

AST 307 - Introductory Astronomy

Fall 2016 - Unique No. 47530

TTh 12:30 — 13:45 @ WEL 2.110

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Course Description: This course provides an overview of modern astronomy and astrophysics for science and engineering majors. We cover topics from our place in the solar system, the formation and detection of planets, stellar evolution, galaxies across cosmic time, to the scale and history of the Universe from the Big Bang until the present day. We will also take a look at the historical context of some of the most important astronomical discoveries, from those of ancient techniques to modern astrophysicists. Intermixed with lectures, our course will incorporate techniques from an inquiry-based approach to learning, including group activities, critical thinking exercises, and open ended analysis. The purpose of this approach is to introduce students to the methodology used by real scientists to solve real astrophysical problems.

Pre-requisites and Core Requirements: No formal pre-requisite is required for this course, although students should feel comfortable with algebra, geometry and pre-calculus concepts, including trigonometry and dimensional analysis. This course is intended to be more mathematically rigorous than AST 301, a course which covers the same material but not at as great a depth.

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.

Texts and Materials:

- Access to *Mastering Astronomy* (required)
standalone access or often sold as a bundle with *Cosmic Perspective*
- Access to *Learning Catalytics*, paired to your *Mastering Astronomy* account (required)
- *The Cosmic Perspective*, 7th Edition. Bennett, Donahue, Schneider & Voit (optional)

You can purchase a *Mastering Astronomy* access code online by itself, online with an electronic copy of the textbook *Cosmic Perspective* bundled, or through the bookstore with a physical access code. The bookstore has told me that they have versions of the *Cosmic Perspective* text in loose-leaf, that also include access to *Mastering Astronomy*. Note that if you purchase *Mastering Astronomy* access online by itself (not in a bundle), you will have to purchase access separately to *Learning Catalytics*. When registering your *Mastering Astronomy* access code choose "Cosmic Perspectives 7th ed" (careful of the correct edition) as the textbook. Do NOT choose the 6th or 5th editions. Our course ID is "CMCASEY47530" which you enter after you have registered.

You can access to *Learning Catalytics* using your *Mastering Astronomy* login information (your “Pearson” login) by going to the *Learning Catalytics* webpage, clicking “Register,” “I am a student, ”I use a Mastering/MyLab Product.” We will be using *Learning Catalytics* everyday in class, which will require you to bring a wifi enabled device: a phone, tablet, or laptop.

Class Structure: This class will not be a traditional University lecture course. It will combine short lectures with discussions and group activities. You will only learn if you participate in class activities, thus attendance and participation is *required*. Do not pack up or leave class early unless you have talked to me in advance, as a consideration to both me and your fellow students.

Class Website and email: The class website is hosted on canvas and should be checked regularly for updates and messages from me regarding exam review sessions, course materials, or special events. In addition to the class website, email is recognized as an official mode of university correspondence, so you are responsible for reading your email for university course-related information, and canvas-delivered announcements. Please check your email regularly and frequently and make sure you are set to receive notifications from Canvas as appropriate.

Use of electronics: The use of a wifi-enabled enabled device is a necessary part of this classroom, and will be an important component of your participation grade. However, students using their electronics/computers for non-class activities are a distraction to those around them. If we find your use of electronics a problem and a distraction to others, we will ask you to leave the classroom, not earning participation credit for that day.

Grading Components and Policies: You will receive the grade you earn in this course. There will be no extra credit awarded after the final class period of the semester, so please be sure to put in your best effort throughout the semester to earn the grade you would like. Your final grade will be composed of the following elements:

- Module Assessments = 40%
- Online homework = 30%
- In-class Participation = 25%
- Scientific Writing Essay = 5%

Here is more information on each of the grade components:

Module Assessments: There will be no traditional exams in this course. Instead, the primary mode of evaluation will be module assessments, or quizzes. These quizzes will be held roughly ever three class periods (through their duration will depend on the task being assessed); some will be done individually and some done with a group. There will be no opportunity for make-up module assessments, unless there is verified illness or emergency accompanied by a doctor’s note, a University related conflict (you are away from UT as part of a University-sponsored activity), or religious holiday. In the case that you are requesting to make up an exam for a University-related conflict or religious holiday, you must give me written notice of the conflict at least 14 days in advance of the scheduled assessment date. All rescheduled Module Assessments will be individual, not group based. You may improve your final assessment score by up to 10% by taking the optional final exam which will cover all material in the course. The optional final exam will be held on Thursday, December 8th from 9am-noon in WEL 2.110.

Homework: Online homework will be assigned weekly through “Mastering Astronomy;” please see the class website and Mastering Astronomy course page for details on homework due dates and times. The system will automatically cut off access to the homework at the designated due date and time. No late credit will be given. Each homework assignment is worth a different number of points depending on length and difficulty, and at the end of the semester those points are added together to form your overall homework grade. On occasion, [paper] homework assignments or problem sets may be given in place of some online homework, in which case it must be turned in at the beginning of class on the due date, unless otherwise stated in class or via canvas communication. Group work and discussion is allowed (and encouraged) for homework assignments, but each student must be responsible for their own understanding of the material from each assignment and independently complete the work.

Class Participation: In-class participation is a major component of your grade. You will carry out many of the in-class activities with an assigned group which will be announced on the 1st or 2nd day of class. We will change the groups once or twice during the semester. At 3 random moments in the semester, we will evaluate your group’s discussion and assign a *discussion* grade (the same for all members of the group) according to the following rubric:

<u>Grade</u>	<u>Criteria</u>
0	Absent, or actively disruptive during class or group activity, or not engaged in class activities (online, texting, etc).
2	Present, not disruptive. Not actively engaged in group discussions, shows sporadic involvement in activities and class-wide discussions. Completed some of the homework assignments.
4	Demonstrates good preparation for class, contributes to group discussions regularly and on occasion, suggests views that may counter the majority opinion, participates in class-wide discussion on occasion.
6	Offers analysis, synthesis and evaluation of problems presented in the course, demonstrates ongoing very active involvement both in group work and class-wide discussions. Contributes significantly to group dialogue, but also listens and responds thoughtfully to other students’ suggestions.

In addition, we will use the Learning Catalytics online system in class each day, which will require use of a wifi-enabled device. Learning Catalytics, importantly, helps me understand what you know: what misconceptions you may hold, whether or not a concept is widely understood in the class and we should move on, or it needs to be discussed further. It also allows everyone to participate in class equitably and gives you a chance to review some of our in-class questions after class. The in-class polling is here to help you. I will use Learning Catalytics to keep track of class attendance, but your answers will not factor into your attendance grade. Participation — which is a combination of your discussion and attendance grades — will account for 25% of your overall course grade, and participation points will be awarded according the the following scale:

- >80% response to L.C. Questions — discussion grade + 19 attendance points
- 0-80% response to L.C. *Questions* — discussion grade + n attendance points, where $n = 0.19 * (\text{percentage of L.C. Questions answered})$

Scientific Writing Project: In mid-October, you will be given prompts for a scientific writing project, due date, and a guideline/rubric for evaluation. The objective of this scientific writing project is to give you a realistic, everyday experience similar to those of professional astronomers. Contrary to popular belief, the vast majority of our time is spent writing (not staring at the sky!). Thus, articulating our scientific arguments clearly and succinctly is very important. If we don't write well and learn how to make clear arguments early on, it's far more difficult to be a productive scientist.

This class will *not* be graded on a curve. Your grade is calculated to the nearest 1/100th of a percentage point. The average percentage in each of the above grade components will be weighted by the indicated percentage to derive the final course grade, to be assigned as follows:

93.00 — 100% = A	80.00 — 82.99% = B-	67.00 — 69.99% = D+
90.00 — 92.99% = A-	77.00 — 79.99% = C+	63.00 — 66.99% = D
87.00 — 89.99% = B+	73.00 — 76.99% = C	60.00 — 62.99% = D-
83.00 — 86.99% = B	70.00 — 72.99% = C-	0 — 59.99% = F

Accommodations for disabilities and/or family responsibilities: If you have any kind of disability, whether apparent or non-apparent, learning, emotional, physical, or cognitive, and you need some accommodations or alternatives to lectures, assignments, or exams, please feel free to contact me to discuss reasonable accommodations for your access needs. Students with disabilities may also request appropriate accommodations from the Division of Diversity and Community Engagement, and from UT's Services for Students with Disabilities. The official wording provided by the university is: The University of Austin provides upon request appropriate academic accommodations for qualified students with disabilities. For more information, contact the Office of the Dean of Students at 471-6259, 471-6441 TTY or Division of Diversity and Community Engagement, Services for Students with Disabilities, 512-471-6259, www.utexas.edu/diversity/ddce/ssd.

Aside from disabilities, I recognize that students with children or family care responsibilities might require special accommodations on occasion, and they should contact me by email regarding missed or late work.

Regarding harassment/assault: Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights violations subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, etc. Harassment of any sort will not be tolerated in this classroom or related workspaces. If you or someone you know has been harassed or assaulted, you can find the appropriate resources through the University Title IX Coordinator (512-232-3992), UT Austin Campus Police (512-471-4441), the Student Ombuds Services (which can provide *confidential* advice, resources and help; 512-471-3825), and the UT Counseling and Mental Health Center (512-471-3515).

Academic Dishonesty: The minimum penalty for cheating — in any way whatsoever — is receiving a zero on the assignment on which you cheated. I reserve the right to seek a penalty I deem appropriate for the given case of academic dishonesty, including failing the class and being reported to Student Judicial Services. In this class, in addition to all the traditional types

of cheating (looking at someone else's answer, utilizing "cheat sheets" of any form or fashion either paper or digitized, getting an advance copy of an assessment or quiz), we also consider allowing someone else to use Learning Catalytics account cheating. For example, if you sign into multiple Learning Catalytics accounts during class, participating on behalf of another class mate or an individual who is not you and you are caught, you and your accomplice will be penalized by losing 5 participation points (5% of your total grade) for the semester. If it happens a second time, all participation credit will be forfeited. If you deny a cheating allegation, or if the academic honesty is sufficiently serious, I will proceed by filing a formal report to the Judicial Services in the Dean of Students Office as is policy. Judicial Services would decide the final penalty after a hearing on the matter. For more information, read in the General Information Catalog about scholastic dishonesty (i.e. cheating).

Drop date: The last day to drop the class is November 1, 2016. This will require you to go to your college and get a drop form. You then must bring the form to me and get my approval and signature. After this deadline, students must go to the Dean's office, WCH 2.112, to begin the appeal for substantiated non-academic reasons.

Class Material and Schedule: Below is the approximate course schedule and material we will cover on those days. The corresponding chapters and subsections in *Cosmic Perspectives* are noted for your convenience if you have purchased the book.

25 Aug	Introduction, Logistics, Scale of Universe Activity	Chapter 1
30 Aug	Geometry of Earth/Moon system	Chapter 1-2
1 Sep	Night Sky Fundamentals, Moon Phases, Seasons	Chapter 2, S1
6 Sep	Measuring flux, angles MA#1	
8 Sep	Debunking Ptolemy	Chapter 4
13 Sep	Angular Momentum, Kepler's Laws, Weighing Planets	Chapter 4
15 Sep	Earth to the Sun: how we figured it out MA#2	Chapter 4
20 Sep	Precession, Geosynchronous things, and using the seasons to our advantage	Chapter 2
22 Sep	Stars part 1: what's the big deal?	
27 Sep	Basics of light, understanding temperature MA#3	Chapter 5
29 Sep	Blackbodies, spectra and EM Radiation	Chapter 5
4 Oct	Stars part 2: Classification, HR diagram	Chapter 15
6 Oct	Stars part 3: Structure & Composition MA#4	Chapter 17
11 Oct	Stars part 4: Lives, Deaths, and Afterdeaths	Chapter 18
13 Oct	Telescope Basics	Chapter 6

18 Oct	The IMF, Doppler Effect, binaries to planets MA#5	Chapter 13
20 Oct	Radial Velocities to find planets	Chapter 13
25 Oct	Transits changing our view of planets	Chapter 13
27 Oct	Planet formation theory MA#6	Chapter 8
1 Nov	Transmission Spectroscopy and Aliens	Chapters 10, 24
3 Nov	Cosmic Distance Ladder	Chapter 20
8 Nov	Shapley/Curtis Debate, and Hubble's Law MA#7	Chapters 20, 22
10 Nov	Big Bang Cosmology	Chapter 22
15 Nov	Dark Energy & Dark Matter	Chapter 23
17 Nov	Galaxy Formation and Evolution MA#8	Chapter 21
22 Nov	Supermassive Black Holes and Quasars	Chapter 21
24 Nov	<i>Thanksgiving Day, No Class</i>	
29 Nov	Astro OddBalls, Astronomy Careers, and Funding of Science	N/A
8 Dec	OPTIONAL FINAL EXAM 9am-12pm	