

Astronomy 301: Introduction to Astronomy

Unique Number 48020

Spring 2021

Class Meeting Times: Tu/Th 2:00pm-3:30pm

Course Mode: Online Only

Instructor: Prof. Mike Boylan-Kolchin

Course Overview and Objectives

This course will provide an overview of astronomy, including basic physical concepts, planets, stars, galaxies, and cosmology. It will cover the familiar (the solar system, the Sun, etc.) and the exotic (for example: black holes, dark matter, dark energy). The design of the course will focus on conceptual understanding rather than memorization of facts. Students will learn how science works, develop critical thinking skills, and gain an appreciation for the Universe around us and of the importance of continued scientific study (both applied and theoretical). The concepts will be primarily qualitative, though students will be expected to be able to do basic mathematics (exponents, ratios, unit conversions, etc.). In this course, you will:

- develop physical intuition the Universe, its contents, and its evolution over cosmic time
- understand the seasons, the phases of the moon, and the contents of the solar system
- learn about how stars are born, evolve, and die
- understand our current understanding of extrasolar planets
- learn about dark matter, dark energy, and black holes
- discover the frontiers of astrophysical research

There are no prerequisites for this course. AST 301 is intended to meet the requirements for the Core Component Area Natural Science and Technology and may be combined with AST 309G, 309L, 309N, 309R, or 309S for a six-hour Core sequence. This course will include work designed to develop skills in critical thinking, communication, quantitative analysis, and teamwork. Communication in the course will include student questions and subsequent classroom discussions during lecture. Teamwork in the course may consist of working in small groups during help sessions and instructor-modeled problem solving that is guided by student decisions and group feedback. This section of AST 301 does **NOT** carry a Quantitative Reasoning (QR) flag.

How Will I Succeed in this Course?

I have confidence that every single person in this course can learn the material and earn a good grade, provided you engage with the material. I believe that the two most important components of success in this class are:

- **Keep an open mind and try hard:** while much of the material can seem complicated, we will try to focus on intuition and concepts.
- **Don't fool yourself:** R. Feynman famously said "The first principle is that you must not fool yourself, and you are the easiest person to fool," and I think this is true in learning, too. It is easy to convince yourself that you understand something; it's important to be sure that you really do understand it. *it's OK to be confused about a topic, an equation, or a concept!* And it's definitely OK to ask questions, even if you're afraid they might be too simple/ And the reverse is true: don't be overly pessimistic about yourself and your abilities. I know you can fully grasp the material and do well in the course!

Course Website and Email

The course website will be hosted on Canvas (<http://canvas.utexas.edu>). **Make sure that you are able to access and receive emails through Canvas.** Email is recognized as an official mode of university correspondence; you are responsible for reading your email for university and course-related information & announcements.

Course Textbook (required)

The Cosmic Perspective (9th Edition), Bennett, Donahue, Schneider & Voit

Mastering Astronomy (connect through Canvas).

Lecture-Tutorials for Introductory Astronomy, 3rd Edition, Prather, Slater, Adams & Brissenden

Please be sure to get the correct editions of the books. In addition, *Mastering Astronomy* (implemented through Canvas) is required, as it will be used for homework assignments and related aspects of the course.

Course Expectations

- **Attendance and Engagement:** Course attendance is crucial for understanding the complex material we will be covering. Additionally, we will be doing regular group exercises in class. These exercises are important for building your understanding and intuition about difficult problems. I always welcome questions about the course material during class or office hours.

Absences for illness, religious observances, participation in University activities at the request of University authorities, and compelling circumstances beyond the student's control are excused under University policy. Please inform the instructor *in advance* of any absences or schedule conflicts for religious observances.
- **Preparation:** This course covers fascinating but sometimes conceptually challenging subjects. I will make every effort to help you understand these topics with a minimum of mathematics. However, a working understanding of high school algebra is required.
- **Assignments:** It is fine to discuss concepts with your classmates – trying to explain something to someone else is a good way to see how well you understand it! We will also engage in frequent group discussions in class. **However, it is crucial to remember that all graded assignments, including homeworks and quizzes, must consist of your own thoughts in your own words.** Please also see the statement on academic integrity below.

Grading

You will receive the grade you earn in this course. **There will be no extra credit awarded during or after the semester**, so please be sure to put in the effort during the semester to earn the grade you want. Your grade will be based on the following components:

- *Homework: 40%.*

Homework will generally be due once every two weeks (for a total of 7 assignments), on Friday at 5pm. After that time, it will be considered late. Late homework will receive a penalty of either 10% (if it is received by 5pm on the Tuesday following the due date) or 25% (if it is received by 5pm the Friday following the due date). Homework will not be accepted later than 1 week after the due date. **Your (one) lowest homework grade will be dropped.**

If you have a valid emergency that prevents you from making a homework deadline, you should make all reasonable efforts to contact me before the due date telling me the nature of the emergency. Please document all such emergencies; a self-signed note is sufficient provided that it contains a statement that (1) the information is true and correct and (2) you are aware that providing false information is prohibited under the Code of Student Conduct. If, for any reason, the University is officially closed on the day of the due date, the due date will be moved to the next lecture.

- *In-class Quizzes: 40%*

There will be 7 total in-class quizzes every other Thursday (on weeks when HW is not due). These will take ~ 20 minutes and are designed to reinforce important concepts in the class. There is substantial research that frequent, small-stakes evaluations are highly beneficial in long-term understanding of a subject (see [Make it Stick: The Science of Successful Learning](#) by P. Brown et al. for more details). **Your (one) lowest quiz grade will be dropped.** If you must be absent for an extended period or miss more than one quiz, please arrange to discuss this with me.

- *Participation: 20%*

We will make frequent use of instapoll for in-class questions to gauge how people are absorbing the material in real time. *Your grade will **not** be based on whether you are correct in your answers*; the point is to try, so your participation via instapoll will receive full credit. **Your four lowest participation grades will be dropped.**

There will be no comprehensive final exam.

Your grade will be computed as follows: the average grade you receive in each of the components listed above will be weighted by the percentage listed above and then rounded to the nearest 1 decimal place. Your final grade will be given by the following 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

Class Policies

- *Respect for others is vital.* I am: invested in the educational experience of each student in the class, respectful of individual differences, encouraging of creativity, available to discuss material and assignments; thorough in evaluating assignments; and rigorous yet supportive in maintaining high standards for performance. As a student, you are expected to work individually and with others, to create an atmosphere that is safe, valuing of one another, and open to diverse perspectives. Everyone is expected to show courtesy, civility, and respect for one another. Comments or postings that degrade or ridicule another, whether based on individual or cultural differences, are unacceptable.
- Classroom norms apply during a zoom call. If you wouldn't do something in a physical class setting, please don't do it in a digital classroom.
- If you feel comfortable doing so, turn your camera on during the class. You are welcome to use a digital background or not; in either case, please make sure there is nothing inappropriate.
- Please keep yourself muted. If you have a question, use the "Raise hand" feature on zoom; the TAs and I will monitor the participants and call on people with raised hands.
- My official responsibilities as a professor occasionally require me to participate in external events. I will do my best to ensure these events do not conflict with class time; if I do have to miss any instructional time, another PhD UT astronomer will lead the class.
- **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 Recordings:** Class recordings are reserved only for students in this class for educational purposes and are protected under FERPA. *The recordings should not be shared outside the class in any form.* Violation of this restriction by a student could lead to Student Misconduct proceedings.
- **Religious Holidays:** According to UT Austin policy, you must notify the professor of a pending absence at least fourteen days prior to the date of observance of a religious holy day.

If you must miss a class, an examination, a work assignment, or a project in order to observe a religious holy day, you will be given an opportunity to complete the missed work within a reasonable time after the absence.

COVID-19 Update

This course may be offered in a format to which you are unaccustomed. If you are looking for ideas and strategies to help you feel more comfortable participating in our class, please explore the resources available here: <https://onestop.utexas.edu/keep-learning/>

Personal Pronouns

Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, culture, religion, politics, sexual orientation, gender, gender variance, and nationalities. Class rosters are provided to the instructor with the student's legal name, unless they have added a "preferred name" with the Gender and Sexuality Center (<http://diversity.utexas.edu/genderandsexuality/publications-and-resources/>). I will gladly honor your request to address you by a name that is different from what appears on the official roster, and by the gender pronouns you use. Please advise me of any changes early in the semester so that I may make appropriate updates to my records. For instructions on how to add your pronouns to Canvas, visit <https://utexas.instructure.com/courses/633028/pages/profile-pronouns>.

Q Drop Policy (modified for Fall 2020 and Spring 2021 semesters)

If you want to drop a class after the 12th class day, you'll need to execute a Q drop before the Q-drop deadline, which typically occurs near the middle of the semester, but has been extended for the spring 2021 semester to May 11. Under Texas law (!!), you are only allowed six Q drops while you are in college at any public Texas institution. However, for the Fall 2020 and Spring 2021 semesters, all Q-drops will be considered "non-academic," which allows students to drop a class without counting toward the six-class limit. For more information about Q drops in general, see: <http://www.utexas.edu/ugs/csacc/academic/adddrop/qdrop>. For information about Fall 2020 and Spring 2021 updates to the Q Drop Policy, see: <https://provost.utexas.edu/2020/11/25/extended-deadline-for-q-drops-and-p-f-flexibility/>.

Pass/Fail or Credit/No Credit Grading Policy

For the Spring 2021 semester, undergraduate students may choose to have a total of three (3) classes graded on a Pass/Fail or Credit/No Credit basis without penalty. These exceptions are new and apply only to the Fall 2020 and Spring 2021 semesters. For more information please visit UT's policy on the Extended deadline for Q-drops and P/F Flexibility, available [here](#).

University Deadlines

Please see <http://registrar.utexas.edu/calendars/20-21> for relevant University deadlines (including drop deadlines)

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/standardsconduct.php>

Services for Students with Disabilities

The university is committed to creating an accessible and inclusive learning environment consistent with university policy and federal and state law. Please let me know if you experience any barriers to learning so I can work with you to ensure you have equal opportunity to participate fully in this course. If you are a student with a disability, or think you may have a disability, and need accommodations please contact Services for Students with Disabilities (SSD): <http://diversity.utexas.edu/disability/>. If you are already registered with SSD, please deliver your Accommodation Letter to me as early as possible in the semester so we can discuss your approved accommodations and needs in this course. For more information, contact Services for Students with Disabilities at 471-6259 (voice) or 232-2937 (video phone) or <http://ddce.utexas.edu/disability/>

Counseling and Mental Health Center

The Counseling and Mental Health Center serves UT's diverse campus community by providing high quality, innovative and culturally informed mental health programs and services that enhance and support students' well-being, academic and life goals. To learn more about your counseling and mental health options, call CMHC at (512) 471-3515. If you are experiencing a mental health crisis, call the CMHC Crisis Line 24/7 at (512) 471-2255.

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Important Safety Information

If you have concerns about the safety or behavior of fellow students, TAs or Professors, call BCAL (the Behavior Concerns and COVID-19 Advice Line): 512-232-5050. Your call can be anonymous. If something doesn't feel right – it probably isn't. Trust your instincts and share your concerns.

BeVocal is a university-wide initiative to promote the idea that individual Longhorns have the power to prevent high-risk behavior and harm. At UT Austin all Longhorns have the power to intervene and reduce harm. To learn more about BeVocal and how you can help to build a culture of care on campus, go to <https://wellnessnetwork.utexas.edu/BeVocal>.

Title IX Reporting

Title IX is a federal law that protects against sex and gender based discrimination, sexual harassment, sexual assault, sexual misconduct, dating/domestic violence and stalking at federally funded educational institutions. UT Austin is committed to fostering a learning and

working environment free from discrimination in all its forms. When sexual misconduct occurs in our community, the university can: (1) Intervene to prevent harmful behavior from continuing or escalating; (2) Provide support and remedies to students and employees who have experienced harm or have become involved in a Title IX investigation; (3) Investigate and discipline violations of the university's relevant policies.

Beginning January 1, 2020, Texas Senate Bill 212 requires all employees of Texas universities, including faculty, report any information to the Title IX Office regarding sexual harassment, sexual assault, dating violence and stalking that is disclosed to them. Texas law requires that all employees who witness or receive any information of this type (including, but not limited to, writing assignments, class discussions, or one-on-one conversations) must be reported. **I am a Responsible Employee and must report any Title IX related incidents that are disclosed in writing, discussion, or one-on-one. Before talking with me, or with any faculty or staff member about a Title IX related incident, be sure to ask whether they are a responsible employee.** By state law, any responsible employee who does not report any Title IX related incidents that are disclosed to them must be fired from the University (and can be charged with a criminal offense – Class B or Class A Misdemeanor).

If you want to speak with someone for support or remedies without making an official report to the university, email advocate@austin.utexas.edu For more information about reporting options and resources, visit <http://titleix.utexas.edu> or contact the Title IX Office at titleix@austin.utexas.edu.

Although graduate teaching and research assistants are not subject to Texas Senate Bill 212, they are still mandatory reporters under Federal Title IX laws and are required to report a wide range of behaviors we refer to as unprofessional or inappropriate conduct of a sexual nature, including the types of conduct covered under Texas Senate Bill 212. The Title IX office has developed supportive ways to respond to a survivor and compiled campus resources to support survivors.

Preliminary Course Outline

Note: changes to this schedule may be made at my discretion and if circumstances require. It is your responsibility to note these changes when announced (although I will do my best to ensure that you receive the changes with as much advanced notice as possible).

Dates	Topics
Jan 19, 21	Course overview; units and scales; a brief tour of the Universe
Jan 26, 28	The night sky; the seasons; the Moon; eclipses; <i>HW 1</i>
Feb 2, 4	The history of astronomy and the scientific method; <i>quiz 1</i>
Feb 9, 11	Modern astronomy's beginnings; Kepler and Galileo; <i>HW 2</i>
Feb 16, 18	Newton, and Gravity; <i>quiz 2</i>
Feb 23, 25	Relativity; the nature of light; atoms; <i>HW 3</i>
Mar 2, 4	Atomic spectra; properties of stars; <i>quiz 3</i>
Mar 9, 11	Fusion and the Sun; stellar evolution; <i>HW 4</i>
	<i>March 16, 18: Spring Break</i>
Mar 23, 25	Stellar deaths; black holes; <i>quiz 4</i>
Mar 30, Apr 1	The solar system; extra-solar planets; <i>HW 5</i>
Apr 6, 8	Planets; life in the Universe; <i>quiz 5</i>
Apr 13, 15	Galaxies and the large-scale structure of the Universe; <i>HW 6</i>
Apr 20, 22	Dark matter and dark energy; <i>quiz 6</i>
Apr 27, 29	The Big Bang; <i>HW 7</i>
May 4, 6	Open questions in astronomy; <i>quiz 7</i>