

AST309N: “LIVES & DEATHS OF THE STARS: ELEMENTS OF THE COSMOS”

<http://www.as.utexas.edu/astronomy/education/spring16/dinerstein/309n.html>

Course Unique No. & Semester: 46885, Spring 2016

Class Meetings: Tues. & Thurs., 12:30 – 1:45 PM, Welch 3.502

Instructor: Prof. Harriet Dinerstein, harriet@astro.as.utexas.edu, (512) 471-3449

Office Hours: Wed. 1:30 – 2:30 PM or by appointment, in RLM 16.324

Teaching Assistants:

Yao-Lun Yang, RLM 15.310E, 471-3387

yaolun@astro.as.utexas.edu

Office Hours: Tues. 10:30 – 11:30 AM

Help Sessions: Wed., 5:00 – 6:00 PM, RLM 15.216B

John Pelletier, RLM 13.126, 471-1309

jpelletier@astro.as.utexas.edu

Office Hours: Mon. 10-11 AM

PREREQUISITES AND CREDIT:

Ast 309N has a prerequisite of AST 301 or an equivalent college-level introductory astronomy course (if taken at UT, this would be either Ast 301 or 307). The system will not bar you from enrolling if you do not meet this requirement, but *we strongly advise against taking Ast 309N without having had a prior introductory class*. This is particularly applicable to this section because we will begin by discussing topics that are usually not covered in introductory courses until the end of the semester.

This course is intended and designed for students who are *not* majoring in Natural Sciences (or engineering). Science majors are permitted to take it, but it will not count towards their major. Ast 309N does not carry the quantitative reasoning flag, but it can count for the Natural Science and Technology Part I core requirement.

WHAT THIS COURSE IS ABOUT:

The “stars” of astronomy are ... well, the stars! They provide the light and heat that makes life-bearing planets like Earth possible. They are the basic unit of galaxies, as atoms are the basic unit of matter. Yet, despite their huge masses, sizes, and energy output, stars are deeply connected to the tiny scales of atoms and nuclei. Nearly every atom of all elements heavier than helium was created deep inside a star that existed long ago. This is what Carl Sagan meant when he said “We are star stuff,” and what Neil deGrasse Tyson calls “the most astounding fact” about our Universe.

Your introductory astronomy course probably started by talking about the night sky and continued with our Solar System, stars, galaxies, and cosmology. We will tell this story in the opposite direction: we start at the beginning, with a universe of hydrogen and helium only, and trace the increasing chemical complexity that results from stars “cooking up” other elements and releasing them to space. This eventually creates the conditions that enabled rocky planets to form around stars, as we see in our universe today. This course is about cosmic chemistry in a very broad sense.

REQUIRED BOOK AND OTHER MATERIALS:

There is no book available that matches the content of this class. While all students should have taken an introductory astronomy course, you may have used any one of a wide variety of textbooks, or purchased the book for only a limited time. To ensure that everyone has access to some reference material, I have assigned the following book: **“Stars: A Very Short Introduction,” by Andrew King**. You can buy it as a paperback from the Coop (about \$12), download the eBook from Amazon for about \$5, or find another way to obtain it. This book covers many of the basic ideas underlying the course material. I will list the relevant sections/pages as we go along.

Other resources will be available at or through the class website. These will include selected (not all) slides shown in class. They will be posted **after** the class where they are shown, to accurately reflect what was actually covered in class. I will also post links to recommended external sites, feedback (but not answer keys) on most quizzes, exams, and in-class exercises, and an archive of messages posted on the announcements page. Due to copyright issues, however, video segments shown in class will not be posted. You should **bookmark** the class url and visit it often!

COURSEWORK AND GRADING:

My grading philosophy is that students should have the opportunity to earn a grade based on their own work; there are no quotas for A's and B's. After the first exam, I will post a table of numerical score to letter grade equivalents, to be used for the rest of the semester (barring extraordinary circumstances). I do use +, – grades.

Your course grade will be based on a combination of **hour exams, short answer quizzes, and in-class activities** that accumulate **participation credit**. Some out-of-class activities may be used to earn a small amount of **extra credit** (see below). There will be more quizzes and activities than the minimum needed for 100% of the credit, so an occasional missed item or low score can be dropped. The important thing to note is that **I do not give make-ups for specific missed assignments**, even when there is a justifiable reason. Instead, I expect you to replace that item with another activity, quiz, or exam that provides the equivalent credit. All students (including SSD-approved) must take exams *at the same time* as the rest of the class. ***There are no exceptions.***

In-class Exams: There will be five multiple-choice exams, each taking about (the second) half of a class period. Three of the exams will count towards your course grade, each counting **25%**, for a total of **75%**. At least one of Exam 4 or 5 must be included, but otherwise we count the best scores. To clarify: You are expected to take Exam 1 and Exam 2, but Exam 3 can replace a low score or missed Exam 1 or 2. You are expected to take Exam 4, but Exam 5 can replace it if it has a higher score or you miss Exam 4). If the total is higher both Exams 4 and 5 may count, plus the best of Exams 1 – 3. There will be no final exam for this course during Finals Week.

Planned dates for the exams are Feb. 11, Mar. 3, Mar. 24, Apr. 14, May 5. These are all Thursdays, and there will be a help session on Wednesdays, the day before each exam, 5 – 6 PM in RLM 15.216B. You will know your scores on 3 exams before Apr. 4, the deadline for academic Q-drops or switching between pass/fail and a letter grade.

Quizzes: We will have a number of short quizzes, consisting of 2 or 3 short-answer questions to be written on the question page. The purpose of these quizzes is to test your ability to quickly react to and answer the questions (this is a “timed” exercise), so unlike the exams they are not subject to SSD-approved accommodations for extra time on assignments (see below). Usually you will have 10-12 minutes to complete a quiz, which may be given at any point during the class hour. Credits earned on the quizzes will accumulate up to a maximum of 15 points and will contribute (up to) **15% of the course grade**. These 15 points can be earned through higher scores on a few quizzes or lower scores on a larger number of quizzes. If you miss a quiz, there will not be a make-up for it; just plan to take a later quiz with the rest of the class.

Participation Credit: The other 10% of the grade will come from credits earned over the semester through in-class activities. Most but not all of these will be carried out in small groups. Your answers will be collected on index cards or worksheets. Credit will be given for any honest effort on these (correct answers not required!)

Extra Credit: A few extra points (each point = 1% on the course grade) can be earned through approved out-of-class activities. These include *documented* attendance at up to 3 UT Star Parties or a public lecture on “Astrochemistry” at UT on Sat., Feb. 20.

CLASSROOM EXPECTATIONS AND POLICIES:

I expect everyone to be respectful of the instructor and their classmates. Talking to your neighbor or using a cell or smart phone is highly distracting to others. **Turn off the volume on your phone before the beginning of class, and do not use it for texting or internet access during class.** I also strongly discourage the use of tablets or laptops in class. There is documented evidence not only that students using the internet for unrelated purposes during class receive lower grades (by half a letter grade on average), but that this also *lowers the grades of students sitting near them*. If you are using a laptop, please sit in the back two rows of the auditorium. Also, if your use becomes too distracting or disruptive, I reserve the right to ban it entirely. Students are also expected to refrain from other activities that may disturb the instructor and other students such as entering or exiting the auditorium loudly, conversing with neighbors except during assigned activities, listening to something via earbuds, snoring, etc.

It is *strongly* recommended that you attend and participate regularly in class. This is the best way to keep up with the class and be prepared for quizzes and exams. If you are looking for a class to take by just showing up for the exams, this is **not** it!

Academic Integrity and Academic Dishonesty: The University of Texas at Austin holds its students and community to high standards of academic integrity. Details can be found at http://deanofstudents.utexas.edu/sjs/acint_student.php . We take these rules seriously. *We will not tolerate copying or cheating on exams, quizzes, or other classwork.* If we find duplicated work or other evidence of cheating, neither student will receive credit. We may also impose more severe academic penalties depending on circumstances, not excluding an F for the course and a report to the Dean of Students.

Students with Disabilities: The University of Texas at Austin provides certain adjustments for students with certified disabilities. If you have been approved to receive extra time and/or alternate seating for exams by the SSD (Services for Students with Disabilities) office, it is *essential* that you provide the instructor with a letter and test scheduling form **as soon as possible** at the start of the semester, to ensure that your exams can be proctored by SSD. (We do not have the resources to do this ourselves.) Such arrangements are for exams only, not the quizzes (for which advance dates are not available). Your exam times must fully overlap with when the class is taking them.

GETTING HELP IN THIS CLASS:

There will be several opportunities each week to ask questions and get help. Most weeks there will be a help session on Wednesday afternoons from 5 – 6 PM, in RLM 15.216B. It is preferred that you consult the professor or either Teaching Assistant during their regular office hours if possible, but individual appointments can also be set up if none of those times work for you (email us!). You may also send questions by email and we will try to answer if feasible. If you have a question about procedures, please first check the course website, which we will endeavor to keep up to date.

ADDITIONAL OPPORTUNITIES:

The Astronomy Department offers Star Parties most Wed., Fri., and Sat. evenings. Details are posted at <http://outreach.as.utexas.edu/public/viewing.html>. You can earn credits by attending star parties, if you obtain a signed slip from the person in charge. There will be at least one Public Lecture you can attend for credit (write-up required). This is the talk on “Astrochemistry” on Sat., Feb. 20, by a distinguished UT astronomer.

KEY DATES FOR SPRING 2016: (from UT’s academic calendar)

First class meeting: **Tues., Jan. 19**

Last day of online adds/drops: **Fri., Jan. 22** (in practice, the last day to add Ast 309N)

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

After Apr. 4, drops require dean’s approval and are *only* for non-academic reasons.

Last class meeting and date of last exam: **Thurs., May 5**

PRELIMINARY SCHEDULE OF TOPICS: (subject to change)

Week 1: Introduction, energy, elements, forces (nuclear force)

Week 2: Light and spectra, solar fusion, Sun-Earth relationship

Week 3: The Big Bang; an early universe of H and He

Week 4: The First Stars and what they produced Exam 1

Week 5: The Hunt for “metal-poor” stars

Week 6: Aging and deaths of stars of various masses

Week 7: Star Clusters: Testing our theory of the stars Exam 2

Week 8: The Last Days of Sun-like Stars; dust & exotic elements

SPRING BREAK

Week 9: Interacting Binary Stars and mass transfer	Exam 3
Week 10: Binaries, continued; novae and supernovae	
Week 11: The cycle of chemical enrichment in the Milky Way	
Week 12: The Chemistry of galaxies near and far	Exam 4
Week 13: Molecular Clouds and Star Formation	
Week 14: Interstellar and presolar grains	
Week 15: Wrap-up, Course-Instructor survey	Exam 5

The following “Memo to Undergraduate Astronomy Students Regarding Astronomy Courses” is posted at: <http://www.as.utexas.edu/astronomy/education/memo.html>

Welcome to this undergraduate Astronomy course. To prevent misunderstandings, we wish to clarify the ground rules set by the Astronomy Department for our undergraduate courses. These courses operate with mutual responsibilities between faculty and students.

For each of our classes:

- A written syllabus will be handed out at the first class meeting containing a description of the course, the material that the course will cover, all requirements in the course, and an explanation of what fraction of your grade is derived from each activity. These requirements or percentages are not to be changed during the semester.
- Special note for AST 301 students: This course, although designed for non-science majors, is nevertheless a **science** course. You will be exposed to scientific reasoning in the course, which you will be required to use on tests and in solving homework problems. Only simple mathematics is used; the level varies from instructor to instructor.
- Students in the College of Natural Sciences should note that AST 301 and AST 309 courses do NOT count towards fulfilling your degree requirements. We encourage you to consider our AST 307 course for science majors instead.
- There will normally be help available outside of class at least once a week (more often in the larger sections); if you have too much trouble understanding the material, or other problems arise, such as illness, *please let your instructor know as soon as possible*. Don't let the problem continue until the end of the semester, for it may then be too late to find a solution.
- You should not need to pay for any outside tutoring. The outside help that is provided with the courses should be adequate. If you need extra help, please see your instructor first. He or she can probably arrange help at no cost. Should you still feel the need of a tutor, please remember that astronomy graduate students cannot tutor for money without special permission from their chair and college dean. The Learning Skills Center maintains a list of tutors, and runs sessions on general study techniques and math review. Many of their services are free. Go to JES A332A or phone 471- 3614.

Note that our undergraduate courses are taught by faculty members who are also professional astronomers. In addition to their obligations to you and the other students in this and other courses, members of our faculty have responsibilities to their graduate students and to remain professionally competent through individual research. As a consequence, your instructor may occasionally need to be away conducting research or attending a scientific meeting. Usually another faculty member will conduct the class when the regular instructor is absent.

We expect, and usually find, honesty in our students. Your instructor will explain any special rules, such as the encouragement of genuine collaboration (not copying!) among students on homework assignments and projects. However, submission of another's work or cheating on examinations are automatically grounds for failure in the course and reporting to the Dean of Students.

If you have any complaints or problems, please try to work out a solution with your instructor first. If you and your instructor cannot find an amicable solution, then please see either:

Prof. Milos Milosavljevic
Chair of the Astronomy Undergraduate Studies Committee
(Office: RLM 17.220, Phone: 471-3397)

or

Prof. Shardha Jogee
Chair of the Astronomy Department
(Office: RLM 15.218, Phone: 471-3302)

If you are in crisis and need immediate assistance, please telephone the Office of the Dean of Students Emergency Staff: 512-471-5017. They can help you with a number of services, and may be able to contact your professors for you if you have an emergency that prevents you from attending class. <http://deanofstudents.utexas.edu/emergency>

For general questions about undergraduate courses, please consult Susy Graves in the Astronomy Student Office, RLM 15.204, sgraves@astro.as.utexas.edu. This office handles many student matters including departmental adds at the beginning of the semester. (For Ast 309N this requires instructor approval and this instructor generally does not allow late adds.)

Finally, all students enrolled in undergraduate Astronomy courses are encouraged to attend our free Astronomy events (e.g. star parties, public lectures) and/or visit the 9- inch telescope on the roof of Painter Hall and the 16-inch one on the roof of RLM. For more information, read the flyers posted on the 4th floor of R.L. Moore Hall, call our Skywatchers' Report at 471-5007, or follow the links about "Public Viewing Austin" on the Astronomy Department webpages at <http://www.as.utexas.edu/>.