Hello and Welcome!

Hello and welcome to ASTR 123! I’m excited for you to join me this term. A bit about me: I grew up in Colorado and studied Engineering Physics at the Colorado School of Mines. My teaching journey started there: I became an undergraduate TA in my Freshman year. I came to the UO to pursue a PhD in physics, studying optical materials for solar applications. Along my journey, I found that teaching captured my curiosity and interest more than my projects in the lab, and that’s why I’m here now! I am honored to teach astronomy to you. I have an enduring interest in climate change and renewable energy, and am happy to discuss that during office hours!

Course Description

Astronomy (ASTR) courses provide an introduction to the science of astronomy for non-science majors, and satisfy 4 credit hours of the Science Area of the Core Education Requirement.

ASTR 123 focuses on the contents, formation, and evolution of the Universe. We will study our home galaxy, the Milky Way, and compare it to other types of galaxies. You will see how astronomers look back in time (literally) to examine ancient galaxies, and peer at the Universe’s oldest light to decode the fingerprints of the Big Bang. We’ll explore cosmology, a field at the intersection of observational astronomy, theoretical physics, and philosophy, to ask some of the basic questions about humankind’s existence: where do we come from, and what is our fate?

I do not assume any prior knowledge of science or math. We’ll teach you to apply the quantitative reasoning you’ll need. Your chances of success in this course are high if you ask a lot of questions starting with "why," "how" and "what if" - because curiosity is what makes scientists tick.
Course Objectives

By the end of the course, you will be able to...

● **Understand science as a process and a skill:**
  ○ Explain how theories in astronomy are supported by specific observational data.
  ○ Support arguments and draw conclusions by interpreting data, figures, graphs, and images, and applying quantitative and logical reasoning.
  ○ Formulate questions and hypotheses based on your own curiosity, and reflect on what you learn to constantly refine your mental models.

● **Build an understanding of galaxies:**
  ○ Explain what types of observations allowed us to map the Milky Way.
  ○ Describe the structure of different types of galaxies, including the locations and motions of old stars, young stars, gas, dust, and dark matter.
  ○ Discuss the characteristic features of galaxies and what wavelengths of light are used to observe each type of feature.
  ○ Compare and contrast active galactic nuclei to quiescent ones, and discuss some reasons why the energetic output of galactic centers can change over time.

● **Trace the evolution of the Universe:**
  ○ Explain the connection between a galaxy’s distance and velocity (Hubble’s Law) and how we interpret the meaning of Hubble’s Law.
  ○ Discuss how we infer the age of the Universe based on its expansion rate.
  ○ Describe how galaxies are distributed in space and the connection of that distribution to the evolution of matter and energy in the early Universe.
  ○ Name the epochs of the early Universe and what key events occurred in each.
  ○ Describe the potential endings for the Universe, connect them to the shape of space-time and the current density of energy and matter, and explain which trajectory our Universe appears to be on based on our current understanding.

Detailed learning goals will also be listed...

● For each textbook section in the weekly study guides.
● For each lecture in the daily slides.
● For each activity and project within the assignment descriptions on Canvas.

I’m not a science major. Why should I take an astronomy course?

I think it’s important for students pursuing a variety of goals to learn astronomy, because:

● Astronomy builds skills employers want, including scientific and quantitative reasoning.
● You will learn strategies for independent learning and study that will serve you well in other classes, and in your journey of lifelong learning.
● Astronomy is part of our history and life. Learning astronomy is inspiring and contributes to a sense of purpose and belonging in our world - a sense of being an “Earthling.”
Andrea’s Teaching Philosophy

Research shows that people learn best through active learning, in which learners are active participants rather than passive observers. Our course design provides structured learning opportunities before, during, and after class to help you engage your brain and monitor your own understanding as you build your knowledge about astronomy.

Each learning opportunity has an essential role to play, and therefore they will all contribute to your grade. However, you will have choices about how to engage and will not be forced into a “one size fits all” solution. If you feel that any element of our course design presents a barrier to you or that you would benefit from different types of learning opportunities, please let me know.

Learning Opportunities and Assessments

Class Preparation: You are expected to read the daily textbook sections and watch the recommended videos. While prep is ungraded, class will be most effective for you and your peers if you are familiar with key terms before class. A “shallow” read before class and “deep” read after class can be highly productive.

In-Class Activities: We will work together on interactive activities on Canvas during class to guide you through new ideas, so please bring a device. You have unlimited attempts so that you can learn from your mistakes. Due after class; grace period through Mondays at noon (so that you can use feedback for the homework).

Homework: Homework will flex your critical thinking skills and guide you to apply new ideas. Homework will be challenging. You will have two attempts and should strive to understand each question by making mistakes and trying again. Please, work together! I encourage you to attend office hours to find study partners, ask questions, and get some coaching.

Due Mondays at 7pm, grace period through midnight; deadline is firm because feedback will be delivered immediately after the due date. Practice versions of the homework will be available after the due date in case you 1) miss it and wish to complete it for practice, or 2) want to revisit it for study purposes later in the term. Your lowest 2 scores will be dropped.

Weekly Reflections: You’ll reflect on your learning, how you’re doing overall, and how we conduct the course. This is your chance to give me feedback - use it! Due Mondays at midnight.

Weekly Forums: Optional weekly forums will give you a chance to connect with others. I’ll ask some questions to get you started, but I invite you to share whatever is on your mind that week about the course, astronomy in the wild, or college life in general. The TAs and I will be part of the conversation, but we’ll follow your lead and only chime in when needed!
Collaborative Quizzes: Short quizzes will help you calibrate your understanding. You will have two attempts and only the highest score will count toward your grade. Attempt one is to be done before class, on your own. You will be able to see your score, but not which questions you got right or wrong. For attempt two, you will have the chance to discuss your thinking with others in class (this process mirrors the practice of science). We will review quizzes in class immediately after they are due (on Fridays).

Quizzes are open-book and open-note, but you should strive to attempt quizzes without these aids to maximize your learning. To reward your growth and learning, you will be given an opportunity to retake quizzes toward the end of the term. These will be modified slightly. You will have only one attempt on quiz retakes.

Final Exam: The final exam will cover everything in the course and will be done individually in class during our university-scheduled final exam time, which cannot be changed (Thursday, March 23, 2:45-4:45pm). If you must miss the final due to emergency or illness on the day of the exam, you should request an incomplete grade and take the final next term. Making travel plans without consulting the final exam schedule does not constitute an emergency, so please put this on your calendar!

The final exam will be in a format similar to homework and quizzes. You will be expected to apply ideas in mostly familiar but some novel ways.

The final exam weighting has been carefully considered to maximize the opportunity for you to improve your final grade, while avoiding the unnecessary stress of a highly-weighted final. You’re unlikely to “save your grade” in an epic way by acing the final after a lackluster term. Plus, you’re more likely to do well on the final if you understand the course material fully. So, the best way to earn a good grade in the class is to engage completely in all learning opportunities.

Project: You will complete two short projects (in groups of 1-3) to demonstrate your learning expressively and explore your curiosity. You will share and discuss your projects through graded forums. Due during weeks 5 and 10. Topics include:

- **Scientist Spotlight**: Learn more about astronomers past and present.
- **AstroBites**: Summarize new research in astronomy, or highlight
- **Explain it To Me**: Explain a key concept by creating a video tutorial.
- **Science Communication**: Dive deeper into a topic of your choice, and explain it to your peers, tying it to specific concepts we’ve learned in class. Your topic must be related to galactic astronomy/cosmology. It can be purely scientific, or you may choose to highlight a connection between astronomy/cosmology and everyday life or culture.
## Grade Breakdown

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Frequency &amp; Grading Policy</th>
<th>Due Date &amp; Late Policy</th>
<th>Percent of Grade</th>
<th>Out-of-class time per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Class Preparation</td>
<td>Daily</td>
<td>-</td>
<td>0%</td>
<td>2 - 3 hours</td>
</tr>
<tr>
<td>In-Class Activities</td>
<td>~ Daily 30% dropped</td>
<td>Due after class.</td>
<td>10%</td>
<td>~ 30 minutes (to review)</td>
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<tr>
<td></td>
<td>Weekly 2 attempts 2 dropped</td>
<td>Due Mondays 7pm.</td>
<td>30%</td>
<td>2 - 3 hours (including office hours)</td>
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<td></td>
<td></td>
<td>Grace period through Mondays at noon.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Grace period through Mondays midnight.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weekly Reflections</td>
<td>Weekly</td>
<td>Due Mondays midnight.</td>
<td>0%</td>
<td>~ 15 minutes</td>
</tr>
<tr>
<td>Weekly Forums</td>
<td>Weekly</td>
<td>-</td>
<td>0%</td>
<td>~ 15 minutes</td>
</tr>
<tr>
<td>Quizzes</td>
<td>Even weeks 2 attempts initially, plus retakes</td>
<td></td>
<td>25%</td>
<td>~ 30 minutes</td>
</tr>
<tr>
<td>Final Exam</td>
<td>Finals Week</td>
<td></td>
<td>20%</td>
<td>-</td>
</tr>
<tr>
<td>Projects</td>
<td>Weeks 5 and 10</td>
<td></td>
<td>15%</td>
<td>&lt; 30 minutes</td>
</tr>
</tbody>
</table>

**Grade scale:** A: 90%, B: 80%, C: 70%, D: 60%. I use plus/minus: plus for grades ending in 7, 8, or 9 and minus for grades ending in 0, 1, and 2.

I do not curve exam or class grades, as I believe each of you is capable of meeting my expectations within this course structure.

Since zero grades are **mathematically unfair**, I give a grade of 50% for any missing work.
Weekly Routine

The total out-of-class time is about 8-12 hours per week (the time above, plus about 2-4 hours per week of individual or group study, possibly in the Drop-In Help Center, Science Library B10). You should spread this time out to get the most out of your effort. Here’s my suggested routine.

A study guide, including an outline of effective study practices, is available. It links to weekly study guides, which you can use to guide your reading or to study throughout the term.

<table>
<thead>
<tr>
<th>To Do</th>
<th>Before Monday</th>
<th>Monday</th>
<th>Before Wednesday</th>
<th>Wednesday</th>
<th>Before Friday</th>
<th>Friday</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Read for Monday</td>
<td>Class &amp; Activity</td>
<td>Read for Wednesday</td>
<td>Class &amp; Activity</td>
<td>Read for Friday</td>
<td>Class &amp; Activity</td>
</tr>
<tr>
<td></td>
<td>Complete a Homework Attempt</td>
<td>Review Notes &amp; Activity</td>
<td>Review &amp; Study</td>
<td>Review Notes &amp; Activity</td>
<td>Attempt Quiz</td>
<td>Review Notes</td>
</tr>
<tr>
<td></td>
<td>Office Hours</td>
<td>HW Due</td>
<td>Office Hours</td>
<td>Begin Homework</td>
<td>Continue Homework</td>
<td>Quiz Due</td>
</tr>
</tbody>
</table>

Office Hours

Our graduate teaching assistants will join us in class to facilitate activities, will hold weekly office hours, and will also be available in the Price Science Commons Drop-In center.
Course Policies

Attendance, Absences, and Late Work
This is an in-person course; a Zoom option will not be offered. There is no grade penalty for absences; however, attendance is important because we will develop our knowledge through in-class activities that you can only benefit from if you actively engage during class.

If you must miss class, there is no need to email me (unless you’d like my assistance connecting to campus resources). You are responsible for completing missed in-class activities by the end of the grace period, and are encouraged to attend office hours to discuss key ideas.

Late Work
Weekly work in this course is due on Mondays (Activities by noon, Homework by 7pm). Quizzes are due Fridays during class. Deadlines are firm, to allow for timely grading and feedback. I have built flexibility into the course by dropping ~20-30% of activities / homework, by offering practice versions of each homework, and by offering quiz retakes at the end of the term. I hope that this combination of structure and flexibility supports your learning.

You are always welcome to speak with me about challenges you are experiencing inside or outside of the class. Although I care about you and your experience, I will not ask you why you are absent, or treat different reasons for absences differently, with the exception of specific accommodations through AEC, religious observances, or university-sponsored events. Having a reason-neutral absence policy allows me to make space for the needs of both those who share and those who choose not to share challenges they may be facing.

Classroom Community Expectations
This class involves a high level of interactive engagement during class because we learn best by learning together. All students are expected to participate by sharing their ideas (even when they might be wrong!) and listening to others share theirs. You should expect to be treated with respect, to be welcomed and included, and to be open to receiving help and feedback from others. We will all strive to cultivate a respectful, inclusive, and supportive learning environment. I understand that our interactive environment can spark exciting conversations; however, for the sake of maintaining a quality learning environment for other students, please do not speak during class except when I am inviting you to do so.

Communication
I will communicate with the class through Canvas announcements and email. I will typically send a weekly announcement each Monday with a summary of the week ahead, a checklist of the week’s due dates, and notes on the previous week. Other occasional announcements will address pressing, time-sensitive questions and issues. I will use Canvas messages for reminders about due dates, and also email individuals as needed about personal concerns. Please make sure to check your Canvas messages and email regularly. I check my own messages about twice daily; you can usually expect a response within 12 hours.
To communicate with me with questions about...

- **Course content**: come to office hours! Office hours are **free help sessions** - come ask questions and work together! I also invite you to ask relevant questions on the weekly forums. I will generally not answer course content questions via email.
- **Procedural questions about assignments or course policy**: please post your question on the weekly forum, where your TAs and peers can also share answers. If you have a question, someone else probably does too (and may have already posted it!). This will save us collectively a lot of time that could be wasted in email back-and-forth.
- **Personal concerns**: email me. I will respond within about one business day. If your question is better suited to the weekly forum, I will re-post and respond to it there.
- **Technical challenges with Canvas**: contact the [UO Service Portal](http://aec.uoregon.edu/).

### University Policies & Resources

#### Academic Disruption and Inclement Weather
I will use Canvas announcements to communicate any course changes made in the event of a campus emergency, inclement weather, or illness/emergencies of my own. Usually, students will be expected to continue previously assigned coursework as outlined on Canvas.

#### Academic Integrity
The University Student Conduct Code (available at [conduct.uoregon.edu](http://conduct.uoregon.edu)) defines academic misconduct, which includes unauthorized help on assignments and examinations, the use of sources without acknowledgment, and publishing class materials without the permission of the instructor (including sites such as Chegg). I will report suspected misconduct to the Office of Student Conduct and Community Standards. If the Office finds a student has committed misconduct, consequences can include failure of the relevant assignment, or of the course.

However, I do want you to learn together, and find and cite sources properly! Each assignment and assessment will outline whether and how and whether you might work with others so you can clearly act with academic integrity. Info about plagiarism: [https://researchguides.uoregon.edu/citing-plagiarism](https://researchguides.uoregon.edu/citing-plagiarism)

#### Accessible Education
I want to enable accessible learning for every student. Please notify me if there are aspects of the instruction or design of this course that result in disability-related barriers to your participation (including access to lectures, activities, homework or quizzes, and exams). Please contact the Accessible Education Center ([http://aec.uoregon.edu/](http://aec.uoregon.edu/)) for assistance with access or with disability-related questions or concerns.

#### Accommodations for Religious Observance
The University of Oregon respects the right of all students to observe their religious holidays. If you will miss a due date due to a religious obligation or observance, please send me the [observance form](http://observance.form) within the first two weeks of the course.
**Basic Needs**
Being able to meet your basic needs is foundational to your success as a student at the University of Oregon. If you are having difficulty affording food, don’t have a stable, safe place to live, or are struggling to meet another need, visit the UO Basic Needs Resource page (https://blogs.uoregon.edu/basicneeds) for information on support for food, housing, healthcare, childcare, transportation, technology, finances (including emergency funds), and legal support.

**COVID-19**
Students with COVID should consult UO’s COVID-19 Safety Resources, and isolate and rest.

**Course Experience Surveys**
The midway and end-of-term Student Experience Surveys will be conducted during weeks 4, 9, and 10. The key parts of the survey are the open-ended questions where you share concrete, actionable feedback and about the teaching practices that stand out to you. My courses continually evolve in response to student feedback, so thank you for your thoughtful reflections!

**Discrimination and Violence Reporting**
I am a mandatory reporter of child abuse and an assisting employee for discrimination or violence reporting. As an Assisting Employee, I will direct students who disclose prohibited discrimination and harassment, including sexual harassment or violence, to resources that can help and will only report the information shared to the university administration if the student requests me to report (unless someone is in imminent risk of serious harm or a minor).

Students who have experienced sexual assault, relationship violence, sex or gender-based bullying, stalking, and/or sexual harassment may seek resources and help at safe.uoregon.edu or call the 24-7 hotline 541-346-SAFE [7244]. Students experiencing all forms of discrimination or harassment may find support through the Title IX office or the Dean of Students: investigations.uoregon.edu/how-get-support

**Incomplete Grades**
Incomplete grades must be initiated by the student, and will only be considered for extenuating circumstances after the last day to drop (the end of week 7). Emergencies or illness preventing you from taking the final are the most likely reasons for an incomplete; however, please email me if you feel you think an incomplete grade might be a good option for you.

For the purposes of interpreting the policy, satisfactory progress in this course is defined as:

- An average grade above 60% on activities and homework, and attempting every quiz
- If the above is not met, students are expected to proactively communicate with the instructor to seek help and/or respond to communication from the instructor (who will reach out to students who demonstrate unsatisfactory progress).

If you experience extraordinary circumstances causing extensive lack of engagement, it may be appropriate to engage in the Dean of Students’ Emergency Academic Notification process.
Mental Health and Wellness
Mental health is a critical factor in your overall well being. Students often feel overwhelmed or stressed, experience anxiety or depression, struggle with relationships, or just need help navigating challenges in their life. It’s healthy and normal to seek support. Support resources include University Counseling Services and support at the Duck Nest in the EMU.

One Stop Resources
Additional resources can be found at https://onestop.uoregon.edu/

Respect for Diversity
You can expect to be treated with respect in this course. Both students and instructors enter with many identities, backgrounds, and beliefs. Students of all racial identities, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, citizenship statuses, ability and other visible and non-visible differences belong in and contribute to this class and this discipline. All students are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class. Please let me know if aspects of the instruction, course design, or class activities and content undermine these principles in any way. For additional resources, you may also consider contacting the Division of Equity and Inclusion or the Center for Multicultural Academic Excellence.

Tutoring and Academic Engagement
Learning how to learn is a key theme in our course. The Tutoring and Academic Engagement center offers free tutoring services and resources on healthy learning routines.

Winter 2023 Dates & Deadlines

- **Week 1 Saturday**: Jan. 14 is the last day to adjust registration without a 'W'
- **Week 2 Monday**: Jan. 16 is the last day to add a class via DuckWeb
  - No Class: Martin Luther King, Jr. Day
- **Week 4**: Midway Student Experience Survey: Open Monday 8:00am-Friday 6:00pm
- **Week 7 Sunday**: Feb. 26 is the last day to withdraw or change grade options
- **Week 9-10**: The End-of-Term Student Experience survey is available from Wednesday of Week 9 to Monday of Week 10
- **Finals week Friday**: Mar. 24, at 5pm, is the last day/time to request an Incomplete.
<table>
<thead>
<tr>
<th>Wk</th>
<th>Monday</th>
<th>Wednesday</th>
<th>Friday</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Welcome to ASTR 123!</td>
<td>Observing the Universe</td>
<td>Numbers in Astronomy</td>
</tr>
<tr>
<td></td>
<td>● Read: Syllabus</td>
<td>● Read 1.1 - 1.3, 1.6-1.7</td>
<td>● Read 1.4 - 1.5, 19.1, App. C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● Watch Intro to Astronomy</td>
<td>● Watch Distances</td>
</tr>
<tr>
<td>2</td>
<td><strong>No Class</strong></td>
<td>Light from the Cosmos</td>
<td>Measuring Motion</td>
</tr>
<tr>
<td></td>
<td>Jan. 16 (MLK Day)</td>
<td>● Read 5.1 - 5.3</td>
<td>● Read 5.6</td>
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<td></td>
<td></td>
<td>● Watch Introduction to Light</td>
<td>● Watch Redshift</td>
</tr>
<tr>
<td>3</td>
<td>Galaxy Structure</td>
<td>Galaxy Structure &amp; Colors</td>
<td>Learning Workshop 1</td>
</tr>
<tr>
<td></td>
<td>● Read 25.1 - 25.2</td>
<td>● Read 20.1 - 20.3</td>
<td>Quiz 1: Measuring Space</td>
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<td></td>
<td>● Watch Guide to our Galaxy</td>
<td>● Watch The Milky Way</td>
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<tr>
<td>4</td>
<td>Galactic Distances</td>
<td>Laws of Motion</td>
<td>Mass of the Galaxy</td>
</tr>
<tr>
<td></td>
<td>● Read 17.1, 19.2 - 19.3</td>
<td>● Read 3.1 - 3.3</td>
<td>● Read 25.3</td>
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<tr>
<td></td>
<td>● Watch Cepheid Variables</td>
<td>● Watch Gravity</td>
<td>● Watch Dark Matter</td>
</tr>
<tr>
<td>5</td>
<td>Relativity &amp; Black Holes</td>
<td>Center of the Galaxy</td>
<td>Galaxy Formation</td>
</tr>
<tr>
<td></td>
<td>● Read 24.1 - 24.5</td>
<td>● Read 24.6-24.7, 25.4</td>
<td>● Read 25.5 - 25.6</td>
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<tr>
<td></td>
<td>● Watch Black Holes</td>
<td></td>
<td>● Watch Why is the Solar System Flat?</td>
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<tr>
<td></td>
<td>Project #1 Due</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Types of Galaxies</td>
<td>Galaxy Mass and Distance</td>
<td>Learning Workshop 2</td>
</tr>
<tr>
<td></td>
<td>● Read 26.1 - 26.2</td>
<td>● Read 26.3 - 26.4</td>
<td>Quiz 2: The Milky Way</td>
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<tr>
<td></td>
<td>● Watch Galaxies, Part 1</td>
<td></td>
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<tr>
<td>7</td>
<td>The Expanding Universe</td>
<td>The Discovery of Quasars</td>
<td>Quasars and AGN</td>
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<tr>
<td></td>
<td>● Read 26.5</td>
<td>● Read 27.1</td>
<td>● Read 27.2 - 27.3</td>
</tr>
<tr>
<td></td>
<td>● Watch The Big Bang, Do We Expand With The Universe?</td>
<td></td>
<td>● Watch Galaxies, Pt 2 (1)</td>
</tr>
<tr>
<td>8</td>
<td>Galaxy Evolution</td>
<td>Structure of the Universe</td>
<td>Learning Workshop 3</td>
</tr>
<tr>
<td></td>
<td>● Read 28.1 - 28.2</td>
<td>● Read 28.3 - 28.5</td>
<td>Quiz 3: Galaxies &amp; Interactions</td>
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<tr>
<td></td>
<td>● Watch Hubble Deep Field</td>
<td>● Watch Galaxies, Pt 2 (2)</td>
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<td></td>
<td></td>
<td>● Watch Where Do Galaxies Come From?</td>
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<tr>
<td>9</td>
<td>Age of the Universe</td>
<td>Early Universe</td>
<td>Fate of the Universe</td>
</tr>
<tr>
<td></td>
<td>● Read 29.1 - 29.2</td>
<td>● Read 29.3 - 29.4</td>
<td>● Read 29.5 - 29.7</td>
</tr>
<tr>
<td></td>
<td>● Watch Dark Energy, A Brief History of the Universe</td>
<td>● Watch Picture of the Big Bang</td>
<td>● Watch Why is the Universe Flat?, Deep Time</td>
</tr>
<tr>
<td>10</td>
<td>Project Review Day</td>
<td>Quiz 4: Universe Evolution</td>
<td>Final Review</td>
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<td>Project #2 Due</td>
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**Final Exam:** Thursday, March 23, 2:45-4:45pm