

UNIVERSITY OF ARIZONA GENERAL EDUCATION SYLLABUS
PTYS/GEOS/ASTR 214: Life in the Cosmos
Building Connections | Quantitative Reasoning & World Cultures/Societies
Kuiper 308, T/Th 11:00 AM -- 12:15 PM

Description of Course

Life in the Cosmos explores key questions in astrobiology and planetary science about the origin and evolution of life on Earth and the possibility that such phenomena have arisen elsewhere in the Universe. We examine what it means for a planet to be alive at scales ranging from cellular processes up to global impacts of biological activity. We consider space-exploration activities to search for life within the Solar System, throughout our Galaxy, and beyond from various cultural perspectives.

Course Prerequisites or Co-requisites

Life in the Cosmos has no formal prerequisites. However, University of Arizona high school competency requirements will be assumed. In particular, we will assume that students understand algebra and geometry.

Instructor and Contact Information

Instructor: Prof. Sukrit Ranjan (he/him)
E-mail: sukrit@arizona.edu
Phone: 520-626-5874
Office: Kuiper Space Sciences Room 428
Office hours: Fridays 4:00-5:00 PM.

Teaching Assistant: Kana Ishimaru (she/her)
E-mail: kana@arizona.edu (business hours)
Office: Kuiper Space Sciences Room 332
Office hours: Tuesdays 12:15-1:15 PM or by appointment.

Teaching Assistant: Orion Hon (they/them)
E-mail: ohon@arizona.edu
Office: Kuiper Space Sciences Room 326
Office hours: Thursdays 10:00-10:30 AM or by appointment.

Course web page: <https://d2l.arizona.edu/d2l/home/1482053>

Course Format and Teaching Methods

Life in the Universe is an in-person, lecture-driven, three credit hour course. Students also engage in online discussions, weekly readings, homework assignments, and small group projects. Lectures incorporate interactive polls as well as a once-weekly, low-impact quiz to check student comprehension.

Course Objectives

- Identify and interrelate the wide variety of disciplines that address the fundamental questions:
 - Where did we come from?
 - What is the meaning of life?
 - Are we alone in the universe?
- Communicate and justify how interdisciplinary approaches contribute to understanding the origin and history of life on Earth.

- Use core values, concepts, theories, and quantitative methods from planetary science and biology to identify promising targets in the search for extraterrestrial life.
- Examine the role and importance of astrobiology from various perspectives.
- Engage in critical and conceptual thinking about the impact of discovering life on another planet.

Expected Learning Outcomes

- The ability to utilize multiple perspectives and make meaningful connections across disciplines and social positions, think conceptually and critically, and solve problems.
- Competency in working with numerical information by critically analyzing quantitative information, generating ideas that are supported by quantitative evidence, assessing the relevance of data and its associated implications in a variety of contexts, and communicating those ideas and/or associated interpretations using various formats (graphs, data tables, illustrations, videos, or written reflections).
- Understanding of the values, practices, and/or cultural products of at least one non-US culture/society with an astrobiology or space exploration program; relate how these values, practices and/or cultural products have shaped their space exploration activities; and reflect on how the student's own background has influenced their perceptions of other societies and their sense of place in the global community.

Absence and Class Participation Policy

Participating in the course and attending lectures and other course events are vital to the learning process. As such, active attendance is incorporated into a student's grade. However, students can have several absences and still achieve a perfect participation score, thereby minimizing the stress of missing a lecture.

- The UA's policy concerning Class Attendance and Participation is available at: <https://catalog.arizona.edu/policy/courses-credit/courses/class-attendance-participation>.
- 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/policies/attendance-policies-and-practices>.
- To request a disability-related accommodation to this attendance policy, please contact the Disability Resource Center at (520) 621-3268 or disability@arizona.edu.
- If you are experiencing unexpected barriers to your success in your courses, the Dean of Students Office is a central support resource for all students and may be helpful. The Dean of Students Office is located in the Robert L. Nugent Building, room 100, or call 520-621-7057.

Makeup Policy for Students Who Register Late

Students who register after the first-class meeting may make up missed assignments within one week of joining the class.

Course Communications

Course-wide communications will be via D2L announcements and associated emails to official UA addresses. Students are welcome to email the instructor with any/all course-related questions or comments and should expect a response within about one working day.

Required Texts or Readings

The required textbook, which is freely available to all enrolled students through the course D2L site, is: Catling, D.C. (2013) *Astrobiology: A Very Short Introduction*, Oxford U. Press

Required or Special Materials

- Access to a networked computing device (phone, tablet, laptop) is required in-lecture to participate in in-class activities for participation credit.
- Access to a computing device (e.g., calculator, computer) is required outside of lecture to complete assignments.
- Students are recommended to take written notes on paper. Paper lecture notes may be used on the in-class quizzes.

Please contact the instructor if access to a computing device is a barrier to your participation in the class. Note that computing devices may be checked out from the UA library (<https://lib.arizona.edu/borrow/tech>).

Use of TopHat for Participation Credit

We will be using Top Hat (www.tophat.com) for class participation and attendance. For instructions on how to download the Top Hat app, refer to Top Hat's [Getting Started Guide \(opens in new tab\)](#). Please note, you cannot create an account through the mobile application. For more information, please see <https://help.intech.arizona.edu/article/706-syllabus-guidelines-for-top-hat>.

Grading Scale and Policies

Grades are assigned based on accumulated points throughout the semester. Course items and associated points are:

Item	Maximum Points
Attendance (30)	20
In-Class Low-Stakes Quizzes (13)	10
Homeworks (6)	25
Sci-Fi Book Peer Grades	5
Sci-Fi Book Group Contracts (<i>group</i>)	5
Sci-Fi Book Justification (<i>group</i>)	5
Sci-Fi Book Poster Draft (<i>group</i>)	5
Sci-Fi Book Cultural Analysis (<i>group</i>)	15
Sci-Fi Book Scientific Analysis Poster (<i>group</i>)	10
Total	100

Letter grades then follow:

A:	≥ 90 pts
B:	≥ 80 pts and < 90 pts
C:	≥ 70 pts and < 80 pts
D:	≥ 60 pts and < 70 pts
F:	< 60 pts

All assignments must be submitted by the stated due date. Late work will not be accepted. All students get one (1) no-questions-asked 2-week extension, which can be applied to any assessment item up until the last day of class (in other words, the extension cannot extend the due date past the last day of class).

Assignments/Assessment Items

Attendance: Attendance at lecture (measured by participation in daily TopHat poll) earns 1 point/day towards the final grade. Attendance points are awarded up to a *maximum of 20 total points*. Note that this means you can miss some classes and still receive 100% credit for the attendance component of the class.

In-Class Quizzes: Brief, low-impact, open-note quizzes will be administered after every 2 lectures (13 quizzes total). These quizzes will not require math. Each quiz has a maximum possible score of 1 point. The three lowest quiz scores will be dropped. Quiz points are totaled over the semester to a *maximum of 10 total points*.

Homework: Students will be assigned 6 homework assignments over the course of the semester. Students will have a minimum of two weeks to complete each homework assignment, affording multiple opportunities to attend office hours to get homework help. Each homework will have a maximum possible score of 5 points. The lowest-scoring homework assignment will be dropped from the grade. Homework points are totaled over the semester to a *maximum of 25 total points*.

Sci-Fi Book Project: Working in small groups (4-5 students), students will select a sci-fi book to read and analyze over the course of the semester. Your analysis will encompass both the scientific concepts depicted in the book, as well as its cultural aspects. This large project is heavily scaffolded by breaking it into a number of smaller assignments, as below.

Group Formation: Group work can be challenging but is also an important skill to learn for use throughout our lives. The instructor will partition the class into groups of 4-5 students to jointly analyze a sci-fi book over the course of the semester. In their first meeting, the group will discuss how to productively collaborate and their expectations for each other, which they will document in a contract (template provided) worth 5 points upon submission.

Sci-Fi Book Justification: Working in small groups, students will select a science fiction book to read and analyze over the course of the semester. Selected books must include at least one of the following themes: (1) Origins, (2) Exploration, and (3) Discovery. A one-page justification of the appropriateness of the selected book (submitted as a group) is worth 5 points. This is an opportunity to receive feedback on ideas, especially with regards to how material in the group-read book connects to cultural themes in Origins, Exploration, and Discovery.

Poster Draft: One Signature Assignment for this course is a poster that provides a scientific analysis (that is quantitative, where feasible) of the astrobiological topics encountered in the group-read science fiction book. Midway through the poster design process, small groups will submit a poster draft for feedback. This draft is not formally graded and its submission awards 5 points.

Signature Assignment: Sci-Fi Book Cultural Analysis Essay. As described above, another Signature Assignment for this course centers on the cultural analysis of the group-read science fiction book. The cultural analysis assignment must connect any of the target book themes (Origins, Exploration, Discovery) to any of: (1) diverse cultural views on life's origins, (2) diverse cultural views on the presence of life beyond Earth, (3) diverse cultural views on exploration or multi-national efforts in space exploration, and (4) historical analysis on the cultural impacts of major new discoveries. A total of 15 points is available for this assignment. Students will have the opportunity to revise and resubmit this assignment for additional credit.

Signature Assignment: Sci-Fi Book Scientific Analysis Poster: As described above, small groups will submit a Signature Assignment in the form of a stylistic poster that provides a scientific analysis of the astrobiological themes present in the group-read science fiction book. A total of 10 points is available for this assignment.

Peer Grades: Group work can be challenging but is also an important skill to learn for use throughout our lives. To best enable the strong functioning of small-groups, group members will

evaluate one another at the middle and end of the semester. Each assessment is worth 2.5 points and the end-semester average group-assigned grade for each student is used to weight their grade for all group-submitted items.

Extra Credit: Both individual and group extra credit opportunities are available. Office Hours: Students can individually earn 2% extra credit by attending instructor office hours. Two (2) points of extra credit will be awarded for the first time a student goes to office hours to get help with an assignment. Two (2) points of extra credit will be awarded for the the first time a student goes to office hours to discuss course topics. Homework: The homeworks will contain extra-credit opportunities. Course evaluations: Class-wide extra credit will be given for completing the end-of-semester course evaluations. If 50% of all students submit responses, the entire class receives one (1) point of extra credit. If 80% of all students submit responses, then the class-wide extra credit will be increased to two (2) total points.

Incomplete (I) or Withdrawal (W):

Requests for incomplete (I) or withdrawal (W) must be made in accordance with University policy, which is available at <https://catalog.arizona.edu/policy/courses-credit/grading/grading-system>.

Dispute of Grade Policy

Grade disputes must be brought to the attention of the instructor within one week of return.

Writing Requirement

All Tier One and Tier Two General Education Courses are writing intensive (<https://ge.arizona.edu/gened-tiers/tiers-course-guidelines>). In this course, the writing requirement will be fulfilled through the Sci-Fi Book Cultural Analysis essay. Groups will have the opportunity to revise and resubmit this assignment for additional credit.

Final Examination or Project

There is no final examination for Life in the Cosmos.

Honors Credit

Honors credit is available through an Honors Contract (<https://www.honors.arizona.edu/honors-contracts>). If interested, please contact Prof. Ranjan.

Scheduled Topics/Activities

Week	Dates	Topic
1	8/27-8/29	Course Introduction; History of Astrobiology (Read: p. 10-11)
2	9/3-9/5	Life in Cosmic Context (Read: p. 11-16)
3	9/10-9/12	The Lives of Stars (Read: p. 16-19)
4	9/17-9/19	Formation of Earth (Read: p. 20)
5	9/24-9/26	Origin of Life and Early Earth (Read: p. 21-31)
6	10/1-10/3	Distribution of Life on Earth (Read: p. 32)
7	10/8-10/10	Structure and Evolution of Life on Earth (Read: p. 33-36)
8	10/15-10/17	Extremophiles; Habitability of Mercury, Venus (Read: p. 36-38)
9	10/22-10/24	Venus through time; modern Mars (Read: p. 39-40)
10	10/29-10/31	Astrobiology of Mars; Outer Solar System Habitability (Read: p. 41-43)
11	11/5-11/7	Enceladus & Ganymede; Discovery of Exoplanets (Read: p. 44-46)

12	11/12-11/14	Exoplanet Habitability (Read: p. 47-48)
13	11/19-11/21	Searching for Life on Exoplanets (Read: p. 51)
14	11/26	Space Exploration & Policy
15	12/3-12/5	Fermi Paradox & SETI (Read: p. 49-50).
16	12/10	In-Class Final Project Assistance

Week	Activity or Item Due
4	Small Group Contracts Due
6	Sci-Fi Book Justification Due
8	Mid-Semester Peer Grades (online)
12	Sci-Fi Book Cultural Analysis Essay Due
14	Sci-Fi Book Scientific Analysis Poster <i>Draft</i> Due
16	Sci-Fi Book Scientific Analysis Poster Due (end of week)
16	Optional Cultural Analysis Essay Revisions Due (end of week)
16	End-Semester Peer Grades (online)

Use of Generative AI

In this course, generative artificial intelligence/large-language-models/tools, such as ChatGPT, Dall-e, Bard, Bing, may be used for research purposes with appropriate acknowledgment and citation, but not to generate written text for submission. In other words, you may use generative AI tools to help you do research for assignments, but you may not use them to help you to write the text you will submit for grading (e.g. for the Cultural Analysis essay). This is because writing text is an integrative learning exercise which solidifies your understanding of course material. Editing LLM text does not produce the same degree of learning. If you are in doubt as to whether you are using generative AI tools appropriately in this course, I encourage you to discuss your situation with me.

Be aware that many AI companies collect information; do not enter confidential information as part of a prompt. LLMs may make up or hallucinate information. These tools may reflect misconceptions and biases of the data on which they were trained and the human-written prompts used to steer them. You are responsible for checking facts, finding reliable sources for, and making a careful, critical examination of any work that you submit.

If you use generative AI to help you with your research, you must cite both it and the underlying secondary sources. You are responsible for verifying the accuracy of the generative AI source (they often report erroneous information). Please use the following guidelines for citing generative AI:

<https://style.mla.org/citing-generative-ai/>.

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.

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>.

Notification of Objectionable Materials

This course will include discussion of the theory of evolution.

Accessibility and Accommodations

At the University of Arizona, we strive to make learning experiences as accessible as possible. If you anticipate or experience barriers based on disability or pregnancy, please contact the Disability Resource Center (520-621-3268, <https://drc.arizona.edu/>) to establish reasonable accommodations.

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/student-rights-responsibilities/academic-integrity>.

The University Libraries have some excellent tips for avoiding plagiarism, available at <https://lib.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.

Nondiscrimination and Anti-harassment Policy

The University of Arizona is committed to creating and maintaining an environment free of discrimination. In support of this commitment, the University prohibits discrimination, including harassment and retaliation, based on a protected classification, including race, color, religion, sex, national origin, age, disability, veteran status, sexual orientation, gender identity, or genetic information. For more information, including how to report a concern, please 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>

Campus Health

<http://www.health.arizona.edu/>

Campus Health provides quality medical and mental health care services through virtual and in-person care.

Phone: 520-621-9202

Counseling and Psych Services (CAPS)

<https://health.arizona.edu/counseling-psych-services>

CAPS provides mental health care, including short-term counseling services.

Phone: 520-621-3334

The Dean of Students Office's Student Assistance Program

<https://deanofstudents.arizona.edu/support/student-assistance>

Student Assistance helps students manage crises, life traumas, and other barriers that impede success. The staff addresses the needs of students who experience issues related to social adjustment, academic challenges, psychological health, physical health, victimization, and relationship issues, through a variety of interventions, referrals, and follow up services.

Email: DOS-deanofstudents@arizona.edu

Phone: 520-621-7057

Survivor Advocacy Program

<https://survivoradvocacy.arizona.edu/>

The Survivor Advocacy Program provides confidential support and advocacy services to student survivors of sexual and gender-based violence. The Program can also advise students about relevant non-UA resources available within the local community for support.

Email: survivoradvocacy@arizona.edu

Phone: 520-621-5767

Campus Pantry

Any student who has difficulty affording groceries or accessing sufficient food to eat every day, or who lacks a safe and stable place to live and believes this may affect their performance in the course, is urged to contact the Dean of Students for support. In addition, the University of Arizona Campus Pantry is open for students to receive supplemental groceries at no cost. Please see their website at: campuspantry.arizona.edu for open times.

Preferred Name & Pronoun

This course affirms people of all gender expressions and gender identities. If you prefer to be called a different name than what is on the class roster, please let me know. Feel free to correct instructors on your preferred gender pronoun. If you wish to change your preferred name or pronoun in the UAccess system, please use the following guidelines:

Preferred name: University of Arizona students may choose to identify themselves within the University community using a preferred first name that differs from their official/legal name. A student's preferred name will appear instead of the person's official/legal first name in select University-related systems and documents, provided that the name is not being used for the purpose of misrepresentation. Students are able to update their preferred names in UAccess.

Pronouns: Students may designate pronouns they use to identify themselves. Instructors and staff are encouraged to use pronouns for people that they use for themselves as a sign of respect and inclusion. Students are able to update and edit their pronouns in UAccess.

More information on updating your preferred name and pronouns is available on the Office of the Registrar site at <https://registrar.arizona.edu/records-enrollment/personal-information/updating-personal-information>.

Safety on Campus and in the Classroom

For a list of emergency procedures for all types of incidents, please visit the website of the Critical Incident Response Team (CIRT): <https://cirt.arizona.edu/case-emergency/overview>

Also watch the video available at

https://arizona.sabacloud.com/Saba/Web_spf/NA7P1PRD161/common/learningeventdetail/crtfy00000000003560

Confidentiality of Student Records

Student records are kept confidential as per [FERPA policy](#).

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.