

PTYS 214 -- Fall 2020

Astrobiology: A Planetary Perspective

Space Sciences Building, Rm 308
T-Th 2:00p -- 3:15p

Instructor: Joe Spitale
Office hours: T 3:30-4:30 Th 3:30-4:30
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If you need to arrange a time to meet outside of our office hours, please contact me for an appointment.

Course description

Astrobiology is the study of life in a universal context. By necessity, this field involves nearly every physical science. In this class, we will examine the following three fundamental questions:

1. What is life?
2. How does life begin and evolve?
3. Does life exist elsewhere in the universe?

Before we can explore those questions, we must review the chemical basis of life (as we know it), the means by which more complex organic molecules are formed, and the various sources of energy available to living systems. Next we will look at the history of our own planet, and evaluate theories of the origin and evolution of life here. We will then extrapolate our knowledge of our single example of a biosphere to hypothesize as to what types of life might be found elsewhere and where it may reside. Finally, we will review various approaches for detecting life in the Solar System, and beyond.

Expected Learning Outcomes

This course will develop the students' ability to think critically about the topic of extraterrestrial life. Upon successful completion of this course, students will have an understanding of the factors that determine the likelihood of life arising elsewhere in the universe, the methods used to search for evidence of such life, and the current state of our knowledge regarding life in our Solar System.

Text Book

Because of the rapid rate of change in this field, textbooks rapidly become outdated. Therefore, no textbook is assigned for this course. Grading will be based on the material covered in the lectures.

Homework

Homework will be assigned for each lecture, but it will not be graded. Instead, hints will be provided, where appropriate, and you will be encouraged to work with other students, and with the instructor and TA to make sure that you understand the reasoning behind those answers. Your incentive for doing your homework will be that the midterm exams will be derived *heavily* from the homework problems.

Mid-term Exams

There will be five mid-term exams, occurring on 9/3, 9/17, 10/6, 10/29, and 12/3 during the normal class period. Each exam will consist of five long-answer questions. In computing your overall mid-term exam grade, only the two highest mid-term exams will be considered. However, the average of all five mid-term exam scores will replace your final exam score if it is higher.

Final Exam

UA final exam policies and schedule are here:

<https://www.registrar.arizona.edu/courses/final-examination-schedule-fall-2020?audience=students&cat1=10&cat2=31>

The final exam for this class will be on Tuesday 12/14 from 3:30 to 5:30. It will be similar in format to the midterm exams, but it will be proportionally longer and it will be comprehensive.

Writing Assignment

All Tier One and Tier Two General Education Courses are writing intensive. To fulfill that requirement, all exam questions will be in essay format, and there will be a review of a timely and relevant article. There will be an opportunity to turn in the assignment early to receive feedback that can be used to revise your work and improve your grade. The score on this assignment will replace your final exam grade if it is higher.

Observing Project

An optional telescope observing project will be available as an alternative to the writing assignment. The observing project will involve observing the Moon throughout its orbit about the Earth and writing an essay relating your observations to the material in the class. As with the writing assignment, there will be an opportunity to turn in the assignment early to receive feedback that can be used to revise your work and improve your grade. The score on this project will replace your final exam grade if it is higher.

Grades

Grading will be weighted as follows:

Overall midterm grade (average of top two):	50%
Final exam (greater of final exam, midterm average, writing assignment, observing project):	50%

Final grades may be curved, but you are guaranteed the following minimum final letter grades, based on your final average:

- A: >90%
- B: 80 - 90%
- C: 70 - 80%
- D: 60 - 70%
- E: < 60%

Extra Credit

Activities resulting in extra credit may be assigned during the semester. The total available extra credit will not exceed 10% of the overall class grade, though there may be none at all.

Makeup/Special Exams

As three of the five midterm exams will be dropped and there are a variety of options for replacing your final exam, there is no justification for requesting a makeup exam. Therefore, makeup work will only be allowed in University-mandated circumstances. Makeup exams will be different than standard exams, and will be more advanced in order to compensate for the extra study time and assumed knowledge of the content of the standard exam. Makeup exams may be oral. Makeup exams will be scheduled based on the instructor's availability.

Late writing assignments

Writing assignments are due *any time* before the deadline, so there is no justification for requesting an extension.

Classroom Behavior

Academic integrity: Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work 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>

Primary things you need to be aware of are:

1. Cheating is not tolerated in any form. If a student is caught cheating on an exam, the penalty will be failure in the course and a letter will be set to the Dean of Students describing the incident. If you are aware that someone else is cheating, it is your obligation to inform the instructor.
2. Note that because homework is not graded, it is not possible to cheat on the homework. We encourage collaboration on all homework assignments.

Threatening behavior: The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to oneself. See:

<https://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students>

Nondiscrimination and Anti-harassment: 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>

Attendance: Attendance is not mandatory, but it is strongly advised. Your attendance will likely be reflected in your exams scores. 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:

<https://policy.arizona.edu/human-resources/religious-accommodation-policy>

Absences pre-approved by the UA Dean of Students (or dean's designee) will be honored. See:

<https://deanofstudents.arizona.edu/absences>

Disruptive behavior: Be considerate. If you are not sure whether your behavior is disruptive, then you can assume that it is. Turn off the ringer on your cellphone and do not talk on your phone during class. Students may come and go as needed (except during exams; see below), as long as they are careful to not be disruptive. If you arrive late to class, do not attempt to step over other students; simply choose a seat near the outside of the row. Likewise, if you know that you will need to leave early, sit at the outside of a row so that you will not have to step over other students when you leave. This policy may be tightened at any time if the instructor feels that it is being abused.

Note that during an exam, no student may re-enter the classroom after leaving, *for any reason*, until the exam is finished.

Any student found to be disruptive during a class may be asked to leave.

Food/drink: The Lunar and Planetary Laboratory does not permit food or drink other than bottled water in the classroom, Space Sciences 308. If you find a problem with a seat or its writing table, please let us know so that the problem can be addressed as soon as possible.

Students with Disabilities

If you anticipate barriers related to the format or requirements of this course, please meet with the instructor to discuss ways to ensure your full participation in the course. If you determine that disability-related accommodations are necessary, please register with Disability Resources (621-3268; <http://drc.arizona.edu>) *and notify the instructor* of your eligibility for reasonable accommodations. We can then plan how best to coordinate your accommodations.

Honors Credit

As this is a Tier Two course it is available for Honors credit. Honors contract information is available at:

<https://honors.arizona.edu/honors-contracts>

See the instructor to discuss your ideas for an honors contract.

Syllabus Changes

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.

TurnItIn.com

If you decide to take and continue in this course, you are agreeing to submit your papers on-line, when so instructed, to a plagiarism-prevention program called TurnItIn.com. When you set up your individual account with TurnItIn.com for this class, make sure you understand and consent to all the terms that the program provides you at that point. You should note that TurnItIn.com – always without

your name and any personal information – will retain your paper as part of their database so that students who plagiarize from it can be detected. Because of this program, the vast majority of you who do your own work and cite your sources of information properly will not have to compete with students who commit undetected plagiarism. Anyone who has questions or problems with TurnItIn.com may talk privately about these with the instructor.

Course Schedule

Date	Topic
Aug 25 (T)	Syllabus / Intro. / Sci. Meth. / Units & conversion
Aug 27 (Th)	Definition of life
Sep 1 (T)	Carbon Macromolecules - building blocks of life
Sep 3 (Th)	Midterm Exam
Sep 8 (T)	RNA, DNA, Cell. Top-down approach
Sep 10 (Th)	Organic synthesis and nutrients; Bottom-up appr.
Sep 15 (T)	Energy and Entropy
Sep 17 (Th)	Midterm Exam
Sep 22 (T)	The Sun
Sep 24 (Th)	Solar Radiation / Solar spectrum
Sep 29 (T)	Geothermal Energy - Water
Oct 1 (Th)	Planetary Energy Balance / Habitable Zone / Greenhouse Effect
Oct 6 (T)	Midterm Exam
Oct 8 (Th)	Climate feedbacks and limits of the HZ
Oct 13 (T)	Climate Change and the Snowball Earth
Oct 15 (Th)	Radiometric dating / Earliest life on Earth
Oct 20 (T)	Atmospheric oxygen
Oct 22 (Th)	Mass Extinction / K/Pg impact
Oct 27 (T)	Asteroids, Comets and Organic Matter
Oct 29 (Th)	Midterm Exam
Nov 3 (T)	<i>Election Day -- Go vote!</i>
Nov 5 (Th)	Extremophiles
Nov 10 (T)	Mars: Introduction / Exploration
Nov 12 (Th)	Mars: Search for life
Nov 17 (T)	Galilean Satellites
Nov 19 (Th)	Titan Writing Assignment / Observing Project early deadline
Nov 24 (T)	Enceladus
Nov 26 (Th)	<i>Thanksgiving -- no class</i>
Dec 1 (T)	Extrasolar Planets
Dec 3 (Th)	Midterm Exam Writing Assignment / Observing Project final deadline
Dec 8 (T)	SETI / Drake Eq.
Dec 14 (M) 3:30am-5:30pm	FINAL EXAMINATION

Class Modality

- This class is scheduled to be taught in the LIVE ONLINE modality.
- **Meeting Times:** The class will meet T Th at 2:00pm via Zoom for the normally scheduled lectures. The link for our class is <https://arizona.zoom.us/j/5092507053>.
- **Staying current:** You are required to complete the assignments described above on your own time to achieve the learning outcomes described above.
- **Class attendance:** Attendance is optional, but your final grade likely be highly correlated with your attendance.
- **Office hours:** Office hours will be held via Zoom using the class Zoom link above.
- **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.
- **Exams:** The midterm and final exams described above will take place during the normal class or final exam periods. They will be distributed via D2L, and proctored via Examity.
- **Equipment and software requirements:** For this class you will need daily access to the following hardware: computer or web-enabled device with webcam and microphone, running a web browser and and PDF viewer; regular access to reliable internet signal.
- **Class Recordings:** Lectures in this class will involve a significant amount of interaction and discussion, which can only take place live, so lectures will not be recorded. Exams will be recorded, but those recordings will not be released.
- **General COVID-19 procedures and resources:**
 - 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.
 - [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.