AST309N (FALL 2022, #47950), "LIVES & DEATHS OF THE STARS: ELEMENTS OF THE COSMOS"

BASIC DATA:

Website: on **Canvas**
To contact the professor and TA: use *Canvas mail*
Class Meeting Times: Not publicly available
Location**:** Not publicly available
Course Modality: **Face-to-Face**
Instructor: **Prof. Harriet Dinerstein**
Professor Office Hours: Not publicly available
T.A.: Not publicly available
T.A. Office Hours: Not publicly available
Help Sessions: Not publicly available

Nebula NGC 3132 (NASA's James Webb Telescope)

WHAT IS THIS COURSE ABOUT AND WHO IS IT FOR?

Ast 309N is a broad introduction to astronomy that focuses on the role and contributions of stars to the makeup of 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 history of how the elements in the Periodic Table were created over the lifetime of the universe. Nearly all those elements other than 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 prerequisites. It is designed for and restricted to students who are ***not*** majoring in Natural Sciences. It does not carry a quantitative reasoning (QR) flag, but it ***does*** count toward the Natural Science and Technology (N1) core requirement.

COURSE AND GRADING PHILOSOPHY:

We will discuss fundamental concepts, as well as surprising recent discoveries about the nearby (planets around other stars!) and distant (Big Bang and first stars!) universe. 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, in-class responses and activities, homework, and quizzes, mostly using online tools available on Canvas. I utilize a cumulative approach to earning credit that emphasizes frequent, low-stakes (and hopefully low-stress) classwork, and minimizes the impact of occasional missed work.

My philosophy is that the grade you earn should be based on your own work and mastery of the material. *There will be no quotas on grades* (no arbitrary limits on how many students can earn a given grade, including A's!). We use the plus/minus grading scale. Consistent participation and engagement throughout the semester are essential for earning a good grade, since many activity credits are earned through being present in class. However, we understand that you might miss an occasional class or assignment for various reasons. Instead of doing make-ups for ***specific*** missed items, we provide opportunities to compensate for credit lost this way through later assignments, an approach I call "overbooking." 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 where each of them "rules" (what phenomena they control).
B. Summarize the properties of electromagnetic radiation (light) and how studying light from astronomical objects is used to infer their nature and characteristics.
C. Describe conditions in the early universe, and summarize the evidence and effects of dark matter and dark energy on the past, present, and future of the universe.
D. Describe the properties of stars and how they produce the energy that makes them shine.
E. Compare the life stories and end states of different types of stars.
F. Name the major chemical element groups, and identify the reactions and places in the universe where they are created.
G. Explain what neutron stars and black holes are and how they behave.
H. Describe how the Solar System and Earth formed and evolved.

GENERAL COMPETENCIES FOR SCIENCE CORE COURSES:

The following are required components of science core (N1) 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. (This will mainly involve interpreting and drawing diagrams, and applying the concepts of proportionality and upper or lower limits.)

COURSE MATERIALS AND RESOURCES:

To participate in credit earning in-class activities you will need a laptop or other device such as a smartphone or tablet, that can hold its charge for a class period and be used with Canvas.

Many class materials will be posted on the Canvas site, including class slides, feedback on HW and quizzes, and links to free readings, animations, and custom video clips shown in class (videos will be viewable on UT Box). Recordings of class meetings through Lectures Online (LO) will be posted after class, and can be useful if you miss a class or want to refresh your memory, although will not fully replace real-time attendance in terms of access to opportunities for participation credit.

We will also make substantial use of the **free** OER (Open Educational Resources) OpenStax textbook, **Astronomy** (lead author: Andrew Fraknoi). You can access this book online at https://openstax.org/details/books/astronomy. For your convenience, we will also post direct links to specific relevant sections. This text provides links to additional outside resources.

If you like to read about course material in more depth – or just prefer hard copy – we suggest the following 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 are cheaper), or you can buy a Kindle version for $7.49 from Amazon. (2) If you like pictures and slick presentations, try **Gravity's Fatal Attraction: Black Holes in the Universe**, Third Edition (2020) by M. Begelman and M. Rees (currently $27.10 for a new paperback copy, or $19.99 for the ebook). We have not ordered copies through the UT Co-op, but you can find them via online booksellers.

TAKING CARE OF YOURSELF AND OTHERS:

Things are different in Fall 2022 than earlier in the pandemic; however, COVID remains a potential threat, particularly to individuals who are more vulnerable to risk. In the spirit of caution and concern, your instructor will be wearing a mask in class. We encourage students to do the same out of consideration for others in the room. We encourage social distancing when possible, for example when approaching the instructor, T.A., or other students. If you feel ill, please do not attend in person. See healthyhorns.utexas.edu/coronavirus.html for latest info. Recordings will usually be available for viewing just a few hours after each class meeting. However, if you miss more than an occasional class, please contact the instructor or T.A.

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, Student Emergency Services, etc. – see p. 7), 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 any course-related communications for Ast 309N,* ***including Announcements****.*

KEY DATES FOR FALL 2022: (Some of these apply to all Fall 2022 courses.)

First class meeting: **Tues., Aug. 23**
Last day to add a class without instructor permission: **Thurs., Aug. 25**
Last Day to drop a class without instructor permission: **Wed., Sep. 7**
Last day to Q-drop or change between letter grade and pass/fail: **Tues., Oct. 25**
(After this date, drops require dean's approval and are *only* for non-academic reasons.
Thanksgiving Break (no classes): **Nov. 21 - 25**
Last class meeting: **Thurs., Dec. 1**
Optional final exam: **Sat., Dec. 10, 1:00-2:00 PM** (serves as the make-up for a missed quiz)

HOW TO SUCCEED IN THIS CLASS:

Our best advice is that you attend and participate regularly in class, and keep up to date with readings and assignments. When you don't understand something, ***DO*** ask the instructor or T.A. about it! There are several opportunities each week to ask questions and get help. We will hold regular open office hours with the instructor or T.A., a mix of Zoom and in-person hours, and weekly group help sessions as needed. At least some of the above will take place on Wednesdays, for optimal timing relative to quizzes and homework due dates. It will also be possible to schedule individual meetings with the T.A. or instructor if the regularly scheduled times don't work for you. Contact us in advance by Canvas mail to set up such appointments. In some cases, we may be able to answer your questions by email. If you have questions on course 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 the answer there or have follow-up questions. We are here to help you succeed in this class! Please don't be shy.

PRELIMINARY SCHEDULE OF TOPICS: (subject to revision)

Unit	Planned Dates	Topics	Goals (p. 2)	Quiz Units & Planned Dates
1	8/23, 25	Atoms, Force, & Energy	A	
2	8/30, 9/1	The Sun: Our Star	A, D	
3	9/6, 8	Messages from Light	B	(1-3): 9/15-16
4	9/13, 15, 20	The Present & Future of the Universe	C, F	
5	9/20, 22, 27	The Big Bang & Early Universe	C, F	
6	9/29, 10/4, 6	The Measures of Stars	D	(4-6): 10/13-14
7	10/11, 13	Lives & Deaths of Low-Mass Stars	E, F	
8	10/18, 20	Lives & Deaths of High-Mass Stars	E, F, G	
9	10/25, 27, 11/1	Black Holes	G	(7-9) 11/10-11
10	11/3, 8, 10	Binaries, Explosions, & Gravitational Waves	F, G	
11	11/16, 18	Formation of the Solar System & Earth	H	
12	11/29, 12/1	Planets around Other Stars (if time permits)	bonus	(10-12): 12/1-2

COURSEWORK AND GRADING:

Coursework components are listed below, with their weights towards the course grade. Most of these will be "overbooked": there will be a larger number of items than needed for full (100%) credit, and the lowest scores or missed items will be dropped. Instead of make-ups for individual missed HWs, quizzes, or activities, **the missed credit is to be replaced by *equivalent* credit** from a later similar item. Extra credit can be earned on top of the course total *and is available to everyone*!

Quizzes and Optional Final: We will have four "unit quizzes" based on material covered in the few weeks prior to each quiz. We will drop the lowest score, so **the best 3 quiz scores each count 20% of the course grade, for an overall quiz weight of 20% x 3 = 60%.** (If you miss a quiz, that one is dropped; there are no make-ups for unit quizzes, but there is an all-purpose make-up optional final.)

To avoid complications due to student absences on quiz days, we will try an unusual quiz format. Quizzes will be taken online, outside class, within a window of time of about a day. The window will start on Thursday afternoon and end on Friday (times to be determined), but once you start, you will be limited to about half an hour. *Each student will receive an individual, randomized quiz, rather than the same questions as your classmates.* You are allowed to make use of class materials, but you **must *not* confer with classmates or other people** (such as topic experts). You *should not* use Google or other search engines to find answers because your responses must be consistent with what you've learned in this class, and information on the Web may be oversimplified, misleading, or wrong. *We may use a remote proctoring program* (such as Proctorio) to record you while taking quizzes, but will always review it personally rather than accepting automated results. This quiz format is experimental and if it doesn't work, we may switch to taking quizzes in person.

Optional Final Exam: As an ultimate backup, you may take an optional comprehensive exam that will be given during the official final exam timeslot for a class that meets at TTh 9:30 AM. Unlike the unit quizzes, it must be taken at the specified time: Saturday, December 10, from 1:00 – 2:00 PM. It may be possible to take it remotely (to be decided later) but that does not mean that you can take it at a different time. Because it will cover material from the entire semester, the final exam serves as the make-up - *and the **only** make-up* – for any of the earlier quizzes. However, *you can choose to take the final exam even if you haven't missed an earlier quiz*, for one more chance to improve your grade. It will count only if it helps your grade!

Homework: Homework assignments will consist of a few questions that call for you to write short narrative responses **in your own words**. They will help you review the material, recognize any points that you don't fully understand so that you can ask about them, and prepare you for quizzes. Partial credit will be available, and the lowest two (or missed) HWs will be dropped. HW will be submitted through Canvas.

Late Policy for Homework: Assignments will be accepted within 24 hours of the due date and time for reduced credit (1 point out of 4 will be taken off). 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%.**

Participation: To do well in this course it is important to stay involved with class meetings and actively engage with the material, especially if some of it seems confusing or unclear. Research on how people learn has demonstrated that challenging yourself to answer questions on subjects you're not sure you've mastered yet turns out to be an effective way to accomplish just that. We will often pose questions in class and ask you to respond with your best guesses, either individually or after brief discussions with nearby classmates. These responses will be documented by having you enter responses on Canvas (using Instapoll or other Canvas features). Some credit will be awarded for any genuine effort even if you don't select the correct answers. Participation credit is cumulative and will be overbooked, so you can earn the full **20%** of the course grade even if you miss a few participation activities in class. The participation total will count for **20%** of the course grade.

Extra Credit: Extra credit is available to every student in the class, and is added to the course total score, on top of the other assignments described above. You can do any or all of these!

Star Parties: One way to earn extra credit is by attending up to 2 "Star Parties" (viewing through telescopes). These are offered on Wednesday, Friday, and Saturday evenings throughout the semester, when the sky is clear. Details will be posted. You must obtain an official attendance slip from the person in charge and submit it to the T.A. to receive credit (1 point per Star Party).

Public Lectures: Sometimes there are public lectures on campus on topics relevant to our course. When they are available, we will announce them in advance. You can earn up to 2 points of extra credit by listening to these talks and submitting a short report in your own words, relating what you heard to what you have learned in this class. If there are few or no such opportunities this semester, we will provide links to free talks you can watch online and write similar reports.

Optional extra credit paper: For those who are interested in ways that astronomy interacts with society and culture and are willing to put in extra effort, we offer the opportunity to write a short term paper for up to 8 points of extra credit. It will be due before Thanksgiving break. We will distribute a list of possible topics early in the semester, but will also entertain suggestions from you (these must be pre-approved before you write the paper). This will involve doing online research utilizing reliable sources. Some topics I have recommended in previous Ast 309N courses include the effects of satellite swarms on astronomical observations, impact of solar activity and storms on human technology, controversies over building telescopes at sites sacred to indigenous populations, effect of space debris on new missions (including crewed missions), can humans develop ways to use fusion as an energy source (as the Sun does), etc.

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

ACADEMIC INTEGRITY:

UT Honor Code: You are 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, unacceptable,** and subject to academic disciplinary action including failure in the course. Even close paraphrases of other people's responses are **plagiarism.** For further information, see https://deanofstudents.utexas.edu/conduct/standardsofconduct.php.

Sharing of Course Materials is Prohibited: Materials from this class including, but not limited to Instructor's Notes, class slides, assignments, quizzes, recordings, and so on **may not be shared** online or outside the class membership unless you have explicit written permission of the instructor. (You may share your own notes with classmates, and they will have access to the same materials as you do through Canvas.) 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 certain 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 have serious consequences.

EXPECTATIONS IN THE CLASSROOM:

This is a large class and the room may sometimes be crowded. *Please avoid talking to others once the class begins, so that other students can hear the instructor.* Obviously, this does not apply when we ask you to discuss questions with neighbors! Please resist the temptation to conduct unrelated online activities: *make the most of your time in class*. Be respectful of your classmates, instructor, and T.A., so that our class time is as pleasant and productive as possible.

We are beginning the semester in face-to-face mode, at a time of moderate local transmission rates. Recommendations for meetings of large groups have been relaxed recently but, as we have seen, the public health situation can change quickly. Current UT memos on what to do if you contract or are exposed to COVID will be posted in the General Information module. Changes to class format or policies will be announced. Some office hours (including the instructor's),will be held over Zoom.

ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES:

The office that serves students with disabilities is **Disability and Access** (formerly Services for Students with Disabilities or SSD). They review and authorize academic accommodations for students with qualifying disabilities. Their website is https://diversity.utexas.edu/disability/. Students seeking accommodations should contact them as soon as possible. Once an Accommodation Letter has been prepared, it is **the student's responsibility** to contact the instructor and arrange a private meeting (possibly by Zoom) to discuss how to address the approved accommodations. Our class design already incorporates some of the most commonly approved accommodations, but all students with Accommodation Letters still need to discuss their circumstances with the instructor.

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 quizzes and participation activities should be made up through later ones; homework or other assignments (e.g. extra credit essays) should be turned in ahead of deadlines.

GENERAL POLICIES AND STUDENT SUPPORT SERVICES:

- **COVID-19 Guidance and Resources:** Details regarding recommended behaviors and available resources are evolving; for example, the "Proactive Testing" program has been discontinued. Current information is posted at https://www.healthyhorns.utexas.edu/coronavirus.html .
- **Q-Drop Policy:** To drop a class after the 12th class day with instructor's permission, you will need to initiate a Q drop through the Dean of Students in your College, ***not through the course instructor,*** before Oct. 25, the deadline for academic Q-drops (see p. 3). By that time, we will have had two quizzes and several HWs, so you should some idea of your course standing. Under Texas law you are allowed only six Q drops in college at any public Texas institution.
- **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 go to https://safety.utexas.edu/behavior-concerns-advice-line .
- 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 or see cmhc.utexas.edu . 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.
- **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 considered "mandatory reporters" under Texas and federal law, and therefore we must report any Title IX-related incidents disclosed to us either in writing or verbally. If you wish to speak with someone who can provide support *without* such automatic reporting, email advocate@austin.utexas.edu, or titleix@austin.utexas.edu, call (512) 471-0419, or visit http://www/titleix.utexas.edu .
- **Evacuation of Classrooms and Buildings in Emergency Situations:** The office of Campus Safety and Security (512) 471-5767 recommends the following: Sign up for Campus Emergency Text Alerts, and familiarize yourself with the exit doors of our classroom. You must evacuate a building when a fire alarm is activated. Exit and assemble outside and follow instruction of faculty or class instructors. Do not re-enter a building unless given instructions by the officers of the Austin Fire Department, UT Austin Police Department, or Fire Prevention Services Office. If you would need assistance to evacuate the classroom, you should inform the instructor or T.A. in writing (email is best) during the first week of classes.
- **OTHER SOURCES OF INFORMATION** will be posted in the General Information module on Canvas. These include a General Memo for Undergraduate Astronomy Students" and other memos and information sheets from the University, College of Natural Sciences, or Health Services.