

PTYS/ASTR 170A – Earth: Evolution of a Habitable World
Tier-One General Education Course
T/Th 11:00-12:15, Kuiper Space Science Building Room 308*
(*online only until further notice)

Instructors and Contact Information

Dr. David P. O'Brien

dpobrien@email.arizona.edu

Office hours Tuesday 1-2 pm, Thursday 3-4 pm, and by appointment if these times do not work for you
Zoom link and/or office location will be posted on D2L course page

Maureen Palmer, Teaching Assistant

mypalmer@email.arizona.edu

Office hours Monday 3-5 pm

Zoom link and/or office location will be posted on D2L course page

Nathan Hadland, Teaching Assistant

nkhadland@email.arizona.edu

Office hours Wednesday 2-4 pm

Zoom link and/or office location will be posted on D2L course page

The official web page for this course is: <https://d2l.arizona.edu/d2l/home/940095>

All online communication related to this course will be conducted through D2L, Zoom, or official UA e-mail addresses.

Course Objectives

This course will begin with a general background in astronomy and focus on the origin and evolution of the Solar System and Earth specifically. The geologic history and habitability of Earth will be explored, along with the potential for life elsewhere in the universe.

Expected Learning Outcomes

Upon completion of this course, you will have an understanding of:

- Astronomical time and distance scales
- The basic physical and chemical processes that govern the operation of the universe
- The geologic history of the Earth
- The processes and conditions that make a planet habitable to life
- The scientific method, and how to apply it
- The discoveries and reasoning that led to our current state of knowledge

Course Format and Teaching Methods

The course will be centered around lectures, with occasional in-class discussion and small-group activities.

Because of the COVID-19 pandemic, the course will begin in a live-online format, with all lectures and in-class activities conducted in real-time via Zoom. If and when the University allows in-person instruction to

resume, and if it is deemed safe by Dr. O'Brien, the course will transition to a flex-in-person modality with a mix of in-person and remote instruction. If this does occur, in-person attendance will not be required, and students who wish to continue participating in a fully remote manner may do so. For more information regarding the flex-in-person modality, see "Information for Flex-in-Person Instruction" at the end of the syllabus.

Required Texts or Readings

There are no required textbooks for this course. Reading materials and other resources relevant to the course material will be made available on the D2L course page.

Availability of Lecture Materials

Lecture slides and a video recording will be made available on the D2L course site following each lecture. Students must access content in D2L only, and may not modify content or re-use content for any purpose other than personal educational reasons. All recordings are subject to government and university regulations. Therefore, students accessing unauthorized recordings or using them in a manner inconsistent with UArizona values and educational policies are subject to suspension or civil action.

Accessibility and Accommodations

Our goal as instructors and teaching assistants is to make the learning experience as accessible as possible. If you anticipate or experience physical or academic barriers based on disability or pregnancy, please contact Dr. O'Brien and/or the Disability Resource Center to establish reasonable accommodations (520-621-3268, <https://drc.arizona.edu/students>). Accessible tables and chairs in the classroom should remain available for students who find that the standard classroom seating is not usable.

As noted above in "Course Format and Teaching Methods", this course will allow for full live-online and remote participation throughout the semester, even in the case that the University allows for in-person instruction to resume.

Preferred Name and Gender Pronoun

If you prefer to be called a different name than what is on the class roster, or by a preferred gender pronoun, please let Dr. O'Brien know.

Schedule of Topics, Assignments, and Examinations

The anticipated course schedule is given in the following table. Dates may be shifted slightly as the course proceeds, except for the time and date of the final exam, which is set by the University.

There will be three exams including the final, and five homeworks, some of which may involve written answers and some of which may be given as D2L quizzes (with no time limit and use of notes and references allowed). The class project will focus on a critical analysis of popular science articles. A first draft will be graded, commented, and returned, and you will submit a revised version based on those comments for the final project grade.

Lecture	Date	Topic	Assignments, Due Dates, etc.
Part 1: Origins and Early Earth History			
1	Tues Aug 25	Course introduction, the scientific method	
2	Thurs Aug 27	Our place in the Universe, gravity and orbital motion	
3	Tues Sep 1	Light and electromagnetic radiation, our place in the Universe (continued)	HW1 Assigned
4	Thurs Sep 3		
5	Tues Sep 8	Star formation, nuclear fusion, our Sun	HW1 Due
6	Thurs Sep 10	Tour of the Solar System, formation of the Solar System and the Earth	HW2 Assigned
7	Tues Sep 15	Formation of the Moon	HW1 Returned
8	Thurs Sep 17	Studying the early Earth, measuring ages of rocks and isotope ratios	HW2 Due
9	Tues Sep 22	Relative age dating, stratigraphy, the geologic timescale The Hadean Earth – Early crust and atmosphere	
10	Thurs Sep 24		HW2 Returned
EXAM 1	Tues Sep 29	EXAM 1	
Part 2: The Origin and Evolution of Life on Earth			
11	Thurs Oct 1	Origin of life: What is it, and what does it need to survive	
12	Tues Oct 6	Early life on Earth	
13	Thurs Oct 8	Greenhouse effect and the faint young sun problem	Project due
14	Tues Oct 13	The Archean earth, the carbon-silicate cycle, and beginnings of plate tectonics	HW3 Assigned
15	Thurs Oct 15		
16	Tues Oct 20	The proterozoic earth and the formation of the first continents The oxygen revolution	HW3 Due
17	Thurs Oct 22		
18	Tues Oct 27	The Cambrian explosion	HW3 Returned

EXAM 2	Thurs Oct 29	EXAM 2	Project returned with comments
Part 3: Mass Extinctions, Climate Change, and the Search for Life Elsewhere			
19	Tues Nov 3	The Phanerozoic Earth and mass extinctions	
20	Thurs Nov 5	Climate change and its causes in the phanerozoic	
21	Tues Nov 10	Human-induced climate change: Evidence and effects	HW4 Assigned
22	Thurs Nov 12		
23	Tues Nov 17	What happened to Venus?	HW4 Due
24	Thurs Nov 19	Early habitability of Mars?	Revised project due
25	Tues Nov 24	Ocean worlds in the Solar System	HW5 Assigned, HW4 Returned
	Thurs Nov 26	No class, Thanksgiving	
26	Tues Dec 1	Exoplanets	HW5 Due
27	Thurs Dec 3	Is life rare in the Universe?	
28	Tues Dec 8	OPEN	HW5 Returned, Project returned
	Thurs Dec 10	No class, reading day	
FINAL	Tues Dec 15	Final Exam, 10:30am -12:30pm	

Writing Requirement

All Tier One and Tier Two General Education Courses are writing intensive. This course will have a minimum of ten pages of writing during the course of the semester, distributed over homeworks, exams, and a project. For the project, you will have an opportunity to turn in a draft version for feedback, and to resubmit a revised version.

The general education writing requirement can be found at <http://gened.arizona.edu/proposal-guidelines/writing-requirement>

Final Examination

The final exam will be held on Tuesday, December 15 from 10:30am -12:30pm.

The full Final Exam Schedule can be found at <http://www.registrar.arizona.edu/schedules/finals.htm>

Final Exam Regulations are available at <https://www.registrar.arizona.edu/courses/final-examination-regulations-and-information>

Grading Scale and Policies

To assure that you are graded based on your individual strengths, this course has a flexible grading scheme that automatically applies a larger weight to work that you perform best on. 90% of your final grade will be based on three exams and a project. Those will be weighted to account for 35, 25, 20, and 10% of your final grade, with 35% going to the highest-scoring exam/project and 10% going to the lowest. The remaining 10% of your grade will be based on six homework assignments that will be given throughout the semester. This will be explained in more detail, with examples, on the first day of class. The important thing to remember is that your grade calculated by this method will ALWAYS be higher than if the exam and project scores were simply averaged together.

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

- A: 90% and above
- B: 80 - 90%
- C: 70 - 80%
- D: 60 - 70%
- E: below 60%

Extra credit assignments may be given at the discretion of the instructor, but are not guaranteed.

Late Work and Missed Exams

Deadline extensions and make-up exams will only be given in the case of University-approved absences, when every effort has been made to notify Dr. O'Brien in advance. Extensions will not be given for scheduled absences where it is possible to turn the work in early. Turning work in after the deadline or missing exams without a University-approved absence and proper documentation will result in zero credit.

Incomplete (I) or Withdrawal (W)

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. If you wish to withdraw from the course or take an incomplete, it is up to you to follow the required procedures to do so, it will not happen automatically (i.e. there are no administrative drops for this course).

Dispute of Grade Policy

If you feel that an error has been made in grading your homework, project, or exam, please contact Dr. O'Brien or the teaching assistant who graded it. Requests to review a grade must be made made within one week of when the homework, project, or exam was returned to you.

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://new.library.arizona.edu/research/citing/plagiarism>

All work will be submitted electronically through D2L course page and will be scanned through the TurnItIn system, which will check for plagiarism and copying. Plagiarism, copying, cheating, and other violations of the Code of Academic Integrity will result in sanctions that may range from getting a zero on an assignment or exam to being reported to the Dean of Students. If you are unsure if something is a violation of the Code of Academic Integrity, please ask Dr. O'Brien or a teaching assistant. We would much rather help someone avoid a violation than have to punish them for it.

Absence and Class Participation Policy

Class attendance and participation is a critical part of the learning process, and in-class discussions and activities will often provide useful background for the homeworks, project, and exams. As such, class attendance is strongly encouraged. There will be no administrative drops for this course, meaning that you won't be removed from the course roster for not attending class, failing to turn in assignments, or missing exams. If you intend to stop taking the course, you must follow the University procedures for withdrawing or taking an incomplete.

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>

Makeup Policy for Students Who Register Late

Students who register by the end of the second week of classes may be given an opportunity to make up missed assignments within a reasonable time to be mutually agreed upon by the instructor and student.

Honors Credit

This Tier One General Education Course is available for Honors credit. Honors contract information is available at <https://www.honors.arizona.edu/honors-contracts>. If you are interested in contracting this course for Honors credit, please contact Dr. O'Brien.

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.).

For classes conducted online, make sure that your microphone is muted unless you are called upon to speak or have a question to ask. Camera use is not required during class, but if you choose to use your camera make sure that whatever is happening in the field of view would not be distracting to other class participants.

In the classroom, 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. While some learning styles are best served by using personal electronics, such as laptops and iPads, these devices can sometimes be distracting to other learners. If

this becomes an issue, students who prefer to use electronic devices for note-taking during lecture may be asked to use one side of the classroom.

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. The full text of the University policy is available at <http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students>.

UA Nondiscrimination and Anti-harassment Policy

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

Confidentiality of Student Records

All student records, not just grades but also any identifiable material submitted for credit are handled according to Federal Education Rights and Privacy Act (FERPA) guidelines.

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

In accordance with FERPA guidelines, discussion of grades will only be done in person, through D2L, or over official University Zoom or email accounts.

Recordings of the lectures will be made available on D2L to everyone enrolled in the class. These recordings are considered part of students' educational records, and may not be shared with anyone outside of the class.

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.

Information for Flex-in-Person Instruction

Because of the COVID-19 pandemic, the course will begin in a live-online format, with all lectures and in-class activities conducted in real-time via Zoom. If and when the University allows in-person instruction to resume, and if it is deemed safe by Dr. O'Brien, the course will transition to a flex-in-person modality with a mix of in-person and remote instruction. If this does occur, in-person attendance will not be required, and students who wish to continue participating in a fully remote manner may do so.

As classroom capacity is limited to allow for sufficient distancing, only half of the students will be allowed in the classroom on a given day. Students will be divided into two groups based on their alphabetical order in the course roster (first will be in Group 1, second in Group 2, third in Group 1, fourth in Group 2, etc.). Group 1 students can attend on Tuesdays and Group 2 Students can attend on Thursdays, with the other groups participating online. Exams will all be given online on days they are scheduled.

Face coverings will be required in the classroom: Per UArizona's [Administrative Directive](#), face coverings that cover the nose, mouth, and chin are required to be worn in all learning spaces at the University of Arizona (e.g., in classrooms, laboratories and studios). Any student who violates this directive will be asked to immediately leave the learning space, and will be allowed to return only when they are wearing a face covering. Subsequent episodes of noncompliance will result in a Student Code of Conduct complaint being filed with the Dean of Students Office, which may result in sanctions being applied. The student will not be able to return to the learning space until the matter is resolved.

Physical distancing will be required in the classroom: During our in-person class meetings, we will respect CDC guidelines, including restricted seating to increase physical distancing and appropriately-worn face coverings. Per UArizona's Administrative Directive, face coverings that cover the nose, mouth, and chin are required to be worn in all learning spaces at the University of Arizona (e.g., in classrooms, laboratories and studios). Any student who violates this directive will be asked to immediately leave the learning space, and will be allowed to return only when they are wearing a face covering. Subsequent episodes of noncompliance will result in a Student Code of Conduct complaint being filed with the Dean of Students Office, which may result in sanctions being applied. The student will not be able to return to the learning space until the matter is resolved.

- 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, 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 if you will be missing an in person or online course.
- [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.

Remaining flexible: If pandemic conditions warrant, the University may require that we return to remote operations. If that is the case, we will notify you by D2L Announcement and email that we are moving to remote operations.

Remote/online only after Thanksgiving: After the Thanksgiving holiday, we are scheduled to move back to remote teaching, in the same manner in which the semester began.