



# General Education

**PTYS/ASTR 170A1: Alien Earths**

**Fall 2023**

**Kuiper 308, TuTh 2:00-3:15**

**<https://d2l.arizona.edu/d2l/home/1339170>**

## **Instructor:**

Dr. Joe Schools ([jschools@arizona.edu](mailto:jschools@arizona.edu))

Lunar and Planetary Laboratory, Kuiper Space Sciences, Room 424

Up to date office hours will be available on the class D2L page, or can be made by appointment via email

## **Part 1: Course Curriculum**

### **1.1 Course Description**

Thousands of planets have been discovered orbiting nearby stars. How many of these worlds can we expect to be Earth-like? We explore this question from the perspective of astronomers, geologists, and historians. We look back at Earth's geologic history to periods when our planet itself would appear very alien to us today. We study the nearby planets Venus and Mars, which were once more Earth-like than today. We discuss not only the evolution of Earth, Venus, and Mars as habitable worlds but also how human understanding of these planets has evolved. Finally, we apply these perspectives to the search for alien Earths in our galaxy. This interdisciplinary treatment of Earth, its neighboring planets, and planets being discovered around nearby stars allows us to consider the potentially unique position of Earth as a habitable world not only in space but in time.

### **1.2 Expected Students Learning Outcomes**

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

1. Students will demonstrate the ability to utilize multiple perspectives and make meaningful connections across disciplines and social positions, think conceptually and critically, and solve problems.
2. Students will demonstrate rhetorical awareness and writing proficiency by writing for a variety of contexts and executing disciplinary genre conventions of organization, design, style, mechanics and citation format while reflecting on their writing development.
3. Students will demonstrate 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 a variety of formats (graphs, data tables, equations, oral presentations, or written reflections).
4. Communicate a broad understanding of the evolution of Earth, Venus, and Mars over their 4.5-billion-year histories, as well as the techniques geologists and astronomers employ to develop our understanding of this evolution.

5. Use perspectives of time and space to apply our understanding of Earth/Venus/Mars to terrestrial planets orbiting distant stars to determine the likelihood of these planets being alien Earths (i.e., Earth-like).

### Course Objectives

During the course, students will:

1. Demonstrate the methodologies and knowledge that characterize the perspective of astronomers in the context of searching for planets orbiting around other stars in our galaxy – including how this astronomical perspective has changed over many generations of astronomers.
2. Demonstrate the methodologies and knowledge that characterize the perspective of geologists in the context of exploring Earth's geologic record as well as those of Venus and Mars – including how this geological perspective has changed over many generations of geologists.
3. Synthesize the perspectives of astronomers and geologists to describe the importance of both space and time in finding truly Earth-like planets around other stars.
4. Obtain their own data – such as images from observations, measurements from scale models, quantitative information from demonstrations, etc.
5. Critically analyze and interpret their observations, measurements, and quantitative data in the context of understanding Earth as a habitable planet.
6. Communicate with educated non-experts – through written essays and recorded video presentations – their analysis and interpretation of their own images and data as well as data provided from primary sources.
7. Discuss the past and current contributions of astronomers and geologists with diverse backgrounds

### **1.3 Course Assessment Plan**

#### Learning Opportunities Throughout the course

This course will involve several components: 1) In-class activities, writings, and review questions based on the content, 2) a collection of 1-page written essays (6-8 of these), 3) The Signature Assignment (see below). The schedule of written essay due dates will be announced in class and posted on the class D2L page. There will be no exams in this course.

#### Signature Assignment and ePortfolio

The Signature Assignment for this course is a Cosmic Calendar video documentary project. Details and due dates will be announced in class and posted on D2L. The Signature Assignment and portfolio of 6-8 written essays will fulfill the requirement of a summative assessment in this course.

#### Final Examination or Project

There is no final exam for this course

#### Honors Credit

As this is a GenEd course it is available for Honors credit. Honors contract information is available at [frankehonors.arizona.edu](http://frankehonors.arizona.edu). See the instructor to discuss your ideas for an honor contract.

## 1.4 Scheduled Topics/Activities

Scheduled lesson topics are likely to shift or change:

Week	Topic	Deliverable	Due Date (at 5pm Tucson time to D2L)
1	Syllabus and Intro	Point Solutions registration	8/23
2	Intro to solar system		
3	Governing principles of the natural world	Essay	9/8
4	Governing principles of the natural world		
5	Birth of elements and life cycle of stars	Essay	9/22
6	Meteorites: time capsules of the solar system		
7	Building a solar system	Essay	10/6
8	Geological timescales and formation of the earth	Signature Project Proposal/Draft	10/13
9	Making Earth habitable: plate tectonics	Essay	10/20
10	Making Earth habitable: element cycling and greenhouse gases		
11	Destruction! Mass Extinctions!	Essay	10/27
12	What's so interesting about Mars?		
13	Venus: Earth's evil twin	Essay	11/10
14	Ocean worlds in our solar system		
15	Exoplanets and Life	Signature Project	11/24
16	Aliens?		

## Part 2: Course Information

General course information includes people, online learning sites, communication strategies, materials, and IT needs for successful engagement with the course.

### 2.1 Course Site

Course information, announcements, assignments, and grades will be posted on the class D2L page: <https://d2l.arizona.edu/d2l/home/1339170>



### 2.2 Course Communications

Course announcements and other communications will be posted on the class D2L page. Important and/or urgent communications will be sent by email. If you need to communicate with the instructor for any reason, see them before class, after class, or by sending an email to [jschools@arizona.edu](mailto:jschools@arizona.edu).

### 2.3 Required Resources and Equipment

- Any device (smartphone, tablet, computer) capable of internet access, including during class time.

## 2.4 Student Success Resources

Please make your students aware of resources and support services. At a minimum, you may include:

- [UA Academic policies and procedures](#)
- [Student Assistance and Advocacy information](#)
- [Counseling and Psych Services \(CAPS\)](#)
- [Other student support resources](#)

## Part 3: Course Policies

### 3.1 Progress and Completion Policies

#### Late Enrollment

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

#### Absence and Class Participation

The UA policy concerning Class Attendance, Participation, and Administrative Drops is available at:

<https://catalog.arizona.edu/policy/class-attendance-and-participation>

The UA policy regarding absences for any sincerely held religious customs will be accommodated where reasonable:

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

Absences preapproved by the UA Dean of Students (or dean's designee) will be honored:

<https://policy.arizona.edu/employment-human-resources/attendance>

Do not attend class while ill. Temporary remote attendance can be arranged with appropriate advanced notification.

#### Grading

Each student designs their own customized weighting for the different components of the course from the allowed ranges listed at the right. Total weighting must add up to 100%. Each component is described in detail during class and feedback is

Course Component	Allowed Range
In-Class Participation (Clickers)	5%
In-Class Activities	0-25%
Collection of 1-Page written Essays	35-50%
Signature Assignment	20-60%

provided on early work for each component prior to the selection deadline, which is at the end of the first 4 weeks of class. After the selection deadline passes, all grading choices are final and cannot be changed.

Three examples of the many possible combinations are shown below. Please use 5% increments.

Example 1

Participation	5%
Activities	25%
Essays	50%
Signature	20%

Example 2

Participation	5%
Activities	0%
Essays	35%
Signature	60%

Example 3

Participation	5%
Activities	25%
Essays	35%
Signature	30%

The nominal scale shown here will be used to determine the final letter grades in the course from the overall cumulative percentage. A lower “curve” may be used.

A:	90% and higher
B:	80-89%
C:	70-79%
D:	55-69%
E:	below 55%

### Extra credit

There will be opportunities for extra credit during the semester. Take advantage of them when they appear because they may not be available at the end of the semester. The total amount of extra credit that can count towards the final overall letter grade is capped at 5% (essentially half a letter grade). Extra credit is possible on the Signature Assignment for exceptional work beyond the nominal requirements of the project. If you have any interesting ideas for extra credit work please tell the instructor as early in the semester as possible.

### Academic integrity

Both students and faculty are bound by the University’s Code of Academic Integrity, which covers many forms of academic dishonesty. 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. This means that work submitted in your name must be the result of your own scholarly efforts. In this course, it is typical that 2-3 students be caught plagiarizing on homework or attempting to cheat on the term project. Every such incident is reported to the Dean of Students. Don’t be one of these students! Details on the code of academic integrity are available at:

<https://deanofstudents.arizona.edu/policies/code-academic-integrity>

The University Libraries have some excellent tips for avoiding plagiarism, see:

<https://lib.arizona.edu/research/citing/plagiarism>

### Use of AI tools

In this course there will be some assignments where generative artificial intelligence/large-language-models (e.g. ChatGPT, Dall-e, Bard, Perplexity, etc.) are welcome or even required. Every assignment will have a description of how AI tools are to be used or avoided. AI contributions to assignments will be clearly labeled when submitted. Inappropriate use of AI tools will be considered a violation of the Code of Academic Integrity, specifically the prohibition against submitting work that is not your own.

## 3.2 Classroom Climate and Community Engagement

### UA Policies and Student Resources

All UA courses adhere to the general UA Policies as stated on the institutional websites:

<https://academicaffairs.arizona.edu/syllabus-policies>. Please make yourself familiar with the Student Code of Academic Integrity and the protocol ensuring non-discriminatory, anti-harassment, non-threatening learning experiences. This site also includes a list of student resources. The entirety of University Policies can be found here: <https://catalog.arizona.edu/policies>.

### Accessibility and Accommodations

It is the University's goal that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on disability or pregnancy, please let the instructor know immediately so that options can be discussed. You are also welcome to contact Disability Resources (520-621-3268) to establish reasonable accommodations. Please be aware that the accessible positions in this room should remain available for students who find that standard classroom seating is not usable.

### Course Climate and Inclusion Statement

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, gaming, online shopping, etc.).

This course also supports elective gender pronoun use and self-identification; rosters indicating such choices will be updated throughout the semester, upon student request. As the course includes some group work and discussion, it is vitally important for us to create an educational environment of inclusion and mutual respect.

### Threatening Behavior

UA policy prohibits threats of physical harm to any member of the University community. Details on the policy are available at:

<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. 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. Details on the official UA policy are available at:

<https://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 FERPA guidelines, see:

<https://www.registrar.arizona.edu/privacy-ferpa/ferpa-compliance>

### **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.