

AST309N (SP 2022, #47020): "LIVES & DEATHS OF THE STARS: ELEMENTS OF THE COSMOS"

BASIC DATA:

Website and email platform for contacting the professor and TA: **Canvas**; *Canvas mail*

Class Meetings: **Not publicly available**

Course Modality: **Hybrid**

Instructor: **Prof. Harriet Dinerstein**

Professor Office Hours: Not publicly available

Teaching Assistant: **Not publicly available**

T.A. Office Hours: Not publicly available

WHAT IS THIS COURSE ABOUT AND WHO IS IT FOR?

This course is a broad introduction to astronomy that focuses on the role and contributions of stars to the universe we live in. Both the title and subtitle of the course are meant to be taken literally! We will describe the characteristics and life stories of all kinds of stars, and wrap these in the saga of how the elements in the Periodic Table were produced over the lifetime of the universe. Nearly all of those elements (except hydrogen and helium) were cooked up in the nuclear furnaces inside stars. This is what Carl Sagan meant when he said "We are star stuff."

This course has no prerequisite. While we will discuss some concepts that may be familiar to students who have previously taken an introductory astronomy class such as Ast 301, *we will not assume such familiarity*. Ast 309N is designed for and restricted to students who are **not** majoring in Natural Sciences. It does not carry a quantitative reasoning (QR) flag, but does count toward the Natural Science and Technology (N1) core requirement.

GENERAL APPROACH TO CLASSWORK AND GRADING:

We will discuss fundamental concepts, as well as surprising recent discoveries about the universe, near and far. We will present the big picture and describe the methods by which humanity has learned about distant objects. You will demonstrate your growing understanding of the material through surveys, homework, group activities, projects, and exams, many of them using online tools available on Canvas. I utilize a cumulative approach emphasizing frequent, low-stakes (and hopefully low-stress!) classwork, with a course structure that minimizes the impact of occasional missed work through "overbooking" most categories of assignments (see below).

My grading philosophy is that you should earn a grade based on your own work and mastery of the material. *There will be no quotas on grades*, no artificial limits on how many students can earn a given grade including A's. We use the plus/minus grading scale. Consistent synchronous participation and engagement throughout the semester are essential for earning a good grade because most activity credits must be earned at the time the class meets. However, we understand that you might miss occasional classes or assignments for various reasons. Rather than providing make-ups for specific missed items, we provide opportunities to compensate for such lost credit through other assignments. There will also be opportunities to earn extra credit.

LEARNING OUTCOMES: After taking this course, you will be able to:

- A. Identify and compare the four fundamental forces of nature and explain what phenomena each of them controls.
- B. Summarize the properties of electromagnetic radiation (light) and other “messengers” (gravitational waves, etc.), and how they are used to infer the nature of their sources.
- C. Describe conditions in the early stages of the Big Bang and summarize the evidence and effects of dark matter and dark energy on the past, present, and future of the universe.
- D. Describe the range of properties of stars and compare the methods they use to produce the energy that makes them shine.
- E. Compare the life stories and end states of different types of stars.
- F. Name the major element groups and identify the nuclear reactions and the astronomical sites (e.g. types of stars) where they are synthesized.
- G. Describe the formation processes of the Solar System and the ways in which planetary systems around stars other than the Sun are different from ours.

GENERAL COMPETENCIES FOR SCIENCE CORE COURSES:

The following are required components of science core courses.

1. Identify, analyze, and synthesize information needed to answer a scientific question.
2. Effectively communicate what scientific theories and methods tell us.
3. Work with others in approaching a scientific question.
4. Apply quantitative methods to a scientific question. (Mainly interpreting and drawing diagrams, and applying concepts of proportionality and upper/lower limits.)

COURSE MATERIALS AND RESOURCES:

You will need a computer/laptop with a working microphone and camera in order to participate in Zoom classes. For in-person sessions, you need a laptop or other device such as a smartphone or tablet that can hold its charge for a full class period and be used with the Canvas app. If you need help obtaining some technology items, contact the [ITS Service Desk](#), or CNS (which has limited resources) at <https://cns.utexas.edu/students/support/student-emergency-funding>.

We will make substantial use of a free OER (Open Educational Resources) introductory textbook, **Astronomy**, from OpenStax (lead author: Andrew Fraknoi). You can access this book online at <https://openstax.org/details/books/astronomy>. We will identify and provide links to the relevant sections. This text also provides links to additional resources including multimedia materials.

We recommend two optional books: (1) a small (100-page) paperback entitled **Stars: A Very Short Introduction**, by Andrew King. The physical book costs \$11.95 (new; used copies cheaper) and should be in stock at the UT Coop, or you can buy a Kindle version for \$7.49 from Amazon. (2) If you like pictures and the topic, consider buying **Gravity's Fatal Attraction: Black Holes in the Universe**, Third Edition (2020) by M. Begelman and M. Rees (in paperback for \$31.99, or \$15.90 for the ebook), which is most relevant towards the end of the semester.

Many materials will be posted to Canvas site, including class slides, feedback on HW and exams, links to free readings, animations, and to custom video clips shown in class. Recordings of class meetings (via Zoom for remote sessions, through Lectures on Line for in-person classes) will be posted as well, and can be useful if you miss a class or want to refresh your memory, although neither will fully replace synchronous attendance, which is required to earn activity credit.

TAKING CARE OF YOURSELF IN THE TIME OF COVID:

The Main website on COVID at UT is Protect Texas Together, <https://protect.utexas.edu/>, where you will find information about testing, screening, and guidance on actions you can take to minimize health risks to yourself and the rest of the UT community. During the current (January 2022) surge due to the omicron variant, it is more urgent than ever that everyone wear protective masks on campus, regardless of vaccination and boost status. When attending class in person, *we strongly request that you continue to wear a mask and remain socially distanced* while seated and if closely approaching others. If you come to the front of the auditorium to speak to the instructor, T.A., or others, please remain masked and at least 6 feet away. If you are feeling ill, please do not attend class in person. Current information and requirements on COVID-19 (such as the expectation to get tested within 3 days of returning to campus at the beginning of the spring semester), and many other useful links, are posted at <https://protect.utexas.edu/students-families/>.

The instructor and T.A. are concerned about your physical and mental health at this stressful time. Please make use of University resources if you need professional assistance (Student Health Center, counselors, BCCAL, etc., see p. 6 of this syllabus) but do not hesitate to let us know if you are facing challenges that may impact your success in this course.

COMMUNICATION AT UT AND IN THIS COURSE:

It is UT policy that email is an approved mechanism for official University communications with students, who must ensure that such emails will be received and read in a timely manner. Since some emails may be time-critical, it is recommended that email be checked daily. 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 for Ast 309N, including Announcements.

KEY DATES FOR SPRING 2022: (Some of these apply to all Sp22 courses.)

First class meeting: **Tues., Jan. 18**

Last day of online adds/drops: **Fri., Jan. 21**

Twelfth class day; last day of instructor-approved adds: **Wed., Feb. 2**

Spring break: **Mon., Mar. 14 – Fri., Mar. 18**

Last day to drop a course or change between letter grade basis and pass/fail: **Mon., Apr. 4**

After this date, drops require dean's approval and are *only* for non-academic reasons.

Last class meeting: **Thurs., May 5**

Optional Final Exam: **Sat., May 14, 2:00 – 5:00 PM** (actual exam will be shorter than 3 hours)

GETTING HELP IN THIS CLASS:

There will be several opportunities each week to ask questions and get help. We will hold three regular, open office hours each week with the instructor or T.A., probably with a mix of Zoom and in-person hours. As of the beginning of the semester, we plan that these will be primarily on Tuesdays and Wednesdays, since the exams and most of the main assignments will be due on Thursdays. If none of these times work for you, please contact us by Canvas mail to set up an alternate time. In addition, we may be able to answer your questions by email (Canvas mail again), and may try setting up topical Discussion boards. If you have questions on procedures, please first check the website and recent announcements to see whether the answer might already be posted, but by all means email us if you don't find an answer there or have follow-up questions.

COURSE MODALITY AND PROTOCOLS:

We begin this semester in a similar situation as for Fall 2021: in the midst of a COVID-19 surge. All class meetings will take place remotely for the first two weeks. As of January 31, the current UT-wide plan is that courses will revert to their original teaching mode. For this **hybrid** class, some sessions may be in-person (only), while others are held via Zoom (only). The motivations to hold some classes remotely over the whole semester are to maintain flexibility in the face of unpredictable pandemic developments, and to ensure that certain class functions can take place safely and effectively. In-person sessions where students maintain social distancing do not allow small groups to literally “put their heads together” to work together on activities, and taking exams remotely (with Zoom proctoring) can be quieter and more comfortable than in class (as advocated by my Fall 2021 students). Please note that although some aspects of classes held in both formats will be recorded and viewable later, *this does not fully replace participation during the actual class period* (for example, activity credit can be earned only at the designated time, not afterwards). Also note that classes will be held in only one modality at a time, that is, *classes will not take place both in-person and on Zoom simultaneously* (this is called “dual-mode”).

Course-specific guidelines directly below; see pages 7 & 8 for University guidelines

When meeting remotely (via Zoom):

- **Use a laptop** rather than a tablet (iPad) or phone to join class sessions if possible, to facilitate accessing web pages, entering responses, interacting online, and verifying your presence.
- **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 are 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 (and times), this is particularly important for group work and when asking or answering questions. We anticipate that the video feed will also probably be used for remote proctoring of exams, with no exceptions. When asking questions, you can raise your hand (virtually), ask a question in chat, or send it to the T.A. to ask the question for you.
- 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.
- Be aware that the general sessions of class meetings (but not breakout room sessions) will be **recorded** for later access by People in the class only.

When meeting in person:

- **It is very strongly recommended that you wear a mask** at all times in the classroom and any UT buildings, for the safety of yourself and everyone else present, especially in view of the extreme transmissibility of the omicron variant. Everyone, regardless of vaccination and boost status, should wear a mask, and ensure that it is worn correctly, covering both nose and mouth. It is now recommended to use surgical, KN95, or N95 rather than cloth masks, for better protection.
- We will maintain **social distancing**, which calls for remaining 6 feet away from classmates and others in the classroom. This should be easy while seated in class, as the room capacity is much larger than our enrollment. We also request that you remain at least 6 feet away from the instructor, T.A., or classmates when approaching the front of the auditorium.
- Our modality and practices may have to be modified depending on the evolving pandemic.

PRELIMINARY SCHEDULE OF TOPICS: (subject to revision)

Unit	Planned Dates	Topics	Outcomes Addressed	Exams (tentative dates)
1	1/18, 20	Force, Atoms, and Energy	A	
2	1/25, 27	Our Star, The Sun	A, D	
3	2/1, 3	Messages from Light (and More)	B	
4	2/8, 10, 15	Present, Future, and Past of our Universe	C, F	Exam 1 (2/17)
5	2/15, 22	Early Stars and Galaxies	C, F	
6	2/24, 3/1, 3	Taking the Measure of the Stars	D	
7	3/3, 8	Life Stories of Higher-Mass Stars	D, E, F	Exam 2 (3/10)
		SPRING BREAK!		
8	3/22, 24	Life Stories of Lower-Mass Stars	D, E, F	
9	3/29, 31	White Dwarfs and Neutron Stars	E, F	
10	4/5, 7, 12	Black Holes and Binary Stars	E, F	Exam 3 (4/14)
11	4/19, 21	Interstellar Clouds and Star Formation	G	
12	4/26, 28, 5/3	Our Own and Other Planetary Systems	G	Exam 4 (5/5)
	5/14	Optional, comprehensive (make-up)	A – G	Final Exam

COURSEWORK AND GRADING:

Course work includes the items below. Weights towards the total course grade are specified. Some work will be “overbooked.” This means that there will be a larger number of each type of assignment than is needed to receive full credit. Instead of having make-ups for individual missed HWs, exams, or activities, any credit missed for these can be replaced with *equivalent* credit from a later assignment of that type. Extra credit work is added on top of the total.

Exams: We will have four “midterm” exams, each based primarily on material covered in the weeks just prior to that exam. (Core competencies 1 and 4.) Study guides will be provided, and we will have office hours in the days prior to the exams, which will usually be on Thursdays. Most likely the exams will be given via Zoom, and will be open book/notes. Each exam counts for (only!) 12% of the course grade. Since the lowest score or missed exam will be dropped, the exam will contribute $12\% \times 3 = 36\%$ of the course grade. Tentative dates are listed above; the date of Exam 4 will not be changed. All students must take the exam simultaneously with the rest of the class; no exams are given earlier or later. If you miss an exam, even for a well-justified reason, it will be replaced by a later exam. Finally, all students will have the option to take a comprehensive final exam as a make-up or do-over to replace any **one** of the midterm exams.

Homework (HW): These will consist of short-answer questions that call for students to engage with ideas introduced in class and express answers in their own words (core competencies 1 and 2). Partial credit will be available. Late Policy: HW will be accepted within 24 hours of the due date and time for slightly reduced credit. No HW more than 24 hours late will be accepted for credit, but the HWs will be “overbooked” by at least 20%, so that one or two missed or low-scoring HWs will be dropped. HW fraction of the course grade: **20%**.

In-class Activities: These will usually consist of multiple, related questions to be discussed and answered by a small group of students. (Competencies 3 & 4). For remote classes, we will use breakout rooms. It remains to be seen how it will work for in-person sessions (we might need to pivot to individual responses). Activities must be done synchronously in class; doing them afterwards tends to defeat the purpose, especially if answers have already been provided.

Activities are mainly indicators of attendance and participation, therefore any sincere effort to answer the questions, even if not entirely correct, will earn at least partial credit. We will “overbook” these activities by at least 20%. Fraction of the course grade: **20%**.

Projects: The small size of this class enables us to be more creative in the assigned work and, we hope, allows you to connect astronomy to your major and other interests. We will have a group project relating to civic, cultural, and societal issues that impact astronomical research due before spring break, and up to three smaller individual projects, including a template-shaped report on characteristics of one of the chemical elements, and an assignment that could take a variety of forms, e.g. a short story, strategic plan for a scientific instrument or project, etc.. (The projects, taken together, tap all of the competencies.) Fraction of the course grade: **24%**.

Extra Credit: Typical sources of extra credit for astronomy courses are Star Parties and public lectures. Availability of these in Spring 2022 is not yet clear. Star Parties are currently suspended but may resume when conditions improve, which happened in Fall 2021 (they returned in mid-October). There will probably be a public lecture on Saturday, February 26 (not guaranteed). I will also look into other possible ways to earn extra credit, particularly through remote means.

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- 76.99	70.00- 73.99	67.00- 69.99	60.00- 66.99	≤ 59.99

GENERAL RESOURCES FOR STUDENT SUPPORT:

- **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.
- If you are concerned about the **safety or behavior** of yourself or others on campus, contact BCCAL, the Behavior Concerns and COVID-19 Advice Line, at (512) 232-5050, or <https://safety.utexas.edu/behavior-concerns-advice-line>.
- Some students are eligible for 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; note that SSD authorizations must be renewed each semester. See diversity.utexas.edu/disability/. Once an Accommodation Letter is obtained, you must meet individually with the Instructor to discuss accommodations and arrange for them to be implemented. *If you already have an Accommodation Letter from SSD, please arrange a private meeting with the Instructor as soon as possible.*
- 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**: studentemergency@austin.utexas.edu or call (512) 471-5017 (Mon.-Fri., business hours). They can provide help in a number of ways and notify your instructors. See 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. In particular, it is important to know what uses of sources are **plagiarism**. 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 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 **Mon., April 4** for the Spring 2022 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 in-class activity or exam; homework and projects should be turned in ahead of deadlines.
- **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> .

Also see the “General Memo for Undergraduate Astronomy Students” and other items posted in the General Information module on Canvas, for information on various topics.

CLASSROOM SAFETY AND COVID-19 (This page of material is from the Provost)

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

- Adhere to university [mask guidance](#). Masks are strongly recommended 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.
- 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. To help understand what to do if you have been had close contact with someone who tested positive for COVID-19, see the "COVID Exposure Guide" in the General Information module on our Canvas site.
- [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.

CAMPUS SAFETY

The following are recommendations regarding emergency evacuation from the [Office of Campus Safety and Security](#), 512-471-5767,

- Students should sign up for Campus Emergency Text Alerts at the page linked above.
- Occupants of buildings on The University of Texas at Austin campus must evacuate buildings when a fire alarm is activated. Alarm activation or announcement requires exiting and assembling outside.
- Familiarize yourself with all exit doors of each classroom and building you may occupy. Remember that the nearest exit door may not be the one you used when entering the building.
- Students requiring assistance in evacuation shall inform their instructor in writing during the first week when the class starts to meet in person.
- In the event of an evacuation, follow the instruction of faculty or class instructors. Do not re-enter a building unless given instructions by the following: Austin Fire Department, The University of Texas at Austin Police Department, or Fire Prevention Services office.
- For more information, please visit [emergency preparedness](#).