

# AST301 : Introduction to Astronomy (Unique #46125; Spring 2020)



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

**PAI 3.02**

## 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.

### **Professor Keith Hawkins**

Office: PMA/RLM 16.228

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Help Hours : T/TH  
12:30-1:30pm

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Email :  
[khawkins13@austin.utexas.edu](mailto:khawkins13@austin.utexas.edu)

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### **TA : Sudesh Agrawal**

Office: PMA 16.304B.

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Help Hours : W 4-5pm

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Email : [sudesh@utexas.edu](mailto:sudesh@utexas.edu)

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### **TA : Andrew Stier**

Office: BME 5.108

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Help Hours : M 9-10am

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Email :  
[andrew.c.stier@gmail.com](mailto:andrew.c.stier@gmail.com)

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

### **Pre-requisites and Core Requirements:**

There are no prerequisites for this course. The concepts will be primarily qualitative, though there will be a small amount of *algebra* in the course. 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 have —

- A broad understanding of the nature, scope, and evolution of the Universe, and where the Earth and Solar System fit in.
- 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.
- 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.
- An understanding of a limited number of crucial astronomical quantities, together with some knowledge of appropriate physical laws, and the notion that physical laws and processes are universal.
- A familiarity with the night sky and how its appearance changes with time and position on Earth.

**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. (Simple printouts sold by third parties on Amazon are not verifiable and not as high-quality.) Astronomy from OpenStax, ISBN-10:1-938168-28-3, [www.openstax.org/details/astronomy](http://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:** Wi-fi enabled device to use the in-class response system through Canvas! Attendance will be done through here so it is *imperative* that you do this. If you do not have a Wi-fi enabled device to participate in class, please see me as soon as possible! If you forget your wi-fi enabled device you will not be counted in attendance.
- ➔ **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.
- ➔ **NO ACTION REQUIRED:** Class notes provided by the instructor via *Canvas* class website

**Use of electronics:** Computers for note-taking & polling is allowed. Other electronic devices can only be used for polling and attendance. Students using their electronics 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. Also, if you are distracted by non-academic use of electronics by a fellow student, you can ask them directly to stop or notify the instructor or TA who will follow-up.

### **Class Structure:**

**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. Therefore, attendance in this course is *mandatory*. We will take attendance each class through a canvas-based polling system at the beginning (and end) of each class period. It is your responsibility to be in class and have a wifi-enabled device to connect to the polling system. If you do not have a wifi-enabled device please see me as soon as possible. Participating in the in-class response system while not physically in class counts as academic dishonesty (see below section) and will result in a minimum penalty of a zero in class participation for the week.

**Class Website and email:** The class website is hosted on Canvas (<https://utexas.instructure.com/courses/1239633>) 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. 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* 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 = 30%

Homework= 25%

In-class Participation = 25%

Quiz or Project = 20%

Here is more information on each of the grade components:

Exams (30%): There will be four closed-notes, closed-book exams covering material discussed in class, as outlined in the class schedule. These exams will be held during class and are tentatively scheduled for **February 11, March 3, April 7, April 30**. 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, 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 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 **March 10**. More details can be found on Canvas at a later date.

Homework (25%): Homework will be a combination of worksheets from the Lecture-Tutorials book (so please obtain an unused copy of the book) and online homework from 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! **We DO NOT accept late homework!** 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 assignments.

Class Participation (25%): 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 *and* the TA. The in-class response system requires a wi-fi enabled device, which is required each class period. If you do not have a wifi enabled device please talk to Prof. Hawkins as soon as possible. We drop your lowest three (3) participation scores. Therefore, you can miss up to three class periods without it affecting your attendance grade.

Projects / Quiz: (20%) There are 3 required projects and there will be an occasional pop quiz. The goal of the pop quiz is to gauge how well you have picked up the previous class or two worth of material. All pop quizzes cannot be made-up. The three projects required are the following:

1. Moon Journal Public Observing (~7%)— 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 14 days). The moon journal must contain your name, the date, location, and time of observations and a sketch of the moon (make sure you label which side is dark) for each of the 14 nights, If it is cloudy, note that it is cloudy. Your Moon journal should be submitted no later than April 23, 2020.
2. Public Observing (~6%) — You must attend at least 1 public observing session details at : <http://outreach.as.utexas.edu/public/viewing.html>) and submit a 1-page write up on it. More details can be found on Canvas for each project. Your public observing pape should be submitted to canvas no later than April 23, 2020. **WARNING : Weather may be bad towards end of semester so DO THIS EARLY!**
3. Astronomy in the News (~7%) — 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 Room font, 1" margin) paper summarizing the news article and how it pertains to the class. Students will then 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 **February 6, 2020** and the second by **March 26, 2020**.



***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](http://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 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:** 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. I will be attending representing UT Austin at a professional meeting on March 10, 2020.

**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.

## Approximate Class Schedule – Spring 2020

**Class Material and Schedule:** Below is the *approximate* course schedule and material we will cover on those days. This is subject to change. Note: Spring Break is March 18-23, 2020. All homework are due by the beginning of the class period on the date noted in the schedule.

<b>Date</b>	<b>Lecture Topic</b>	<b>Pre-Class Reading (Astronomy)</b>	<b>Homework</b>	<b>Lecture Tutorials</b>
<b>Theme 1: The View from a Pale Blue Dot</b>				
Jan 21	Introduction/Overview, Logistics, Scale of Universe			
Jan 23	Scientific Notation, Units, The Scientific Method, The Earth	11-30; 103-107		*Ranking Exercises
Jan 28	The Sun, The Seasons	107-113		Seasons
Jan 30	The Moon, Eclipses, Lunar Cycle	120-124; 129-135	HW#1 (Due) : Sun Size	Causes of Moon Phases
Feb 4	The Night Sky, Constellations	32-42; 50-53		Position, Motion
Feb 6	Historical Astronomy	42-61	News Item #1 Due	Observing Retrograde Motion/ Seasonal Stars
<b>Feb 11</b>	<b>Review + Exam#1</b>		HW#2 (Due): Predicting Moon Phases	
<b>Theme 2: Across the Solar System</b>				
Feb 13	Introduction to the Solar System / Birth of Solar system / Gravity I	233-264		Newton's Law of Gravity



Feb 18	Gravity II/ Planetary Motion	69-102		Kepler's 2nd Law
Feb 20	The Inner (rocky) Planets + Climate	335-380		
Feb 25	The Outer (Gas giant) Planets	381-430; 740-762		
Feb 27	Exoplanets and the Search for Life in the Universe	381-430; 740-762	HW#3 (Due): Kepler's 3rd Law	
Mar 3	<b>Review + Exam #2</b>			
<b>Theme 3: The Life and Death of Stars</b>				
Mar 5	Radiation/Light/Energy	17-18; 145-160		Light/Atoms
Mar 10	A stellar introduction / Guest Lecture	563-575	(Optional) Creative project proposals due	
Mar 12	A stellar introduction / The Sun as a star	527-554	HW#4 (Due): EM Spectrum of Light	
Mar 17	Spring BREAK			
Mar 19	Spring BREAK			
Mar 24	Observing Stars	595-617; 659-672		Types of Spectra, Analyzing Spectra, parallax
Mar 26	Classifying Stars	625-658	News Item #2 Due	H-R Diagram, Luminosity/Temp/Size
Mar 31	Birth and Life of Stars	727-739; 771-797	Hw#5 Due (Doppler Shift)	Star Formation and Lifetimes
Apr 2	Death of Stars & Black Holes	798-835;871-882		Stellar Evolution
Apr 7	<b>Review + Exam#3</b>		(Optional) Creative Projects Due	
<b>Theme 4: Galaxies Far, Far Away...</b>				

Apr 9	The Milky Way	895-920	HW#6 (Due): Binary Stars; Proposals for Optional Creative Project Due	Milky Way Scales
Apr 14	Galaxies	935-950;		Galaxy Classification
Apr 16	Galaxy Formation	921-934		Dark Matter
Apr 21	Composition of the Universe	921-934		Looking at Distant Objects
Apr 23	An Expanding Universe		Moon Journal and Observing Paper Due	Hubble Law
Apr 28	The Big Bang	1047-1088		Big Bang
<b>Apr 30</b>	<b>Review + Exam#4</b>		HW#7 (Due) Expansion of the Universe	
May 5	Topics in Modern Astronomy			
May 7	Topics in Modern Astronomy			