

PROFESSOR KEITH HAWKINS PRESENTS:

AST301 : Introduction to Astronomy (Unique #46555; Fall 2020)



**Professor Keith
Hawkins**

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Meeting : T/Th 11:00-12:30

Course Description

This course will provide a modern overview of astronomy geared towards non-science majors. Over the course of this semester, we will be covering topics including basic physical concepts, our place in the solar system, planets, stars, galaxies, and cosmology. Students will also learn how science works, and develop critical thinking skills, as well as gaining an appreciation for the universe around us. We will focus on conceptual understanding, rather than memorization of facts, although you do need to make sure to remember some fundamental ones. Intermixed with lectures, our journey through the cosmos this semester will feature techniques from an inquiry-based approach to learning, which include group activities, critical thinking exercises, peer-to-peer discussions, and written or oral presentations on current discoveries. The purpose of this approach is to introduce students to the methodology used by real scientists to solve real astrophysical problems.

Pre-reqs, Required Material, and Use of Electronics:

Pre-requisites and Core Requirements:

There are no prerequisites for this course. While the concepts in this class will be primarily qualitative, **at least 50% of graded material or more will use quantitative reasoning skill (QR Flag)**. QR 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. AST 301 is intended to meet the requirements for the Core Component Area Natural Science and Technology and may be combined with AST 309C, 309G, 309L, 309N, 309R, or 309S for a six-hour Core sequence. See the “Memo for Undergraduate Astronomy Students Regarding Astronomy Courses”: <http://www.as.utexas.edu/astronomy/education/memo.html>.

Course-Level Learning Objectives and Goals: By the end of this course you —

- Should demonstrate an understanding of the scope and evolution of the Universe and should be able to describe how the Earth & Solar System fits into the broader Universe.
- Should develop critical thinking and quantitative reasoning skills by being able to construct and apply scaled models to the Universe, explain the concept of proportionality and how it applies to physical laws that govern the motion of planets and your everyday lives. Students should also develop an understanding that science is a process, that the world is knowable, and that we are coming to know it through observations, experiments, and theory.
- Should be able to explain each step of the scientific method, know how to apply the scientific method to every day life as well as astronomical questions covered in the course. Students should be able to falsifying models and be able to ascertain the validity of basic theories about the universe through the scientific method.
- Should have a basic knowledge of a several physical laws & astronomical quantities that govern the way the universe behaves. For example, they should be able to quantify the effect of gravity (Newton’s Law of Gravity), the orbital period of the planets (e.g. Kepler’s Laws), the relationship between color and temperature of stars (Wien’s Law), and other basic physical laws.
- Should develop a familiarity the with the night sky (as viewed from Earth) and how its appearances will change with time and position. For example, students be able to deduce when certain phases of the moon will rises and set, explain how to predict the motion of the stars, and discuss human’s relationship with the sky among other things.

Texts and Materials: As you will find, or already know that, courses, and the required textbooks, are expensive in 2020! To minimize cost to students, this course requires a FREE online textbook (though it can be bought) and a relatively inexpensive workbook. Below are the required Texts and Materials for this class:

- ➔ **REQUIRED:** Your primary textbook for this class is available for free online, in web view and PDF format! **Astronomy by Openstax which can be found at : <https://openstax.org/details/books/astronomy>**.
 - ➔ You can also purchase a print version, if you prefer, via the campus bookstore or from OpenStax. The 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. Astronomy from OpenStax, ISBN-10:1-938168-28-3, www.openstax.org/details/astronomy
- ➔ **REQUIRED:** “*Lecture-Tutorials for Introductory Astronomy*”, **3rd Edition**, Prather, Slater, Adams & Brissenden. *Do not rent or buy used*. Available at Coop or online for ~\$45. Please make sure to the 3rd edition!
- ➔ **REQUIRED:** Internet-enabled device to join virtual classes, and participate in the ‘in-class’ response system through Canvas! Attendance will be done through the in-class response system so it is *imperative* that you do this. If you do not have an internet-enabled device to participate in class, please let me know as possible!
- ➔ **OPTIONAL:** *The Cosmic Perspective*, 8th Edition. Bennett, Donahue, Schneider & Voit. You are free to use an earlier version of this text if you prefer. The text is completely optional for the course and is not required to succeed.
- ➔ **Class Notes:** Class notes will be provided by the instructor via *Canvas* class website

Class Structure & Expectations:

Overview : We will divide the semester into four themes that will allow us to explore the universe in a manageable way. At the end of each theme there will be an exam.

Themes:

1. A View from a Pale Blue Dot (Lectures 1—6)
2. Across the Solar System (Lecture 7—11)
3. The Life and Death of Stars (Lecture 12—18)
4. A Galaxy Far, Far Away (Lecture 19—24)

Attendance: This class has a strong weight towards in-class participation. This is true *even though the course will be online!* Participating in the ‘in-class’ response system while not in the virtual classroom counts as academic dishonesty (see below section) and will result in a minimum penalty of a zero in class participation for the week.

Online Information and Expectations (Extremely Important):

AST301 will be taught online though my goal is to keep the course as similar as possible to the in-person version of AST301. Therefore, the course will contain both **synchronous lectures on Tuesday's via Tower Video Stream/Lectures Online + Zoom and asynchronous lectures, where students watch a pre-recorded lecture (via Lectures Online) before Thursday's class and come ready to discuss and engage in activities via Zoom.** The UT Tower Video Stream and Zoom link both can be accessed via the Canvas course homepage. Group activities will be conducted using Breakout Rooms and brief questions will be carried out with real-time polls. Active, engaged participation from students is *extremely important!* This is especially true in an online environment. You are expected to participate in group discussions, work through problems yourself and in groups, and avoid distractions during class.

Expectations for students in an online environment:

- All classroom norms apply when in a Zoom/Video Stream session. If you wouldn't do something in a physical class setting, don't do it in a digital classroom. Please dress in the same attire you would in a university classroom.
- Find a quiet work station with good lighting.
- As for an in-person class, do not browse the internet, email, or social media during class.
- During the **Video Streaming Sessions (Tuesdays)** your camera **MUST be turned off.** However, it is our preference that during the **breakout rooms discussion (Thursdays)** that your **camera is turned on.** If this is problematic for any reason, please contact me so we can find an alternative solution.
- Students **should remain muted while the instructor, TAs, or classmates are speaking.** Students should only unmute if given permission to do so.
- During lecture, students must use the Response Icon to raise hands. The TA will alert the professor to your question. The Instructor cannot see your questions directly through the video stream.
- Breakout Room discussions should be structured and on topic. Take turns sharing ideas without any single person dominating the discourse. The instructor, teaching assistant will be dropping in at random to listen in, promote the discussion, and answer questions.
- When in breakout rooms, each student should be present and the group should be participating together equally on the assigned topic. If a member of the group is not participating 50% or more of their group must collectively email the TAs and Instructor with the person's name and complaint. We will get in touch first with a warning then points will be deducted.
- Students are welcome to use appropriate digital backgrounds. If no digital Zoom background is used, please be sure there is nothing inappropriate in the background.

Class Website and email: The class website is hosted on Canvas (<https://utexas.instructure.com/courses/1283866>) and should be checked regularly for updates and messages from me regarding exam review sessions, course materials, or special events, etc. In addition to the class website, email is recognized as an official mode of university correspondence, therefore 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. When sending an email to us please put AST301 in the subject and make sure you have your name and EID in the email somewhere. Also please make sure you email both myself and the TAs.

Grading Components and Policies: You will receive the grade you *earn* in this course. There will be no extra credit (except for Exams) awarded in this class, 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:

Exams = 25%

Homework & Projects=45%

In-class Participation = 30%

The grading scheme is designed to be focused on a larger number of 'lower-stakes' assignments due to the online format. Here is more information on each of the grade components:

Exams (25%): There will be four exams covering material discussed in class, as outlined in the class schedule. These exams will be held during class and are tentatively scheduled for **Sept. 17, Oct. 8, Nov. 5, Dec 3**. Of these four exams only three will count towards your final grade. In other words, I will drop your lowest exam score. As such, there will be **no opportunity for make-up exams**, unless there is verified illness or emergency accompanied by a doctor's note (or due to COVID19 confirmed via Student Emergency Services) or a 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 fourteen (14) days in advance of the scheduled exam date. There will be no final exam for this course.

Exam Replacement through Creative Project (Optional) : Exams can, in some instances, not be the best assessment method to test the understanding of the material you have learned in class. Therefore, it will be possible in this class to replace one (1) exam grade with a *creative* project connecting your interests or major to Astronomy. This cannot be a simple term paper but other than that the genre and medium you want to work with written or otherwise is up to you (e.g. infographic, podcast, video, business proposal, space policy proposal etc.). In order to use this optional exam grade replacement you will be *required* to sketch this out in a proposal that must be presented to the TA and instructor. Proposals for creative projects must be submitted no later than start of class on **Oct. 15, 2020**. More details can be found on Canvas at a later date.

Homework & Projects (45%): Homework will be a combination of worksheets from the Lecture-Tutorials book (so please obtain an unused copy of the book) and online homework through the Canvas system. The due dates (and times) for homework will be posted to Canvas (though a rough guide can be found below) so please check the class website regularly! 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. 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. Unless otherwise noted, all paper based homework assignments must be scanned into canvas in order to be graded! When computing the final grade, we will drop your lowest two (2) homework & Project assignments.

Projects: There are 2 required projects:

1. Moon Journal Public Observing— The purpose of this project is to get you to take a moment to look up and actually view the sky. You must keep a moon journal (original journal sketching of the moon for grand total of 8 days). The moon journal must contain your name, the date, location, and time of observations, the predicted moon phase, whether the prediction was correct and a sketch of the moon (make sure you label which side is dark). *Cloudy nights do not count, so please do this early.* Your Moon journal should be submitted no later than **Nov. 17, 2020**.
2. Astronomy in the News — Astronomy is a rapidly changing field that often appears in the news, from the recent blood moon lunar eclipses to stories spacecraft landing on distant worlds. Your task will be to choose at least two (2) news/pop science articles about astronomy and write a 1-page (12 point, Times New Roman font, 1" margin) paper summarizing the news article and how it pertains to the class. Students will *may* be randomly selected to present their Astronomy in the News in front of the class at the beginning. The first Astronomy in the News paper is due by the beginning of class on **Sept. 15, 2020** and the second by **Oct. 22, 2020**.

Late-Policy: Each homework assignment can only be up to 2-day (48 hours) late. If it is late from 30 min - 1 day you lose 10%, if it is 24-48 hours you will lose 20%. After 48 hours past the deadline, we will not accept the assignment.

Class Participation (30%): **In-class participation is a major component of your grade.** You will carry out many of the in-class activities, peer-to-peer discussions and engage with the material over the semester. Therefore, your attendance will be *recorded every single class period using an in-class response system.* The in-class response system requires a wi-fi/internet enabled device, which is required each class period. If you do not have a wifi/internet enabled device please talk to Prof. Hawkins as soon as possible. **Participation credit will be given through the successful completion of 'in class' instapolls, worksheets, and quizzes.** We drop your lowest three (3) participation scores. *Since each class period will have a varying amount of material covered/assessed, it should not be expected that each class period will carry the same participation weight.*

This class will not be graded on a curve. Your grade is calculated to the nearest 1/10th 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, assigned as follows:

93.0 – 100%	= A
90.0 – 92.9%	= A-
87.0 – 89.9%	= B+
83.0 – 86.9%	= B
80.00 – 82.9%	= B-
77.00 – 79.9%	= C+
73.00 – 76.9%	= C
70.00 – 72.9%	= C-
67.00 – 69.9%	= D+
63.00 – 66.9%	= D
60.00 – 62.9%	= D-
0.0 – 59.9%	= F

If you have a question about your grade feel free to meet with Prof. Hawkins. If you have a request to appeal/change grade, please send Prof. Hawkins an email with the scan of the attached assignment and *at least 2-paragraph (i.e. 500 word) justification* on why you believe your grade should be changed.

Other University / Class Policies

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 should 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.

Regarding harassment/assault: Harassment of any sort will not be tolerated in this classroom or related workspaces. 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. 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). Remember as a Professor (or TA) we are mandatory reporters.

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 (SJS). 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). If the academic dishonesty 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: You may be required 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.

Diversity & Inclusion : Astronomy belongs to all people, independent of race, religion, gender, gender identity, gender expression, nationality, citizenship status, or sexual orientation. Incidents of discrimination, assault, harassment, threats, intimidation, profiling, or coercion based on membership or perceived membership will not be tolerated! The University of Texas President's statement of community values can be found here: <http://equity.utexas.edu/presidents-statement/>. If you notice an incident that causes concern, please contact the Professor, TA, and the Campus Climate Response Team (<http://diversity.utexas.edu/ccrt>).

Notice of Professional Astronomer Memo: See the "Memo for Undergraduate Astronomy Students Regarding Astronomy Courses": <http://www.as.utexas.edu/astronomy/education/memo.html>. It is also uploaded to Canvas. I am a professional Astronomer. In addition to my obligations to you and the other students in this and other courses, I have responsibilities to my graduate students and remain professionally competent through individual research. As a consequence, I may occasionally need to be away conducting research or attending a scientific meeting. Usually another faculty member will conduct the class when the regular instructor is absent.

Personal Family Emergencies: If you experience a personal or family emergency (death in the family, protracted sickness, serious health issues) that prevents you from attending an exam or forces you to miss more than a 2 class periods you should contact the Student Emergency Services in the Office of the Dean of Students ([http:// deanofstudents.utexas.edu/emergency/](http://deanofstudents.utexas.edu/emergency/)). They will work with you to communicate with your professors.

Religious Holidays: A student absent from class or examination for the observance of religious holidays are permitted to make up missed work if notice is given at least fourteen (14) days in advances of an absence.

COVID-19: A student absent from class or examination should work with Student Emergency Services in order to receive an extensions. All extensions are at the discretion of Prof. Hawkins.

Approximate Class Schedule – Fall 2020

Class Material and Schedule: Below is the *approximate* course schedule and material we will cover on those days. This is subject to change. All homework are due by the beginning of the class period on the date noted in the schedule. Under Pre-Class Recording you will find whether the class is meeting on Zoom (denoted A) or via the UT Tower Video stream + Zoom (denoted S)

AST301 : INTRODUCTION TO ASTRONOMY (HAWKINS) SYLLABUS

Date	Lecture Topic	Pre-Class Reading (Astronomy)	Homework	Lecture Tutorials	Pre-Class Recording
Theme 1: The View from a Pale Blue Dot					
Aug 27	Introduction/ Overview, Logistics, Math boot camp, Scale of Universe			Math Boot Camp (Due Sept. 3)	S
Sept. 1	Scientific Notation, Units, The Scientific Method, The Earth	11-30; 103-107		*Ranking Exercises	S
Sept. 3	The Sun, The Seasons	107-113		Math worksheet, Seasons	A
Sept. 8	The Moon, Eclipses, Lunar Cycle	120-124; 129-135	HW#1 (Due) : Sun Size	Causes of Moon Phases	S
Sept. 10	The Night Sky, Constellations	32-42; 50-53		Position, Motion	A

Sept.15	Historical Astronomy	42-61	News Item #1 Due	Diversity in Astronomy; Others :Observing Retrograde Motion/ Seasonal Stars	S
Sept. 17	Review + Exam#1		HW#2 (Due): Predicting Moon Phases		S
Theme 2: Across the Solar System					
Sept. 22	Introduction to the Solar System / Birth of Solar system / Gravity I	233-264		Newton's Law of Gravity	S
Sept. 24	Gravity II/ Planetary Motion	69-102		Kepler's 2nd Law	A
Sept. 29	The Inner (rocky) Planets + Climate	335-380			S
Oct. 1	The Outer (Gas giant) Planets	381-430; 740-762			A
Oct. 6	Exoplanets and the Search for Life in the Universe	381-430; 740-762	HW#3 (Due): Kepler's 3rd Law		S
Oct. 8	Review + Exam #2				S
Theme 3: The Life and Death of Stars					
Oct. 13	Radiation/ Light/Energy	17-18; 145-160			S

Oct. 15	Exoplanets (Guest Lecture)	563-575; 595-617; 659-672	(Optional) Creative project proposals due	Light/Atoms	A
Oct. 20	Light, Atoms, and the Doppler effect	527-554;625-658	HW#4 (Due): EM Spectrum of Light		S
Oct. 22	Star, The Sun, and Observing Stars (& Doppler effect)	727-739; 771-797	News Item #2 Due	Types of Spectra, Analyzing Spectra, parallax	A
Oct. 27	Classifying Stars	798-835;871-882		H-R Diagram, Luminosity/Temp/Size	S
Oct. 29	Birth and Life of Stars		Hw#5 Due (Doppler Shift) ;	Star Formation and Lifetimes ; Stellar Evolution	A
Nov. 3	Death of Stars & Black Holes	895-920	HW#6 (Due): HR diagram; (Optional) Creative Project Due		S
Nov. 5	Review + Exam#3	935-950;			S
Theme 4: Galaxies Far, Far Away...					
Nov. 10	The Milky Way	921-934		Milky Way Scales; Looking at Distant Objects	S
Nov. 12	Galaxies	921-934		Galaxy Classification; Dark Matter	A

Nov. 17	Galaxy Formation		Moon Journal and Astronomy Paper Due		S
Nov. 19	Composition of the Universe	1047-1088	HW#7 (Due) Expansion of the Universe		A
Nov. 24	An Expanding Universe			Hubble Law	S
Dec. 1	The Big Bang			Big Bang	S
Dec. 3	Review + Exam#4				S