

AST 352K – STELLAR ASTRONOMY (FALL 2021, Unique No. 48315)

Syllabus (posted Aug. 26, 2021)

Course website and email platform for contacting the professor and T.A.: **Canvas**

Class meetings: **Tues. & Thur. 9:30-10:45 PM** in PMA 15.216B and/or via Zoom

Instructor: Prof. Harriet Dinerstein (she/her), primary method of contact = Canvas email

Instructor Office Hours: Initially Wed 1:30 – 2:30 PM or by appointment, via Zoom

Teaching Assistant: Yuchen (“Kay”) Guo (she/her), method of contact = Canvas email

T.A. Office Hours: Initially Wed 4 – 5 PM via Zoom; more hours to be added later

IMPORTANT INFORMATION:

This syllabus is provisional. There may be changes to the schedule, material covered, class meetings format, and assigned coursework including credit given for specific assignments. Such changes may be necessitated by evolving public health conditions, best approaches for particular assignments, and feedback from you. This course is “hybrid” as defined by the Registrar (<https://registrar.utexas.edu/schedules/mode>): meets in person some of the time and remotely at other times. The first few class meetings will be remote, while we see how the health situation on campus and in Austin develops at the start of the semester. Later we may transition to about half the class sessions meeting in person (probably mostly Tuesdays), and being recorded on Zoom, with the rest of the sessions (probably most Thursdays) held remotely. The latter works better for quizzes and for conducting small-group activities while maintaining social distancing, but having only up to half the class meet in person at a time is also a possibility. These choices will depend on the unknown future situation.

Main website for COVID information: Protect Texas Together, <https://protect.utexas.edu/>

If you choose “Students and Families,” the section entitled “Staying Healthy on Campus” has links to information about testing, screening, and health behavior guidance. You have probably also received information on these topics from other sources, but here are some links:

<https://protect.utexas.edu/vaccine> ; <https://www.healthyhorns.utexas.edu/>

Note: If you are feeling ill, stay home and report to the [Occupational Health Program \(OHP\)](#). If you test positive, contact [BCCAL](#) , or report to [University Health Services](#) if tested off campus.

For further information about UT and class-specific protocols, see below (last few pages).

The instructor and T.A. are concerned about your physical and mental health in this stressful environment. Please make use of University resources for needs that call for professional assistance (Student Health Center, counselors, BCCAL, etc.) but do not hesitate to let the us know if you are facing challenges that may impact your success in this course.

COMMUNICATION AT UT AND IN THIS COURSE:

UT policy says that email is a mechanism for official University communications to students and that email communications will be received and read in a timely manner. Since some emails may be time-critical, it is recommended that email be checked daily. For more details, see

<https://it.utexas.edu/policies/university-electronic-mail-student-notification-policy>

In addition, you should ensure that your Canvas notification settings enable immediate delivery of course-related communications such as Announcements, which we will use in AST 352K.

COURSE SUBJECT MATTER AND LEVEL:

Astronomy 352K is an upper-division course on stellar astronomy that approaches the subject from the perspective of *how we obtain and interpret astronomical measurements*. It carries a Quantitative Reasoning flag and is designed for students majoring in astronomy, physics, engineering, or geology. Students with other majors should check that they have the prerequisites before taking this course.

Stars are fundamental to astronomy. They are the ruling bodies of planetary systems, the building blocks of galaxies, and the nuclear ovens where the elements heavier than helium are created. We will examine the “observable” properties of stars: characteristics that can be measured over great distances by analyzing the light they emit. By applying basic physical principles we deduce stellar surface temperatures, radii, luminosities, composition, masses, and much more. It is amazing how much we can learn from starlight, but we need to recognize both the power and limitations of these techniques in order to assess what is well-established and what is provisional knowledge. I hope you will enjoy this broad tour of astronomy!

PREREQUISITES, COURSE PHILOSOPHY AND OBJECTIVES:

The prerequisites for Ast 352K are Physics 301 and 316 or the equivalent: two semesters of college level, calculus-based physics. Previous astronomy courses are not required but may be helpful. Since astronomy draws on specialized topics in physics that you might not have covered yet we will introduce them as needed. The purpose of the prerequisite is to ensure familiarity with physical principles and problem-solving methods. In Ast 352K you will mainly be *applying* principles rather than carrying out theoretical derivations. The math will be mostly algebra, trigonometry, and simple calculus. We will use math as a tool to explore and uncover interesting results and relationships. Since our purpose is **not** simply to derive numbers but rather to obtain insight, you will be expected to comment on your answers: Are they surprising? What are their significance and implications?

WHAT WILL I LEARN IN THIS COURSE? To master common terms, metrics, and conceptual bases of observational astronomy and use these tools to infer properties of stars and their life stories. Specific learning outcomes for each unit will be listed as we begin that unit.

REQUIRED AND RECOMMENDED COURSE RESOURCES:

- **Primary Resource – Instructor’s Notes:** The primary text for Ast 352K is a set of course notes developed jointly by Profs. Harriet Dinerstein and Chris Sneden. These will be posted in sections, a few days in advance of the material being covered in class. These notes are for your use **only** and may not be distributed to others, in accord with University Policies.
- **Class Slides** – More information will be presented in slides shown during class. A preliminary version may be posted before class, but the definitive version will be posted **after** the class.
- **Especially for astronomy novices:** If you have not previously taken an astronomy course you may encounter many unfamiliar terms. You may consult any reasonably recent introductory textbook, but another option is the free OpenStax book “Astronomy” by Andrew Fraknoi, et al. at <https://openstax.org/details/books/astronomy>. You can download the whole book or just the relevant sections, which will be listed on Canvas.

Other Resources: We will provide links to other free materials on the Internet.

PRELIMINARY SCHEDULE: (DATES, TOPICS INCLUDED & ORDER ARE SUBJECT TO REVISION!!)

Unit No.	Unit Title	Key Topics	Expected Dates	Tentative quiz & HW due dates
1	Where the Stars Are: Positional Astronomy	Reference frames & coordinate systems; diurnal & annual cycles; precession; parallax/distances	8/26, 31 9/2, 7	HW 1 (9/9) Quiz 1 (9/23)
2	Seeing the Light: EM Radiation and Spectra	EM spectrum; kinds of spectra; blackbody radiation; magnitude system; filters; color indices	9/9, 14, 16, 21	HW 2 (9/30) Quiz 2 (10/14)
3	Tools of the Trade: Telescopes, Tellurics, and Techniques	Telescopes; instruments; types of measurements; effects of the atmosphere & back/foregrounds	9/28, 30, 10/5	Group Project due 10/12
4	Roadmap of the Stars: Stellar Spectra and the HR Diagram	Spectral types; luminosity class; color-magnitude & HR diagrams; MS lifetimes & star clusters	10/5, 7, 12, 19	HW 3 (10/21) Quiz 3 (10/28)
5	Hiding in the Light: Quantitative Methods	Bohr atom; spectral lines; basis of spectral types; Boltzmann & Saha eq'ns; element abundances	10/19, 21, 26, 11/2	HW 4 (11/4) Quiz 4 (11/18)
6	Dancing with the Stars: Binary Systems & Stellar Masses	Radial velocity & proper motion; binary systems & stellar masses; evolution in close binaries	11/4, 9	HW 5 (11/23) 2 nd Project (Indiv/Group)
7	Lives & Deaths of the Stars: Birth, Evolution and Endpoints	Pre- and post-Main Sequence Evolution of Low and High-Mass Stars; Remnants & Recycling	11/11, 16, 23, 30	Quiz 5 (12/2)
	Optional Final Exam	Make-up chance if you missed a quiz or just want a "do-over."	12/13	

I have built in time lags between lecture dates for a unit and the quiz that covers that material., to ensure sufficient time for us to provide feedback on HWs prior to the corresponding quiz.

COURSEWORK AND GRADING BASIS:

Grades will be assigned on a plus/minus scale, based on a "points" system. I do not use a "curve" that sets a quota on how many students can receive a certain grade, e.g. an A. You will receive a grade based on *your* performance in the course. That said, note that about a quarter of your grade will come from group activities carried out in class, but most (not all) of the credit on these is for effort, and they will be "overbooked" (see below). The breakdown:

- **Unit Quizzes:** there will be 5 quizzes, **tentative** dates listed above, each focusing on the previous 1 or 2 units. Each quiz is worth 14 points, but the lowest score will be dropped, so a quiz total of 4×14 will make up 56% of the course grade. The modality of these quizzes is to be determined, but they will take place during the official class meeting time. One possibility is that they would be taken remotely. You will be able to use calculators and at least a list of constants and equations provided by the instructor.

- Rather than make-ups for specific missed quizzes, there will be an all-purpose make-up opportunity in the form of a comprehensive optional final exam (probably administered remotely) at the official Final Exam time of Mon, Dec. 13, 9:00 AM. This option is also available to any student who wants a “do-over” to try to improve their grade. However, it will not be possible to take the final at a time other than this scheduled time slot.
- Ungraded on-line “review” quizzes: No points. For each unit we will offer a “Terms and Concepts Check” consisting of simple (e.g. multiple-choice) questions that will provide a check on your basic knowledge of the material. These are not at as high a level as the graded assignments (homework and quizzes), but are intended to be self-study tools.
- In-class Activities: We will have small-group activities during some class meetings. These will probably happen mostly in remote synchronous sessions – in Zoom breakout rooms – to enable safe interactions while working together. (If your circumstances make this difficult, contact the instructor to discuss.) As with quizzes there will not be make ups for specific missed activities. Instead, you should plan to earn the equivalent credit with other activities or assignments. Most of the credit for activities is earned for any significant and sincere effort (you don’t have to get all the right answers!). The total is capped at 14 points, but more than 14 points will be available, an approach I call “overbooking.” This allows you to miss an occasional class without need for letters.
- Small Projects: We will have a couple of less-conventional assignments. One, due in mid-semester, will be a group project to create a proposal to build a telescope (up to 6 points). A second project towards the end of the semester may be either another group project or possibly a project called a “Stellar Spotlight” that involves finding a recent news story relevant to class content and writing an original summary (up to 3 points).
- Homework: We will have about 5 homeworks. The best 4 will count, for an overall HW total of up to 16 points. On-time submissions can earn up to full credit, late papers received within 24 hours can earn up to ¾ credit, after that no credit is given. You may discuss HW approaches with other students but the work you submit must be your own.
- General Participation: The remaining 5 points that bring the total to 100 come from regular participation in class. Alternatively, this credit can be earned through making substantive contributions on Canvas Discussions (these may be questions or answers).
- Extra Credit: There will be some opportunities to earn a small amount of extra credit that is not subject to the “caps” listed above but can be included in your total grade. The formats are to be determined, but might include additional individual reports on articles of interest, or from a talk or seminar you attend or watch its recording. I will provide information in advance of seminars that are appropriate; please do not attend talks without such authorization and assume that they will be approved “after the fact.” UT policy is that extra credit opportunities must be available to all students in the class.

The expected correspondence of letter grades to numerical scores is as follows. There will be no rounding up or down. (Adjustments are unlikely, but if made they will be in your favor.)

A	A–	B+	B	B–	C+	C	C–	D	F
≥ 90.00	87.00- 89.99	84.00- 86.99	80.00- 83.99	77.00- 79.99	74.00- 73.99	70.00- 73.99	67.00- 69.99	60.00- 66.99	≤ 59.99

IMPORTANT DATES FOR FALL 2021 (some of these apply to any UT class):

- First class meeting: Thurs., Aug. 26
- Last day to add this class (end of free adds/drops period): Mon., Aug. 31
- Last day to add a class with instructor approval, or to drop with a possible refund: Fri., Sep. 11
- Last day to drop a class for academic reasons (requires dean's approval) or to change grading basis between a letter grade and credit/no-credit: Fri., Oct. 29 (We will have had at least 2, possibly 3, quizzes and several activities and homeworks before that date)
- Last class meeting: Thurs., Dec. 2
- Last UT class day: Mon., Dec. 6
- Optional final exam (= make-up for previous quizzes): Mon., Dec. 13

HOW TO GET HELP IN THIS COURSE:

- Ask questions during class meetings – Often the best time to ask a question is when it first arises. Other students may have the very same question! If the class is held remotely and you are muted, use the “raise hand” feature or the chat window. If you feel uncomfortable addressing your chat question to “everyone,” direct it to the T.A., who will ask it for you.
- Visit during Consulting Hours - We will initially schedule several Zoom meetings per week with the instructor and T.A. You can also request appointments at other times. Later we may add in-person office hours in the classroom to ensure low density and social distancing.
- Email the instructor and T.A. with questions. It is important that you do this through Canvas (not directly to their general email addresses) since this identifies your message as being associated with the course. In your message please indicate exactly to whom it is being addressed, e.g. Instructor only, T.A.s only, or both, to avoid crossed signals.
- We also plan to create Discussions on certain topics including one on questions about course operations, deadlines, etc. This lets other students see questions and responses.
- We want you to feel comfortable and to succeed in this course! All participants must exhibit respect, courtesy, and sensitivity toward others in this class. If you prefer to be addressed by a different name or pronoun than those on the class roster, you can indicate this on a survey early in the semester. You can also edit your visible name on Zoom.

CLASSROOM PROCEDURES AND PROTOCOLS FOR ASTRONOMY 352K: (ALSO SEE PAGE 8)

When meeting in person:

- The CDC and UT strongly recommend that you wear a mask in indoor spaces such as the classroom, 15th floor hallway, elevators, etc. Wearing a mask helps ensure the safety of you and others, for both vaccinated and unvaccinated people. The Provost says: “Make sure your recommended protective face mask covers your nose and mouth.” Students can pick up free masks at the Texas Union and Student Activity Center.
- The University recommends that we maintain social distancing in class. This affects the class format we can safely use while maintaining 6 feet of separation from classmates. We also request that you remain 6 feet from the instructor or T.A. when asking questions after class (an easy way to ensure this is to avoid stepping onto the stage).

- As you know, all students, even those who are continuing current residence in Austin, need to report a negative COVID test at the start of the semester.
- If you feel ill or have a positive COVID test, report this to BCCAL at (512) 232-5050. You can also report other concerns or issues about the behavior of others to BCCAL.
- The University strongly encourages everyone who has not yet been vaccinated to do so. Vaccinations can be obtained on campus, and incentives are now being offered.

When meeting remotely (via Zoom):

- You should use a laptop rather than a tablet (iPad) or phone to join class sessions if possible, to facilitate accessing and viewing web pages and interacting online.
- Always log onto Zoom through Canvas: sign on to Canvas first, then select the Zoom link on the left menu. This ensures that you are logged in on your official UT Zoom account.
- You will be expected to keep your video feed live most of the time during class sessions, as announced by the instructor. While there can be exceptions for special circumstances (contact the instructor), this is particularly important for group work and when asking or answering questions. The video feed will also be used for remote proctoring of quizzes. As mentioned above, when asking questions, another choice is to pose your question in the chat window, or send it directly to the T.A., who can then ask the question out loud.
- You may be muted some of the time, to keep background noise to a minimum.
- Ensure that your Notifications are set so that you receive class Announcements promptly, since these will be a primary channel for us to communicate with you.
- Be aware that the general sessions of class meetings (but not necessarily the breakout room sessions) will be recorded for later access by members of the class only.

GENERAL RESOURCES FOR STUDENT SUPPORT (NOT COVID-SPECIFIC):

- University and College of Natural Sciences (CNS) Inclusivity Policies – The University is committed to creating an accessible and inclusive learning environment for every member of our community. Bias, discrimination, and harassment have no place here. If you have concerns, contact the Campus Climate Response Team at diversity.utexas.edu/ccrt.
- Places to turn to if you are concerned about safety or the behavior of other students, TAs, faculty, etc. are the Behavior Concerns and COVID-19 Advice Line, BCCAL (512) 232-5050, or BeVocal, wellnessnetwork.utexas.edu/BeVocal.
- Some students are eligible for certain accommodations on course requirements through authorization by Services for Students with Disabilities (SSD). If you have a disability or think you may have one and need accommodations, please contact SSD as soon as possible. SSD authorizations must be renewed each semester. See diversity.utexas.edu/disability/ for information. Once an Accommodation Letter is sent, you must meet individually with the Instructor to discuss your accommodations and arrange for them to be implemented. For some classes, you may wish to take advantage of the new Testing Center.

If you have already registered with SSD and have an Accommodation Letter, please email me soon to set up a meeting to discuss your specific needs and how to meet them.

- The Counseling and Mental Health Center (CMHC) offers programs and services that enhance and support students' mental health and well-being. For information on their programs, call (512) 471-3515. However, if you are experiencing a mental health crisis, call the CMHC Crisis Line at (512) 471-2255, 24/7.
- In difficult or emergency situations, you can obtain assistance (not counseling) from Student Emergency Services: email studentemergency@austin.utexas.edu or call (512) 471-5017 (Mon.-Fri., business hours), who will notify your instructors. More information is given at deanofstudents.utexas.edu/emergency. For immediate threats or emergencies, call 911.

GENERAL UNIVERSITY POLICIES (NOT COVID-SPECIFIC):

- Academic Integrity: Each student 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.”** Copying or presenting someone else's work as your own is academic dishonesty and entirely unacceptable, and is subject to academic disciplinary action, including failure in the course. You are responsible for understanding UT's Honor Code: <https://deanofstudents.utexas.edu/conduct/standardsconduct.php>.
- Sharing of Course Materials is Prohibited: Materials from this class, including but not limited to Instructor's Notes, class slides, assignments, quizzes, etc., may not be shared online or outside the class membership unless you have explicit, written permission of the instructor. Unauthorized sharing of materials is academic dishonesty and a violation of the University's Honor Code. We are aware that some unauthorized academic materials are posted on websites; if any of this course's materials are found there and are associated with you, it will be reported to the Office of the Dean of Students, which may result serious consequences.
- Q-Drop Policy: To drop a class after the 12th class day you will need to execute a Q drop before the deadline, which is Fri., Oct. 29 for the Fall 2021 semester. This process is initiated through your student dean, not through the course instructor. Under Texas law you are allowed only six Q drops in college at any public Texas institution.
- Religious Holidays: If you will miss a class or be unable to meet a course requirement due to a schedule conflict with observance of a religious holiday, please let the instructor know as soon as possible (at least two weeks in advance). You will not be penalized for this but will still be responsible for material covered in class. Missed credits should be made up as for other short-term absences, through a later activity or quiz; homework and projects should be turned in ahead of deadlines. (I have consulted the calendar and tried to avoid conflicts with religious holidays, but probably cannot avoid them all – there are many in the fall!)
- Class Recordings: Class recordings, if made, are curated by the Instructor and reserved for private, approved use only by students in the class. They are used strictly for educational purposes and are protected under FERPA. Recordings must not be shared by you to anyone outside the class. Violation of this restriction could lead to Student Misconduct proceedings.
- Title IX: Title IX is a federal law that protects against sex and gender-based discrimination, sexual harassment, assault, and unprofessional or inappropriate conduct, dating/domestic violence and stalking at federally funded educational institutions. UT can intervene to prevent continuation or escalation, provide support, and investigate and discipline

violations. However, you should be aware that your instructor and T.A. are classified as “mandatory reporters” under Texas and federal law: we must report any Title IX-related incidents disclosed to us in writing or verbally. If you do not want to automatically trigger formal proceedings on a complaint, be sure to first check whether a person you consult about the situation is a mandatory reporter. If you wish to speak with someone who can provide support without automatic reporting, you can email advocate@austin.utexas.edu, or titleix@austin.utexas.edu, call (512) 471-0419, or visit <http://www/titleix.utexas.edu> .

CLASSROOM SAFETY AND COVID-19 (INFORMATION FROM THE CNS DEAN’S OFFICE):

To help preserve our in-person learning environment, the university recommends the following.

- Adhere to university [mask guidance](#). Masks are strongly recommended although optional inside university buildings for vaccinated and unvaccinated individuals, except when alone in a private office or single-occupant cubicle.
- [Vaccinations are widely available](#), free and not billed to health insurance. The vaccine will help protect against the transmission of the virus to others and reduce serious symptoms in those who are vaccinated.
- [Proactive Community Testing](#) remains an important part of the university’s efforts to protect our community. Tests are fast and free.
- The university has determined that all students coming to campus for the fall semester must receive a viral COVID-19 test in their local community within 72 hours prior to arrival in Austin. If they already reside in Austin, they must test within 72 hours of moving into the residence where they will reside for the academic semester. Individuals who are already living in the residence in Austin where they will reside this academic semester should test within 72 hours (3 days) prior to the start of class on Aug. 25.
- We encourage the use of the [Protect Texas App](#) each day prior to coming to campus.
- If you develop COVID-19 symptoms or feel sick, stay home and contact the [University Health Services’](#) Nurse Advice Line at 512-475-6877. If you need to be absent from class, contact [Student Emergency Services](#) and they will notify your professors. In addition, to help understand what to do if you have been had close contact with someone who tested positive for COVID-19, see this [University Health Services link](#).
- [Behavior Concerns and COVID-19 Advice Line](#) (BCCAL) remains available as the primary tool to address questions or concerns from the university community about COVID-19.
- Students who test positive should contact [BCCAL](#) or self-report (if tested off campus) to [University Health Services](#).
- Visit [Protect Texas Together](#) for more information.