



ASTR 202 Life in the Universe (Fall 2017)

Tu/Th 12:30 p.m.- 1:45 p.m., Steward Observatory N210

Description of Course

Welcome to one of the most exciting adventures in science, astrobiology! We meet on Tuesdays and Thursdays from 12:30 to 1:45 PM in N210 at Steward Observatory. “Life in the Universe” confronts one of the biggest questions humans can ask: Are we alone in the universe? The content is mostly astronomy, but will include aspects of physics, geology, chemistry, biology and even sociology. Astrobiology is driven by large telescopes, space missions, lab experiments and continued exploration of the full range of terrestrial life. We will critically assess the nature of life on Earth and the likelihood for finding life beyond.

Course Prerequisites or Co-requisites

Astronomy 202 is a Tier 2 General Education course, aimed at students who have had at least one general education science course, but it assumes no prior knowledge of astronomy.

Instructor and Contact Information

Instructor: Dr. Jinyoung Serena Kim in the Department of Astronomy

- Office: N330 (note N in front of 330) at Steward Observatory.
- Phone: 520-626-0187
- Email: serena00@email.arizona.edu. Email is the best way to reach me. I will try to answer your emails within 24 hours.
- Office hours (N330 at Steward Observatory):
 - Mondays: 1:00 p.m. – 3:00 p.m.
 - Tuesdays: 2:00 p.m. – 3:00 p.m.

You are welcome to see me before or after class. It is best to make an appointment first, by phone or email.

Teaching Assistant Mr. Yifan Zhou (Ph.D. student)

- Email: yifzhou@email.arizona.edu
- Office: N208 at Steward Observatory
- phone: 520-621-1406.
- Office hours (N304-Parker Library at Steward Observatory):
 - Mondays: 11:00 a.m. – 12:00 p.m.
 - Wednesdays: 1:00 p.m. – 3:00 p.m.

Class Materials and the D2L course website

The textbook is **Life in the Universe** by Bennet and Shostak (**4th** edition). We will follow the textbook, although some extra materials may be used. Lecture notes, additional materials, including copies of the activities and homework, helpful web sites, and this syllabus, will be posted on the class web site. We will be using the UA course management system **Desire2Learn** (D2L, go to the URL <http://d2l.arizona.edu>, and follow the instructions for students; you'll need your **NetID** to login). You are strongly advised to stay current with course related announcement and materials as well as class notes. Check the class d2l site frequently. I will use the D2L course website for any announcement related to this course, and send you emails. **Please make sure the email sent to your d2l email address is correctly forwarded to you.**

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- The textbook can be either hardcopy or eTextbook. You may purchase or rent for the semester.
- Hardcopy can be found in the University book store.
- If you want to buy or rent from Pearson store:
<http://www.mypearsonstore.com/bookstore/life-in-the-universe-plus-masteringastronomy-with-pearson-0134068408>
- If you want to buy or rent from Amazon https://www.amazon.com/Life-Universe-4th-Jeffrey-Bennett/dp/0134089081/ref=sr_1_1?ie=UTF8&qid=1502507995&sr=8-1&keywords=life+in+the+universe+4th+edition+bennett%2C+shostak
- This textbook may be available in used book section and from book stores I did not list here.

Course Format and Teaching Methods

We will have lectures, small group activities, and discussions in class. Even though this class is large, everyone will be an active participant. Each week we will cover a particular broad topic. We will generally have lectures, although we may often break for recent news on extra-solar planets solar system planets, and other astrobiology related topics for short discussions. We will touch upon the broad and selected topics from the textbook, therefore keeping up with reading assignment is important. Questions are always welcome. We will often have *group activities and mini-discussions* that relate to the lecture materials, where I expect all students to actively engage in discussion. The class will split into groups of 3-4 for the regular activities (maximum 4), and as a group you will fill in a worksheet and get a "group" grade (the same score for each person) for the activity. An *individual homework assignment* will be handed out at the end of each activity. Homework builds on the class activities and reading, and is due one week after the homework assignment is given. There will be seven **pop quizzes or mini discussions** in class mainly based on reading materials, previous lectures, activity and homework. There will be three **exams** during the semester. There will be **one term project** (your exo-planet) and few opportunities for extra-credit assignments. This course encourages active participation by the students in class.

Course Objectives and Expected Learning Outcomes

The main goal for students in this course is to have fun learning about the possibilities for life in the Universe and, in the process, gain an appreciation for the methods used in science. To achieve this goal, we will study such seemingly diverse topics as the origin of the Universe, the formation of stars and planets, the nature of planets, basic Physics and chemistry, geological and atmospheric evolution, biological evolution, cultural and technological evolution, interstellar travel, and communication

techniques. Students are expected to actively participate in the class, ask questions and learn to work together with other students. We encourage students to be creative, think outside the box, and work together as a team for in-class activities. At the end of this semester-long course, we expect that students will be able to understand how science work, understand better and critically think when they read news articles about astrobiology, extra-solar planets, and general science related subjects.

This course is included in the astronomy minor program for liberal art (see: <http://www.as.arizona.edu/undergraduate-minors-astronomy>).

Absence and Class Participation Policy

Participating in the course and attending lectures and other course events are vital to the learning process. As such, attendance is required at all lectures and discussion section meetings. Students who miss class due to illness or emergency are required to bring documentation from their health-care provider or other relevant, professional third parties. Failure to submit third-party documentation will result in unexcused absences.

- The UA's policy concerning Class Attendance, Participation, and Administrative Drops is available at: <http://catalog.arizona.edu/policy/class-attendance-participation-and-administrative-drop>
- The UA policy regarding absences for any sincerely held religious belief, observance or practice will be accommodated where reasonable, <http://policy.arizona.edu/human-resources/religious-accommodation-policy>
- Absences pre-approved by the UA Dean of Students (or Dean Designee) will be honored. See: <https://deanofstudents.arizona.edu/absences>

I do not take attendance separately. However, activities, *unannounced* pop quizzes and mini discussions (10-15 minute-long small group discussions) will be given throughout the semester. Extra-credit discussion may be scheduled toward the end of the semester (<5% of total grade). Activity, pop quizzes and mini discussions will together count for about 40% of your final grade.

Makeup Policy for Students Who Register Late

If you registered late, and missed the first lecture, please come and see Dr. Kim after the class or during her office hours.

Exams

There will be total three exams during the semester (see the schedule table). Exam questions will be related to the reading assignments, lectures, activities, quizzes, and homework. Details on exam format will be discussed in class. The exams typically have T/F questions, multiple choice, matching, and short answer questions. The lowest grade will be dropped. Midterm exam dates are currently planned on **September 21st (12:30pm-1:45pm)** and **October 31st (12:30pm-1:45pm)**, and the final exam date will be on **December 8th (1:00pm-3:00pm)**. More details on midterms and final exam will be discussed IN CLASS, and information related to each exam will be posted in the course D2L site.

Term Projects - YOUR EXO-PLANET

Each student will adopt one extrasolar (exo) planet that will be randomly selected from a list of known exo-planets. Exoplanet assignment will be announced during the first few weeks of the

semester. Everyone will work on her/his own unique planet! Each student is expected to do research about the planet and the system (star+planet), discovery method, habitability, etc. Detailed instruction and rubric will be discussed in class.

This term project counts for 15% of your grade. Please do not copy the materials just as written in a webpage or in a journal. Quoted texts should not be more than 10% of your paper. All the used references including the links (URLs) should be clearly cited at the end of the term paper. Please find the citation guide in the University of Arizona Library website(<http://www.library.arizona.edu/search/reference/citation.html>). You may follow the suggested guide in the website, e.g., APA, Chicago, MLA guide, or AAS guide (<http://journals.aas.org/authors/references.html>).

The page limit of the written part of the project is 5 singled-spaced pages (**not** including large figures and citations) using font size similar to 11-12 for Time New Roman font type. The rubric and submission details for the project will be discussed IN CLASS, and will be posted in the d2l. Students will also submit their draft paper by the deadline (November 10th) will receive feedback and comments. The final version of your paper will be due by November 27th, 2017 (firm deadline). No late draft will receive comments, therefore do not procrastinate until the last moment. All projects are to be submitted on-line to d2l Dropbox in pdf format, word or page document format. Note that we will discuss a lot of detailed materials related to the project **IN CLASS**.

Grading Scale and Policies

About 70% of the total grade in this class will be based on in-class group activities, homework, pop quizzes, and a term project. Exam will be 30% of the final grade. There are 6 group activities and 4 homework assignments, and 7 pop quizzes (or mini discussions) during the semester. You may drop your 1-2 lowest scores of activity and pop quizzes/mini discussions, 1 lowest for homework and exams. All missed assignments and exams are scored as zero. Everyone is also expected to do an individual term project (“your exoplanet”). I reserve the option to offer a small amount (about 5% of total grade) of extra credit for an outside class event. There will be three exams during this semester, one of which can be dropped (highest two exam grades will be counted). **This course uses absolute grading scheme, therefore you’re not competing with other students.** By the end of the eighth week of the semester 40% of the total grade will be determined.

The components of the grade and the final grade boundaries are following:

- 3 Exams (1 exam dropped) 30% (150 points)
- 6 Group activities (1 score dropped) 30% (150 points)
- 1 Term project 15% (75 points)
- 4 Homework (1 score dropped) 15% (75 points)
- Attendance (7 pop quizzes or mini discussion) 10% (50 points)
(2 lowest scores dropped)
- extra credit homework/activity <5% (25 points)

total grade points: 500 points

A: 90-100%	(450-500+)
B: 80-90%	(400-449)
C: 70-79%	(350-399)
D: 60-69%	(300-349)
E: < 59%	(<300)

Requests for incomplete (I) or withdrawal (W) must be made in accordance with University policies, which are available at <http://catalog.arizona.edu/policy/grades-and-grading-system#incomplete> and <http://catalog.arizona.edu/policy/grades-and-grading-system#Withdrawal> respectively.

Errors in grading

If you spot an error in grading or have a question you must call it to the attention of the TAs or instructor **within one week** after the graded materials are handed out. An effort will be made to hand back material in a timely manner. Make sure to review all your handed-back material as soon as possible. Note that you can only discover an error in grading if you pick up your graded material and review it!

Feedback on assignments and writing: Activity, homework, mini-group discussion and quizzes require writing in sentences and paragraphs. Students will receive feedback on their assignments from the TA and/or Dr. Kim on hardcopy paper or as a comment in the d2l. The draft project paper which is submitted at least 1 week in advance will receive comments individually, and the final paper can be resubmitted to the d2l.

Honors Credit

This course offers Honors contracts to any Honors students who would like to receive Honors credit. Honors students will be given a semester-long project that will turn into a 5-page paper, and will be expected to give a short presentation at the end of the semester. Honors students will discuss possible topics for the project with Dr. Kim at the beginning of the semester, and will have regular meetings outside the regular class to discuss progress of their projects. The project can be either individual project or a group project. Please talk with Dr. Kim if you wish to receive Honors credit. Students wishing to contract this course for Honors Credit should email me to set up an appointment to discuss the terms of the contact. Information on Honors Contracts can be found at <http://www.honors.arizona.edu/faculty-and-advisors/contracts>.

Classroom Behavior Policy

To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed. To that end, our focus is on the tasks at hand and not on extraneous activities (e.g., texting, chatting, reading a newspaper, making phone calls, web surfing, etc.).

Students are asked to refrain from disruptive conversations with people sitting around them during lecture. Students observed engaging in disruptive activity will be asked to cease this behavior. Those who continue to disrupt the class will be asked to leave lecture or discussion and may be

reported to the Dean of Students.

Note-taking using electronic devices, such as laptops and iPad are permitted. These devices can be distracting to other students. Therefore, students who prefer to use electronic devices for note-taking during lecture should use one side of the classroom. Please be courteous to other students and the instructor.

No mobile phone use policy: use of personal electronics, such as mobile devices, is distracting to the other students and the instructor. Their use can degrade the learning environment. Therefore, students are not permitted to use these devices during the class period. No mobile phone, texting, web surfacing is permitted during the class.

Threatening Behavior Policy

The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to oneself. See <http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students>.

Accessibility and Accommodations

Our goal in this classroom is that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, please let me know immediately so that we can discuss options. You are also welcome to contact the Disability Resource Center (520-621-3268) to establish reasonable accommodations. For additional information on the Disability Resource Center and reasonable accommodations, please visit <http://drc.arizona.edu>.

If you have reasonable accommodations, please plan to meet with me by appointment or during office hours to discuss accommodations and how my course requirements and activities may impact your ability to fully participate. Please be aware that the accessible table and chairs in this room should remain available for students who find that standard classroom seating is not usable.

Code of Academic Integrity

Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work/exercises must be the product of independent effort unless otherwise instructed. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog. See:

<http://deanofstudents.arizona.edu/academic-integrity/students/academic-integrity>.

The University Libraries have some excellent tips for avoiding plagiarism, available at <http://www.library.arizona.edu/help/tutorials/plagiarism/index.html>.

Selling class notes and/or other course materials to other students or to a third party for resale is not permitted without the instructor's express written consent. Violations to this and other course rules are subject to the Code of Academic Integrity and may result in course sanctions. Additionally, students who use D2L or UA e-mail to sell or buy these copyrighted materials are subject to Code of Conduct Violations for misuse of student e-mail addresses. This conduct may also constitute copyright infringement.

UA Nondiscrimination and Anti-harassment Policy

The University is committed to creating and maintaining an environment free of discrimination; see <http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy> Our

classroom is a place where everyone is encouraged to express well-formed opinions and their reasons for those opinions. We also want to create a tolerant and open environment where such opinions can be expressed without resorting to bullying or discrimination of others.

Additional Resources for Students

UA Academic policies and procedures are available at <http://catalog.arizona.edu/policies>.
 Student Assistance and Advocacy information is available at <http://deanofstudents.arizona.edu/student-assistance/students/student-assistance>.

Subject to Change Statement

Information contained in the course syllabus, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructor.

Scheduled Topics/Activities

These lectures/activities/date for activity will be revised or rescheduled during the semester. The revised version of syllabus will be updated in the D2L.

A: Activity E: exam EC: extra credit

Week	DAY	DATE	TOPIC	CHAPTER
1	Tu	8/22	1. A Universe of Life? Welcome, Introduction, Course Overview, Astronomical Numbers Concept of Habitable Zone	1, Appendixes (A,B,C)
	Th	8/24	Flandrau Science Center - Planetarium Show	Planetarium Lecture
2	Tu	8/29	2. The Science of Life in the Universe Ancient Debates about Life beyond Earth Copernican Revolution	2 Appendixes (A,B,C)
	Th	8/31	Activity 1: Astrology and Statistics Activity Nature of modern science, Scientific Method	2, A
3	Tu	9/5	3. Definition of astronomical objects Structure and Scale of the Universe	2, 3
	Th	9/7	Scales of the Universe Activity 2: Scale of the Universe	3, A
4	Tu	9/12	Universe of Matter and Energy Properties of Light Radiation, Matter, and Energy Solar system formation (nebula theory)	3
	Th	9/14	Spectroscopy (light and energy review) Activity 3: Light and Spectroscopy	3, A

5	Tu	9/19	4. Habitability of the Earth Geology and Life, History of the Earth and Life	4
	Th	9/21	Exam 1	E1
6	Tu	9/26	The Hadean Earth and the Dawn of Life Geology and Habitability	4
	Th	9/28	Climate Regulation and Change Formation of the Moon 5. Defining Life, CELLS	4
7	Tu	10/3	Metabolism, DNA and Heredity, Biological revolution	5
	Th	10/5	Activity 4: DNA extraction (kiwi or other fruit)	5, A
8	Tu	10/10	Natural Selection Life at the Extreme, Evolution as science	5
	Th	10/12	6. The Origin and Evolution of Life on Earth Life's Origins, The Origin and Evolution of Life	6
9	Tu	10/17	Impact, Extinctions, and Human Evolution, AI 7. Searching for Life in Our Solar System Requirement for Life	6, 7
	Th	10/19	Biological Tour of the Solar System 8. Mars	7, 8
10	Tu	10/24	10. The Nature and Evolution of Habitability Concept of Habitable Zone Habitability Factors, Future life on Earth (10.2 and 10.5 to be discussed later)	10
	Th	10/26	11. Extrasolar Planets Distant Suns, Exo-planets Classifying Stars	11
11	Tu	10/31	Exam 2	Exam2
	Th	11/2	Extrasolar Planet Detection	11
12	Tu	11/7	Travel to exo-planets Habitable zone in other solar systems	11
	Th	11/9	Habitable zone in other solar systems Activity 5: Distant Suns and Exo-planets Project paper draft submission deadline: 11/10	11, A
13	Tu	11/14	9. Mars 10. Jovian Moons	8, 9

	Th	11/16	10.2 Venus and runaway greenhouse effect 10.5 Global Warming Activity 6: Climate change/Global Warming Project peer review deadline: 11/17	10, A
14	Tu	11/21	12. Drake Equation	13
	Th	11/23	THANKSGIVING DAY (no class)	
15	Tu	11/28	Project paper final version deadline: 5pm on 11/27 SETI, UFOs 13. Fermi Paradox	8
	Th	11/30	Which exo-planet would be our choice? Extra-credit activity	9
16	Tu	12/5	Last lecture: Summary and Ending remarks Are we alone? How will the Universe end?	1-13
17	F	12/8	Exam 3 (final exam day:1PM – 3PM at SO N210)	Exam on Friday!

Tips for the Class

This syllabus serves as the “contract” for this class. Please read this syllabus carefully and continuously check for updated schedule that will be posted in the d2l class site. Come to class regularly, and come to one of our office hours if you have a question or have trouble understanding certain topics. Keep up with the readings (the textbook and the lectures). You will get a chance to give your opinion on a variety of topics. Get help if you need it. If you miss two weeks of assignment it will be difficult to get the best grade in the class. Group activities and discussions work best when everyone contributes. Since you can drop one or two scores for each category of work, no late work will be accepted, and no make-up will be offered. With absolute grading, you know what you need to do to get a particular grade on day one and you are not competing with other students. Research project on your own planet should be started as soon as you receive the name of your planet. **Do not procrastinate until the last moment.** Ask for comment for draft of your project writing well in advance. Remember to participate actively in class. Always ask questions. Try to think outside the box. The best part of a university education is the chance to think deeply about big questions. Enjoy the class! Let’s have a fun semester to search for life in the universe!

Summary

The summary of most important information you'll need for the course is summarized below:

Class: Tu/Th at Steward Observatory N210 from 12:30PM to 1:45PM

Materials: Textbook: *Life in the Universe* by Bennet & Shotstak (**4th edition**)

Instructor:

Dr. J. Serena Kim (serena00@email.arizona.edu)

Office Hours: Mondays: 1:00 p.m. - 3:00 a.m. (Steward N330)

Tuesdays: 2:00 p.m. - 3:00 p.m. (Steward N330)

TA: **Mr. Yifan Zhou** (yifzhou@email.arizona.edu)

Office Hours: Mondays: 11:00 p.m. - 12:00 p.m. (Steward N304 - Library)

Wednesdays: 1:00 p.m. - 3:00 p.m. (Steward N304 - Library)

Group Activities: Group activities will be given in class. Hand in the group report as a group at the end of the activity. You may want to keep your own copy for homework assignments and exam preparation.

Pop Quizzes, Mini-discussion, and Homework assignment:

Pop quizzes and mini-discussions may be given in class UNANNOUNCED. The previous week's homework is due before the lecture starts (to D2L dropbox).

Grade: 30% exam, 30% group activities, 15% homework, 15% project, 10% pop quizzes, and <5% extra credit

Grading queries and appeals: All grade queries or appeals should be done within a week of work being handed back.

Late Work/make-up: **No late work or makeup will be offered** without a formal excused absence, because 1 or 2 lowest scores can be dropped.

Project: Final project due by **5pm Nov. 27, 2017 to D2L**

You can hand in early, but not late! No late work will be accepted.