 | **Unique Number:** 48255

How can I contact my professor or TAs ?

Professor:

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

Email:
keelyf@astro.as.utexas.edu

Instructor Weekly Drop-In

Hours: Mondays
11:30am-12:30pm (in person
in my office or Zoom optional),
Thursdays Virtual 3:30-4:30pm
(via Zoom), or by appt.
See Canvas Calendar for
Zoom links

TA: Jessica Luna

Weekly Drop-In Hours: Mondays
1-2pm
Email: jessicaluna@utexas.edu
Location: Zoom (see Canvas)

TA: Malvika Badri

Weekly Drop-In Hours:
Wednesdays 11am-12pm
Email: malvika.badri@utexas.edu
Location: Zoom (see Canvas)

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.

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

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 answer polling questions in real time during Zoom Class Meet Ups - to respond to instructor questions and get immediate feedback.

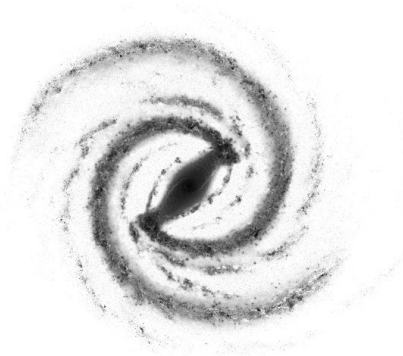


Image credit: <http://www.enderra.com>

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.

Course Website:

Canvas page for this course:

<https://utexas.instructure.com/courses/1313068>

Where can I find... ?

Canvas will have the following:

1. Lecture slides & Lecture Videos
2. Weekly reading assignments / modules
3. Weekly quizzes
4. List of Learning Objectives
5. HW assignments
6. Gradebook
7. Discussion Board for weekly Group Discussion Posts
8. Important Announcements
9. 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.

- 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 pre-recorded mini videos and readings. You will be assigned short videos to watch which will be posted in the module sections, these will often be accompanied by additional reading materials and/or other video resources shared in the weekly modules.
- After watching the video there will be a short practice quiz problems assigned.
- 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.***
- In addition, there will be required Module Discussion Groups. You can complete these on your own time schedule, but you will need to join a Discussion Group and post answers to the discussion questions in each Module, along with responding to one other group member's post. More details about this are on Canvas and listed below in the Participation section.

What happens during regular class time (MWF 10am-11am)? - *Class Meet-ups:*

- We will meet in-person and/or synchronously on Zoom during our regularly scheduled class times. MWF 10-11am.
- Every Class Meet-Up coupled with the pre-recorded asynchronous mini lectures will have specific Learning Objectives associated with it. We will focus on these Learning Objectives during Class Meet-Ups (in-person and/or on Zoom), and will use this time to work in small groups on the assigned Lecture Tutorials 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, MWF 10-11am, and at other times (*Drop-In Hours*). See Canvas for scheduled meetings and available times.
- A majority of Content from Lectures will be pre-recorded and posted on Canvas in the modules section. I will also post electronic copies of the slides in the Lecture Slides Page on Canvas. You'll be able to review the slides / re-watch the videos and lectures on Canvas at anytime.
- In addition, 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..

General Class Information and Expectations:

Class Format:

AST 301 will be taught in-person in Fall of 2021. To build in as much flexibility there will also be the option to attend class over Zoom whenever you need it. Attendance in each class is still expected whether in person or if you need / choose to join over Zoom. The Zoom link can be accessed via the Canvas course homepage. If you join class over Zoom, group activities will be conducted using Breakout Rooms and brief questions will be carried out with real-time polls (Instapoll) - just as if you were in-person.

Classroom Safety and COVID-19:

This is a science classroom and we are strongly recommending that we look to the science and follow the guidance of local public health officials and the CDC. Wearing a mask indoors is strongly encouraged, even if you are vaccinated, especially while Austin is in Stage 5. ***To help preserve our in person learning environment, the university recommends the following:***

- Adhere to [university mask guidance](#) and follow the recommendations of the CDC.
- [Vaccinations are widely available](#), free and not billed to health insurance. The vaccine will help protect against the transmission of the virus to others and reduce serious symptoms in those who are vaccinated.
- [Proactive Community Testing](#) remains an important part of the university's efforts to protect our community. Tests are fast and free.

- To help keep everyone at UT and in our community safe, it is critical that students report COVID-19 symptoms and testing, regardless of test results, to [University Health Services](#), and faculty and staff report to the [HealthPoint Occupational Health Program](#) (OHP) as soon as possible. In addition, to help understand what to do if a fellow student in the class (or the instructor or TA) tests positive for COVID, see this [University Health Services link](#)
- Visit protect.utexas.edu for more information.

Expectations for students in the classroom environment:

General: All classroom norms apply when in person or on a Zoom session. If you wouldn't do something in a physical class, don't do it in a digital classroom. For both the in-person class or Zoom classroom do not browse the internet, email, or social media during class.

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*. If you are attending via Zoom use the 'raise hand' feature in Zoom so that I can see that you have a question. Since I will be actively leading the class, I may not see typed questions in the chat window, but the TA's can address questions or bring questions to my attention. Please refrain from using the chat for comments not related to the class.

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

How is my performance in this class assessed?

There will be 4 unit exams. The exams will consist of short answer problems and multiple choice questions, and will be given over Canvas and Zoom (see schedule). We will also have weekly reading quiz checks, Lecture Tutorials, periodic HW assignments, and Graded Discussion Posts + Instapoll Voting questions to provide feedback on your progress between exams.

There is one 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.

An optional self-directed Astronomy Project can also be completed, and if so it can replace your lowest Exam grades.

Your final course grade will be determined as follows:

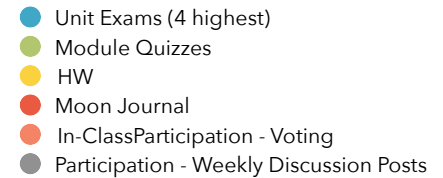
40% - 4 unit exams None of the exams will be cumulative, e.g. no Final Exam. You will also have the option to replace one of your counted four exams with an Astronomy Project - see details below.

20% - Weekly Canvas Module Checks For Understanding (drop 2 of ~15 - these will be short mini quizzes conducted through Canvas each week, as a check for your understanding of the presented Module Lecture materials.)

15% - Participation - participation will have two components: In-class Instapoll during regular class meet-ups 7%, and Weekly Discussion Posts - 8%. Lowest three "days" or "weeks" in each category will be dropped.

15% - HW Assignments (drop 1 of ~4)

10% - Moon Journal



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

- **Unit Exams:** Exams will most likely be administered through Canvas for maximum flexibility. Myself and the TA's will be on-hand during some window of the exam time to answer questions over Zoom in real time. More details to follow on Canvas.
- **Weekly Module Checks for Understanding:** You are allowed to miss **three** Canvas module "quizzes" without penalty. Late assignments will not be accepted. Your lowest three 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 pre-recorded videos that you will need to watch on your own. We will then use the class meeting times, MWF 10-11am to practice problems, using the Lecture Tutorial book. We will answer questions from students and/or work in small groups in person or over Zoom, using the Breakout Room function.
- **Class Participation:** There are two components for your course participation grade:
 - We will use **Canvas Discussion Groups** for Participation Credit, due once per week. You will be tasked with joining a weekly Discussion Group, posting to the Group with responses to the assigned discussion questions, and responding to at least one other Group Member's post. More details and step-by-step instructions are given in Canvas. You will receive credit for any answer as long as it follows the required minimum steps. You will be allowed to miss up to three weekly Discussion posts without penalty.
 - We will also use the **Canvas Instapoll in-class voting tool** for participation Class Meet-Ups. You must be in person or on the Zoom Class meeting to access and receive participation credit through

Instapoll for these questions, but you will be allowed to miss up to four class participation sets without penalty. We will randomly spot check attendance (in-person and on Zoom) if you are found to have answered Instapoll questions while not being in person or in Zoom 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.

- **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.
- **Moon Journal:** The Moon Journal is due at the end of the semester, but can be turned in at any point. Late Moon Journals will not be accepted.
 - **Moon Journal - Assignment details:** Go outside and 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, the location you observed it from (e.g. Austin, TX, Houston, TX, Seattle, WA), as well as the location of the moon in the sky (i.e., high in the southern sky, low in the SW, near the horizon on the East. etc.). **You will create an electronic document / booklet of your drawings to turn it in to complete your assignment.**
 - *You can sketch your journal entries by hand and then use a scanning app, your smart phone, etc. to save and convert your drawings to a PDF to upload. Or you can use a tablet or drawing app to make your Moon Journal sketches.*
 - **Optional Astronomy Project - There are two ways to complete this optional project assignment:** The optional semester project is very open-ended, but should relate astronomy to something you are excited about. **This is a chance for you to be creative, and spend time researching and thinking about astronomy from a perspective that interests you.** We want you to learn and enjoy the experience, mindful also that the optional project counts as much as one unit exam, so the work you put into it will be reflected in the grade you get out of it.
 - 1.) Option 1** - You will pick a specific astronomical object or topic and find a creative way to present about it. This could be making an electronic poster, an art project, a video or podcast, a narrated ppt; or something else even more creative. You will be asked to convey similar information as described below in Option 2 (and on Canvas) in your creative representation or presentation.
 - 2.) Option 2** - You will pick a specific astronomical object of your choice. Anything from a planet, a star cluster, a galaxy, a nebula is allowed. You will find two different images of your object taken with two different types of telescopes, one could be from a space telescope like the Hubble Space telescope, another could be with a ground-based telescope. You will do a mini report on the

object and also compare the different images of the object. You will also be asked to connect this object back to one of our course learning objectives.

*If you choose to complete this Optional Project it can replace your lowest exam score or a missing exam. **More details about this optional project can be found on the Canvas assignment.***

Where can I find University and Course Resources?

- **Student Support: COVID-19 Updates and Information:** This course may have changes, we all will need to be flexible with the learning environment depending on changing situations. But I will do my best to build in flexibility and options for you to be successful in this course. To help yourself, please explore the resources available here: <https://protect.utexas.edu/students-families/>
- **Academic accommodations (SSD):** 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:

Do you record the in-class lectures?

Yes! Although there is not much in-class lecturing, it may still be useful to review the video of our think-pair-share discussions, or the debrief after the lecture tutorials. 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. I will also post a PDF of the lecture slides.

How do I succeed in this class?

The best way to succeed is to prepare and participate. Do the modules ahead of time, and take the time to watch them in full. When in class, buy in and **participate!** The green book 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 lecture tutorials. 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 discussion boards.
- 3) Re-watch the relevant module videos, find 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. You will have the opportunity to do the optional Astronomy Project Assignment which will replace your lowest exam. 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 before class (late submissions are not allowed), and after class, download the PDF to see what you missed. Do the missed lecture tutorials, 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 they will let me know if they feel you should be allowed to make up for missed participation.

I need to leave class early? How do I make sure I don't lose participation?

Participation is counted through InstaPoll. You will not receive credit for questions you miss.

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 200 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 investigate.

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. 25 / 27	Wed.: Intro/Overview, course goals; <i>Friday</i> : activities on Position in the Sky	Module 1 materials due Monday Aug. 30
Week 2 - Aug. 30/ Sept. 1 / 3	<i>Monday</i> : Motion in the Sky; <i>Wed.</i> The Ecliptic; <i>Friday</i> : Path of the Sun	Module 2 Materials due Friday 9/3
Week 3 - Sept. 8 / 10	<i>Monday</i> : Holiday no class or drop-in hours; <i>Wed.</i> Seasons; <i>Friday</i> : Moon Phases	HW 1 due Friday 9/10; Module 3 Materials due Friday 9/10
Week 4 - Sept. 13/15/17	<i>Monday</i> : Moon Phases; <i>Wednesday</i> : <i>Ancient Astronomy</i> ; <i>Friday</i> : Exam 1	Exam 1 9/17
Week 5 - Sept. 20/22/24	<i>Monday</i> : <i>Kepler</i> ; <i>Wed.</i> & <i>Friday</i> activities on: Gravity & Newton	
Week 6 - Sept. 27/20 / Oct. 1	<i>Monday</i> : Intro to Light; <i>Wed.</i> : Telescopes; <i>Friday</i> : Nature of Light	
Week 7 - Oct. 4/6/8	<i>Monday</i> : Atoms & Spectra; <i>Wed.</i> Climate Change; <i>Friday</i> : Solar System	HW 2 due Monday Oct. 4th
Week 8 - Oct. 11/13/15	<i>Monday</i> : Exam 2 ; <i>Wed.</i> & <i>Friday</i> activities on: Solar System & Planet Formation	Exam 2 - 10/11
Week 9 - Oct. 18/20/22	<i>Monday</i> : The Sun & Fusion; <i>Wed.</i> & <i>Friday</i> activities on: Intro to Stars / Distances	
Week 10 - Oct. 25/27/ 29	<i>Monday</i> : HR Diagram; <i>Wed.</i> & <i>Friday</i> activities on: Stellar Evolution	
Week 11 - Nov. 1/3/5	<i>Monday</i> : Black Holes; <i>Wed.</i> : Exoplanets; <i>Friday</i> : Exoplanets	HW 3 due Wednesday Nov. 3rd
Week 12 - Nov. 8/10/12	<i>Monday</i> : Exam 3 ; <i>Wed.</i> & <i>Friday</i> activities on: Intro to the Milky Way / Galaxies	Exam 3 - 11/8
Week 13 - Nov. 15/17/19	<i>Monday</i> : Dark Matter; <i>Wed.</i> & <i>Friday</i> activities on: Distant Galaxies / Expanding Universe	
Week 14 - Nov. 22	<i>Monday</i> : Hubble's Law; NO Class <i>Wed.</i> & <i>Friday</i> - Thanksgiving Break	
Week 15 - Nov. 29/ Dec. 1/3	<i>Monday</i> : / Hubble's Law cont. <i>Wed.</i> Mysteries the Universe; <i>Friday</i> : The Big Bang	HW 4 due Monday 11/29; Moon Journal due in class Friday 12/3

Dates	Topics & Synchronous Class Meeting Activities	Assignment Due Dates
Week 16 - Dec. 6 (last class day)	<i>Monday: Exam 4 (Dec. 6th)</i>	Exam 4 - 12/6 ; Optional Astronomy Project submit by 12/6