

**Astronomy 309L (47360)— Spring 2015**  
**The Search for Extraterrestrial Life and Intelligence**  
**Syllabus**

**Classroom and time:** Welch 3.502, T Th 2-3:15.

**Professor:** John Scalo  
 Office: R.L. Moore (RLM) 15.318 (R.L. Moore is at the corner of Dean Keaton and Speedway)  
 Phone: 478-2748 (home: best place to call me); office number is 471-6446.  
 Email: [scalo@astro.as.utexas.edu](mailto:scalo@astro.as.utexas.edu)  
 Office hours: M 2:30-3:15, F 3:00-4:00 (may be shifted when exam is near).

*Alternatives to office hours:*

1. We can talk outside the classroom (in the foyer) after class, but only on Thursdays.
2. I welcome phone calls at home—it is an efficient way for us to communicate while a particular question is on your mind, or to have an individual review before exams. It also provides an opportunity for both of us to assess your progress and make suggestions. Calling any time before 9pm is fine, weekends are even better. Sending me email is ok, but I usually cannot give adequate answers to subject matter questions by email.

**Teaching Assistants:**

	Name	Office	Office hours	email	Phone
1 <sup>st</sup> TA:	Vignesh MG	Peridier Library, RLM 15.202	M, W 3:30-4:30	<a href="mailto:vignesh.sambandam@gmail.com">vignesh.sambandam@gmail.com</a>	920-8579
2 <sup>nd</sup> TA:	Bohua Li	RLM 16.212	none	<a href="mailto:bohuali@astro.as.utexas.edu">bohuali@astro.as.utexas.edu</a>	471-8443

The 1<sup>st</sup> TA (Vignesh) is responsible for office hours during which you may seek his guidance. If you can't make his office hours, arrange an appointment (call him!). The 2<sup>nd</sup> TA (Bohua) is in charge of exams that require exceptional circumstances and the organization and grading (with me) of your recording assignments.

**Materials:** The items you need to purchase or obtain are:

- Textbook (immediately!)
- Some #2 pencils (for each exam),
- The Canvas app for your phone and/or laptop (at iTunes or elsewhere), which we will use for attendance. If you have a flip phone, no problem, just sign a sheet after class.
- A smart phone or computer method (native or free app) for short recordings that will become (roughly) weekly assignments (explained below).

I assume you have convenient access to the internet, and that you check your email regularly.

**Course web site:** All materials will be available via Canvas or sent to you by email, including notes, outside readings, exam review sheets, etc.

→ Please download and read "First Day Handout for Undergraduates" from the files section of our Canvas page, where you can always find a current version of this syllabus. Also, you'll find the announcements for student observing opportunities and "star parties" there in a few days.

**Required textbook:** *Life in the Universe*, 3<sup>rd</sup> edition, by J. O. Bennett and S. Shostak (2011).

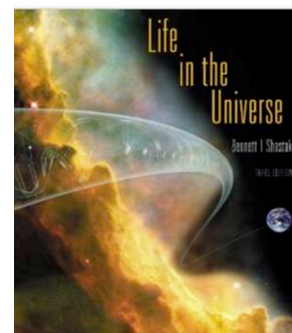
Student Companion Website:

[http://wps.aw.com/aw\\_bennett\\_liu\\_3/174/44767/11460576.cw/index.html](http://wps.aw.com/aw_bennett_liu_3/174/44767/11460576.cw/index.html).

The book comes with an access code (inside front cover) you need in order to register at the student companion website, giving you access to the textbook in ebook form, quiz questions for each chapter, self-guided tutorials, interactive figures and photos, links to astrobiology-related web sites, a math review, and more.

--The co-op sells this at \$153 new (\$138 with rebate), \$115 used (\$104 with rebate). At amazon.com the book sells new for about \$128. Rentals start at \$25. Unfortunately, the rental is not a new book, and will not have the access code for the textbook website.

You can live without it, but there are a few things, like some of the assigned review questions, that you won't have, or will have to copy off of someone else's access. You could purchase an access code separately, online from the publisher web site—I think it's about \$40-50, which makes the total nearly as high as a new book, as far as I can tell.



--The eTextbook version is the same book (3<sup>rd</sup> edition), and only \$51 to \$92. If you are *more* comfortable reading on your laptop or desktop computer (for size—tablet is marginal and phone is out of the question), go ahead—at least delivery will be rapid.

--Purchasing this textbook *used*, online or otherwise, may be tricky and is not recommended. If you do, *be sure you are purchasing a 3<sup>rd</sup> edition*. The second edition will be cheap but useless. Also, a used book will not have a valid access code to the student companion site; as remarked above and explained more in class, this access code is useful, but in a jam you can get by without it.

--These publishers are vigilant, and have cut off all other paths to free or inexpensive new books, as far as I can tell.

→ *I recommend purchasing at the Co-op. After rebate, and considering you can sell it back at the end of the semester, the price is roughly the same as amazon. Besides, you cannot afford to wait 4-10 days for delivery, so you would have to specify two-day shipping.*

→ *In any case, purchase it now; you should have it in-hand by Th, Jan. 22, or you will already be behind in the readings.*

**Other required reading:** Several sources of outside readings, including my notes, will be provided for you to download at Canvas (as pdfs). Some you can read online. through the UT electronic library, or at a url I will supply. More detailed guides to the reading assignments for each of the five parts of the course will be handed out separately.

**The textbook reading assignments corresponding to each exam, as well as a day-by-day calendar of lecture topics and readings will be distributed separately.**

**Grading:** 85% of your grade is based on 5 exams (17% each), 5% on attendance and diligence, and 10% on the regular submission of short recordings or other brief assignments (see below).

**Final letter grades:** Final grades in our class will be assigned on the following basis.

**A = 87.0 to 100    B = 77.0 to 86.9    C = 67.0 to 76.9    D = 57.0 to 66.9    F < 57.0**

➔ Final percentages will *not* be “rounded up.” 86.87 is a B, not an A.

➔ *Plus/minus grades will not be assigned in this class.*

**Just under the cutoff?** If at the end of the semester you are just under the cutoff for a grade (by, say, one, or two, or 0.3, percentage points), whether you are just under a D, say, or an A, do *not* call or write asking me to lower the cutoff--this is unfair to all concerned. Cutoffs will *not* be lowered to accommodate your individual score. Scores at the end of the semester are *not* rounded up, so, for example, a 76.7 will get you a C. Instead, you should trust in my flexibility when it comes time for final grades, as some of you who were in my class last semester may know.

**Extra Credit:** Extra credit assignments will be offered, but they will not be trivial. Their nature depends on the final size of our class, so I’ll give you an update later in the semester. In any case, you should not assume there will be some fast-and-easy paper you can throw together at the end in order to improve your grade.

### ***Lectures, homework, exams: Overall organization of the course***

■ The rhythm of this class is simple: About 5 in-class lecture periods, then an exam. Then repeat four more times. I want to keep things as simple as possible. With so much weight given to exams (85%), but so much “dead time” between Th and the following T classes, **major factors in your success will be attendance, diligent reading, and especially review between classes. Familiarity** will be one of your most important advantages in this class, and will also make the recording assignments easy.

■ **There are five exams, counting 85% of your final grade.**

--All exams are weighted equally *except* that your lowest exam score will only receive a weight of 1/2 compared to the others. So you have to take all the exams, but if you have an off day (or week), it won’t hurt your final grade *too* much.

--The exam dates are all Tuesdays except for the last exam.

**Ex 1: T Feb 10    Ex 2: T Mar 3    Ex 3: T Mar 31    Ex 4: T April 21    Ex 5: Th May 7**

--Given the likely size of the class, all the exams will be multiple-choice questions, usually about 30-35 questions.

--In case of medical or other non-academic emergencies or situations, contact me as early as possible—it will usually be possible for you to take an exam a day or so early or late in these cases (but not for academic reasons).

--We will try to get exam grades available to you through Canvas within one, or at most two days of the time of the exam.

--There will be no comprehensive final (the amount and variety of topics is immense).

--*Details of the materials and readings corresponding to each exam will be made available separately*

■ **Five percent of your grade is based on attendance.** I'll explain how attendance will be monitored later, during class, but the method I use requires that you download the free Canvas app from iTunes or elsewhere. We hope to take attendance in a minute or two, usually as a break in this long lecture class. Attendance also affects your grade indirectly: The exams are weighted toward the lecture material, as well as the textbook readings. Some statistical studies I've done in the past indicate an average difference of nearly a full letter grade between students who attend regularly and those that don't. In semesters for which I counted attendance, it was very rare for a student who didn't have about 80--90% attendance to receive a grade of "A," unless they were motivated solely by attendance points.

■ **Ten percent of your grade is based on an assignment called "expository recordings."** *Think of these as parts of a single semester-long take-home oral exam.*

A major part of self-evaluation of students, and proper preparation for exams, is based on the idea that you only understand something to the degree that you can explain it, in your own words. To that end, you will be asked to submit a very short **recording** each week or so, answering, *in your own words, without rehearsal, memorization, or reading*, your choice of several questions covering what we have been reading and discussing. In order to receive any credit (1 or 2), they must reflect the appropriate degree of preparation to be counted as a viable recorded explanation. Grammar, style, and articulation are unimportant, as long as we can understand the words. The recordings are also meant to keep you from falling behind. The relationship of this approach to the problem of conceptual learning is described below.

--I will seek your suggestions and ideas on this "oral exam" component of the course, which may evolve as the class progresses.

*(Note: The procedure will be explained in more detail elsewhere, but basically you make a recording (<1 min) on your computer or phone, drop it into your UTbox site, where you'll be seeing a shared folder called "Expository Learning," containing subfolders "Exercise 1," "Exercise 2," etc. ]*

■ **Homework:** There is homework in this class, but it will be ungraded *except* in the sense that references to it will appear on each exam in the form of a few exam questions. In other words, your homework will be graded as part of each exam. In my opinion, this is a obviously a way to get higher exam scores, but is also a tool that forces you to keep familiar with the material, probably the most important thing required in order to do well.

■ **Student feedback:** I think there is not much purpose, and certainly no benefit to you, when I receive your comments on the Course-Evaluation Survey after the class has ended. Instead, I hope we can both "self-correct" if there are particular problems. It could be something as simple but important as "Could you write a little larger on the board?" or "Would you try to stop speaking when facing the board?" etc. Or you may have more serious and/or in-depth comments. And of course positive comments are also very useful, and not just because they give me a warm feeling of encouragement. For the small things, you can just tell me after class, or by email, but most students feel more comfortable with complete anonymity.

For that purpose, we have an anonymous comment web site where you can say anything you want, always trying to be constructive, of course, at any time. A link to this SurveyMonkey.com site is on the home page for our course in Canvas. I'll place it here in the syllabus while I'm at it:

<https://www.surveymonkey.com/s/J87V3P6> (Links to an external site.)

I periodically read these carefully, and can address some remarks in class, or at least try to use this feedback as an in-semester tool for improvement of the class.

**Special requests:** Students with disabilities or other special needs may request appropriate accommodations for the exams or more general accommodations from the Division of Diversity and Community Engagement, Services for Students with Disabilities, 512-471-6259, <http://www.utexas.edu/diversity/ddce/ssd/>

**Dropping the course:** See *General Information*, Registrar's web site, for details of required approvals. Brief list of dates are at the online academic calendar. The College of Natural Sciences adheres strictly to the published deadlines. Notice the 12<sup>th</sup> class day (last day to drop a class with possible refund), the deadline for dropping a course without possible academic penalty, and the last day to drop a course, except for urgent nonacademic reasons, with Dean's approval.

**Incompletes:** An incomplete (X) will only be considered for students who cannot complete the required course work for reasons other than lack of diligence (illness or other imperative nonacademic reasons), but only if the student has a passing grade on the work completed.

**Cheating:** Academic dishonesty will result in failure of the course and a report to the Dean of Students, who will decide on further action. If our enrollment is small enough, students will be required to sit one seat apart during exams. Because of the increasing frequency of clear infractions, please protect your work, even your "homework."

**Student observing opportunities:** Call 471-5007 or see <http://outreach.as.utexas.edu/public/viewing.html> for Monday updates; I'll place info at Canvas when I have it in case you're interested.

**What is this course really about? A little more detail, and a warning.**

This course is concerned with the possibilities and implications of extraterrestrial life and intelligence, and a few more subtle themes that will become apparent. The standard major topics include

- whether habitable planets around other stars are commonplace
- how likely or unlikely life is elsewhere (based on theories and evidence about the origin of life on Earth)
- how we might detect such life remotely
- the possibilities of life within our own solar system
- whether we should expect that complex organisms, especially creatures possessing "intelligence," language, technology, etc. are common
- strategies for communication with extraterrestrials
- the possibilities for interstellar travel, and (if time permits) the question of whether we have been visited by extraterrestrials.

That probably sounds pretty dry, so this semester we'll begin with something called "The Fermi Paradox," which is all about star travel and colonization of our galaxy, and why and whether we are alone in our galaxy. First, you'll become experts on "The Drake Equation," which is really a simple mnemonic device for seeing the big picture, and can be a lot of fun if you let it.

**WARNING:** *Please note from the outset that the course is highly interdisciplinary by nature, and that only a fraction of the material (maybe a quarter) is directly astronomical.* I have worked in this area as part of my research for about 15 years, and studied and taught it nearly every year for about 30 years. My problem for this course, then, is the urge to and habit of overstuffing the course with more and more material, and especially updates (your book is several years old), thinking that students will be able to discriminate between something that is just interesting to know and something that will be on an exam, but more often than not it just leads to confusion. For that reason, I'm attempting to whittle the material down to a cleaner, less comprehensive, learning experience.

You will be required to become familiar with a lot of elementary but diverse material from astronomy, planetary science, chemistry, and molecular biology. This material requires no background, nor gives any advantage to those who do have some background—it is really at an elementary level. My goal is to show you how simple it is. **If you are not willing to study interdisciplinary material, please drop the course now, but don't complain in the end that this wasn't a straight astronomy class!** *I suggest you immediately look through your textbook to get a feel for the nature of the topics we will be covering.*

The material will be *almost* entirely non-mathematical, nothing beyond simple arithmetic, concentrating on a number of key ideas that can be understood without math. However, they do require a solid conceptual grasp of the subjects, and *a degree of comfort using graphs as an important quantitative tool.* If you are at all uncomfortable with elementary mathematics (or even if you're not), take a look at the "Math Review" at the textbook web site; the most important are "Powers of Ten," "Scientific Notation," and "Working with Units." Without some comfort with these, it will be difficult to understand what is going on. Most of the numbers will come early, in the first couple of weeks.