



ASTR 202 Life in the Universe (Fall 2022)

Tu/Th 11:00 a.m.- 12:15 p.m. MST

Instructor: Dr. J. Serena Kim (SO N330)

TA: Maggie Smith (SO T109)

In-person classroom: Steward Observatory N210

Description of Course and Objectives

Welcome to one of the most exciting adventures in science, **astrobiology!** "**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.

We will have fun talking about various topics related to Life in the Universe, learn basic concepts and scientific backgrounds that will help you, as a group, to find the best Earth #2 candidates by the end of the semester.

Expected Learning Outcomes

Upon completion of this course, students will be able to:

- ▶ understand the nature and application of science;
- ▶ apply ideas and processes beyond the classroom;
- ▶ learn to obtain necessary information and data from publicly available, trustworthy sources in internet;
- ▶ critically analyze and interpret data and results presented in tables, graphs and charts as well as perform simple mathematical calculations appropriate for non-science major students;
- ▶ appreciate the relative scale of astronomical objects, size, and distance
- ▶ recognize the complexity of many scientific issues;
- ▶ speak and write about scientific knowledge;
- ▶ read and understand scientific literature from popular sources such as magazines and newspaper.

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

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 (office)
- Email: serena00@arizona.edu. **Email is the best way to reach me.** I will try to answer your emails within 24 hours.
- **Office hours via in person, Zoom and by appointment** (email to set up a time)
In person: Mondays 1:30 pm – 2:30 pm
Zoom: Tuesdays 1:30 pm – 2:30 pm
See D2L for zoom info; please sign up for office hours if coming in zoom. **You are welcome to see me after the class.** It is best to make an appointment using google spreadsheet for office hour appointments or by email to set up time for office hour if you need help with assignments or any other question related to the course work.

Teaching Assistant: Maggie Smith (Ph.D. student in Physics/Astronomy)

- Email: maggiesmith@arizona.edu
- Office: SO T109
- **Office hours: in person, zoom and by appointment** (email to set up a time)
In person: Wednesdays 9:30 am – 10:30 am
Zoom: Wednesdays 2:30 pm – 3:30 pm

Office hours are subject to change: see the D2L Calendar and announcement for changed schedules. **Please wear masks during in-person office hours.**

Class Materials and the D2L course website

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 UANetID to login). You are strongly advised to stay current with course related announcement and materials and class notes. Check the class D2L site daily.

I will use D2L as our course website. Announcements, grades, lecture notes, instructions for your projects, activities, and other news related to this course will be posted in D2L. I will also send you emails. Please make sure the emails I send to your D2L email address can find you well in timely manner.

The textbook is **Life in the Universe by Bennet and Shostak (4th edition)**. We will follow the textbook in general, although some later chapters may be discussed earlier to prepare for two projects. Some extra materials will be used as well for activities and discussions. Lecture notes, additional materials, including copies of the activities and homework, helpful web sites, and this syllabus, to-be-revised syllabi can be found in the course D2L site.

Textbook information: ISBN-13: 978-0134089089

ISBN-10: 0134089081

Authors: Jeffrey Bennet and Seth Shostak

- 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, via on-line book stores.
- If you want to buy or rent from Pearson store:
<https://www.pearson.com/en-us/subject-catalog/p/life-in-the-universe/P200000006993/9780135234457>
- If you want to buy or rent from Amazon or other on-line book store. Make sure you get 4th edition.
- This textbook may be available in other used book stores I did not list here.

Meeting Times and patterns

We will be meeting in person on **Tuesdays and Thursdays from 11:00 a.m. to 12:15 p.m.** at N210 at Steward Observatory. In general, we plan to have lectures with short discussions or mini activities on Tuesdays and lectures and longer activities on Thursdays. This plan may be modified during the semester.

Course Format and Teaching Methods

This course will be taught using both lectures and interactive discussions and collaborative activities. Everyone will be an active participant. We will cover a particular broad topic each week. During the lectures, we may often break for recent news on extra-solar planets, solar system planets, and other news on astrobiology related topics. We will touch upon the broad and selected topics from the textbook, therefore keeping up with reading assignment is important. Questions are always welcome. For certain activities we may ask students to submit their own activity sheet as well. There will be about seven pop quizzes or mini discussions in class mainly based on reading materials, previous lectures, activity and homework. There will be **NO exam**. There will be **two projects** instead of exams, **a student presentation (recording)**, and some opportunities to earn extra-credits.

- ▶ **Activities:** During the *group activities and discussions* all students are expected 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. One lowest activity grade will be dropped.
- ▶ **Exams: There will be no written exam.**
- ▶ **Equipment and software requirements:** For this class you will need an access to the following hardware: computer (desktop or laptop) or web-enabled device for homework and projects, regular access to reliable internet signal; ability to download and run the following software: web browser, word processor, such as Word, Page, Googledoc, and similar software. You may want to use ZOOM if you want to attend the *office hours via zoom*.
- ▶ **Lecture notes :** Slides will be uploaded to the D2L/Content for all lectures
- ▶ **Homework:** There will be about 6-7 homework assignments in the semester. Homework assignments will be posted in the D2L, which will be due a week after the assignment is given. One lowest grade will be dropped.
- ▶ **Quizzes:** There will be pop (unannounced) quizzes in class throughout the semester. One lowest grade will be dropped.

Term Projects

Project 1: Habitability of Solar System Objects (other than Earth)

Each student will work on a mid term project on habitability among the Solar System bodies (planets, moons, asteroids, comets, Kuiper Belt objects). Each students will select three solar system objects that they want to work on. More detailed guideline and rubric will be discussed during the class and the guidelines will be posted in the D2L. During the class activities and homework, students will learn how to find data and necessary information, learn to analyze the data you find, and to write a short paper. Total 15% of the final grade. Format of the paper will be discussed during the class. Project 1 will be **due by 11:59pm, October 20th, 2022**.

Project 2: Your Exo-Planet

Each student will adopt one extrasolar (exo) planet that will be randomly selected from a list of known exo-planets. Exoplanet assignments will be announced during the first few weeks of the semester. Everyone will work on her/his/their own unique planet! Each student is expected to do research about the planet and the system (star+planet), discovery method, habitability, etc. Detailed instructions and a rubric will be discussed in class. We will also learn to prepare each step this project in class as part of activities and discussions.

This term project counts for 20% of your grade. All references you use, including the websites, should be 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 a 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 Times New Roman font type. The rubric and submission details for the project will be discussed in class, and will be posted in D2L. Students can come to office hours to receive feedback and comments from Dr. Kim or TA. **The final version** of your paper will be **due by 11:59pm, November 22nd, 2022**. Late draft will not receive any comment, therefore do not procrastinate until the last moment. All projects are to be submitted on-line to the D2L Dropbox in pdf format (preferred), word or page document format.

Recorded Student Presentation based on Project 2.

Instead of a written final exam, each student will prepare 3-5 slides (up to 5 minutes) to present their adopted exoplanet using power point or keynotes or pdf. Students will record their presentations using zoom and submit the recordings to the D2L Dropbox. Selected excellent presentations and the final four exoplanets for the Earth#2 activity will be presented in class. There will also be chances for students to show their pre-recorded presentations, and earn extra credit during last few days of classes. Dr. Kim will provide guideline and instruction to prepare the presentations. Individual help is available during the office hours by Mx. Smith and Dr. Kim. Final slides and recordings are **due by 11:59pm Dec 1st, 2022**.

Grading Scale and Policies

I reserve the option to offer a small amount (about 5% of total grade) of extra credit for an outside class event. **This course uses an 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:

- | | |
|---|-----|
| • Group activities | 25% |
| • Mid Term Project 1 | 15% |
| • Final Project 2 | 20% |
| • Homework | 20% |
| • Student Presentation (pre-recorded/in-person) | 10% |
| • Quizzes | 10% |
| • Extra credit homework/activity | <5% |

A: 90-100%

B: 80-90%

C: 70-79%

D: 60-69%

E: < 59%

The overall end-of-semester grade will be calculated from all components of the class.

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 and the grades are posted in D2L. 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, group discussion and quizzes require writing in sentences and paragraphs. Students will receive feedback on their assignments from the TA and/or Dr. Kim as a comment in D2L. Students may submit their draft project papers at least 1 week prior to the paper deadline to receive comments before the deadline individually.

Absence and Class Participation Policy

Participating in the course, attending lectures and other course events are vital to the learning process. Here are the links to U Arizona's policy related to Class Participation and Absence.

- The UA's policy concerning Class Attendance, Participation, and Administrative Drops is available at: <https://archive.catalog.arizona.edu/2021-22/policy/class-attendance-participation-and-administrative-drop.html>
- 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.

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.

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 an 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 contract. Information on Honors Contracts can be found at <https://www.honors.arizona.edu/honors-contracts>.

Rules on Seating

Each students will leave **at least one seat between students** in all direction (front/back/left/right). During the group activities, students will stay in their seats. Please **leave the first row empty** during the lecture.

When you come to the front to talk with me or TA, we recommend wearing a mask/face covering.

Face Covering Recommendation

Face coverings are strongly recommended. During the in-person office hours, please wear a face covering/mask. If you need a mask, please let Dr. Kim know in advance, so that we can prepare masks for you.

The **Disability Resource Center** is available to explore face coverings and accessibility considerations if you believe that your disability or medical condition precludes you from utilizing any face covering or mask option. DRC will explore the range of potential options as well as remote course offerings. Should DRC determine an accommodation to this directive is reasonable, DRC will communicate this accommodation with your instructor.

Classroom attendance/If you feel sick:

- If you feel sick, or may have been in contact with someone who is infectious, stay home. Except for seeking medical care, avoid contact with others and do not travel.
- Notify your instructors as soon as possible if you will be missing class(s).
- [Campus Health](#) is testing for COVID-19. Please call (520) 621-9202 before you visit in person.
- Visit the [UArizona COVID-19](#) page for regular updates.

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 in class. 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 room or discussion and may be reported to the Dean of Students.

Note-taking using electronic devices, such as laptops and iPad are permitted during the in-person lectures. However these devices can be distracting to other students. 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 unless instructor gives permission for certain activities. 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 (DRC, 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: <https://deanofstudents.arizona.edu/policies/code-academic-integrity>

The University Libraries have some excellent tips for avoiding plagiarism, available at <https://new.library.arizona.edu/research/citing/plagiarism>.

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>

- ▶ **Academic advising** If you have questions about your academic progress this semester, or your chosen degree program, please note that advisors at the [Advising Resource Center](#) can guide you toward university resources to help you succeed.

► **Life challenges** If you are experiencing unexpected barriers to your success in your courses, please note the Dean of Students Office is a central support resource for all students and may be helpful. The Dean of Students Office can be reached at 520-621-2057 or DOS-deanofstudents@email.arizona.edu.

► **Physical and mental-health challenges:** If you are facing physical or mental health challenges this semester, please note that Campus Health provides quality medical and mental health care. For medical appointments, call (520-621-9202. For After Hours care, call (520) 570-7898. For the Counseling & Psych Services (CAPS) 24/7 hotline, call (520) 621-3334.

Confidentiality of Student Records

<http://www.registrar.arizona.edu/personal-information/family-educational-rights-and-privacy-act-1974-ferpa?topic=ferpa>

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.

Tentative Scheduled Topics/Activities (subject to change - please check updated schedule in D2L)

*These lectures/activities/date for activity **may be revised or rescheduled** during the semester.*

A: Activity EC: extra credit

Week	DAY	DATE	TOPIC	CHAPTER for reading
1	Tu	8/23	Welcome, Introduction, Course Overview, Life beyond Earth? Definition of Astronomical Objects	1, 2 Appendixes
	Th	8/25	Astronomical Numbers, Key Concepts Definition of Habitability, Scientific Methods	
2	Tu	8/30	Ancient Debate, Copernican Revolution	2
	Th	9/01	Nature of Modern Science, Kepler's laws Activity	2, A
3	Tu	9/06	Newton's laws, History of the Universe	1, 2
	Th	9/08	Structure, Scales of the Universe, Activity	A
4	Tu	9/13	Matter and Energy, Light and Matter	3
	Th	9/15	Spectroscopy Activity	3 A
5	Tu	9/20	Tour of the Solar System: Inner Planets Nebula Theory, Moon formation	3

5	Th	9/22	Concept of Habitability Tour of the Solar System Objects: Gas and Ice Giants	4, 7
6	Tu	9/27	History of the Earth, Age of the Earth (Radiometric Dating) Geology and Life	4
	Th	9/29	Three aspects of geology, Structure of the Earth, Activity	4 A
7	Tu	10/04	Project1 guideline discussion Plate Tectonics, Climate Regulation	4
	Th	10/06	Solar System Objects and Habitability: Jovian Moons Io, Europa, Ganymede, Callisto, Enceladus (Saturn), Titan (Saturn)	7, 9
8	Tu	10/11	Definition of Life Heredity, Natural Selection	5
	Th	10/13	Cells: basic unit of life, DNA, Mars Activity	5
				A
9	Tu	10/18	Metabolism Extremophile - part 1(Thermophile)	5
	Th	10/20	Extremophiles - part 2 Mars Project 1 due (on 10/20) Project 2 intro - find your exoplanet's name	5
10	Tu	10/25	Exoplanets: Basic information for Project 2 The Origins of Life	11, 6
	Th	10/27	Evolution of Life, Impact and Extinction, Human Evolution	6
11	Tu	11/01	Habitable Zone, Venus, Exoplanets in Habitable Zone	10
	Th	11/03	Exoplanets in Habitable Zone Activity	10
12	Tu	11/08	Discovering Extrasolar Planets (part 1)	11
	Th	11/10	Discovering Extrasolar Planets (part 2 and Activity)	11, A
13	Tu	11/15	The Habitability of Extrasolar Planets and Moons	11
	Th	11/17	Revisiting Mars and Terraforming Mars Activity	8
14	T	11/22	Drake Equation FINAL Project paper due (11/22)	12
	W	11/24	THANKSGIVING DAY (no class)	

15	Tu	11/29	Searching for Intelligent Life, SETI, UFOs Travel to other planets?	13
	Th	12/2	Fermi Paradox, Earth-like exoplanets/future missions Student presentation (recordings with slides and video) Activity: YOUR exoplanets - what is the best Earth #2 candidate?	13 A
16	Tu	12/06	Last Lecture Students presentations on the final Four Earth#2 candidates Activity: Deciding the Best Earth #2 Candidate - What is your choice?	Last lecture

Tips for the Class

This syllabus serves as the “contract” for this class. Please read this syllabus very carefully and continuously check for an 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 assignments it will be difficult to get the high grade in the class. Group activities and discussions work best when everyone contributes. Since you can drop one or two scores for activities and quizzes, **no late work will be accepted**. 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 projects on Habitability of Solar System Objects and Your Exo-planet should be started as soon as possible. **Do not procrastinate until the last moment**. Ask for comments on project drafts in advance. Dr. Kim and Mx. Smith are available for help. 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

Class: Tu/Th at Steward Observatory N210 from 11:00 a.m. to 12:15 p.m.

Materials: Required textbook: *Life in the Universe* by Bennet & Shostak (4th edition) rental/eTextbook are all fine.

Instructor: Dr. J. Serena Kim (she/her; serena00@arizona.edu)

Office Hours:

In person: Mondays 1:30 pm – 2:30 pm

Zoom: Tuesdays 1:30 pm – 2:30 pm or via appointment

TA: Maggie Smith (they/them; maggiesmith@arizona.edu)

Office Hours:

In person: Wednesdays 9:30 am – 10:30 am

Zoom: Wednesdays 2:30 pm – 3:30 pm or via appointment

During in-person office hours please wear masks.

ZOOM office hour info: ZOOM information is posted in D2L

In-Class requirements: 1. face coverings recommended; 2. at least 1-2 seats between students at all direction; 3. Please do not sit in the first row. Your active participation!

Group Activities: Group activities will be given in class. Submit the group report as a group at the end of the activity.

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 by 11:59pm Thursdays (to D2L Dropbox).

Grade:

• Group activities	25%
• Mid Term Project 1	15%
• Final Project 2	20%
• Homework	20%
• Student Presentation (recorded)	10%
• Quizzes	10%
• Extra credit homework/activity	<5%

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 assignments or makeup will be offered without a formal excused absence. 1 or 2 lowest scores of quizzes, homework and activity can be dropped.

Project 1 and 2: Final projects due dates (subject to change) by 11:59pm, October 20th (project 1) and November 22nd, 2020 (project 2). you can hand in early, but not late! Late work will be subject to reduced grade. No submission will be accepted after 24 hours from the deadline.

Student presentation (pre-recorded or in person): dates TBA