

# PTYS 170A1 – Planet Earth: Evolution of a Habitable World

Tier-One General Education Course  
Kuiper Space Sciences Rm 308 Tues/Thurs 11:00-12:15 pm

**Instructor:** Dr. Lynn Carter, [lmcarter@arizona.edu](mailto:lmcarter@arizona.edu)

**Office Hours:** Wednesdays 11:00 am to noon, or by appointment, 533A Kuiper Space Sciences Building. Any changes to office hours will be announced on D2L.

## Teaching Assistants:

Teaching assistant office hours will be listed on the D2L website.

Claire Cook, [clairec@arizona.edu](mailto:clairec@arizona.edu)

Michael Daniel, [mfdaniel@arizona.edu](mailto:mfdaniel@arizona.edu)

Samantha Moruzzi, [smoruzzi@arizona.edu](mailto:smoruzzi@arizona.edu)

## Part 1: Course summary and logistics

### 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.

### 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.

### Expected Student 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 website:** This course will use D2L for assignments, lecture notes, and communications. Assignments will also be submitted through D2L unless otherwise noted.

**Course Communications:** Course announcements will be posted on D2L and announced in class. If we need to contact you for any reason we will use your university email, so please check it regularly. Please email Prof. Carter or the T.A.s, or talk to us before or after class, or come to office hours, if you have any questions, comments or concerns.

**Required Texts and Materials:** There is no textbook. You will need a device capable of internet access (phone, tablet, laptop) to get credit for in-class participation via Top Hat. You will also need pens/pencils to complete the in-class labs. A calculator or calculator program on your phone or laptop may also be useful.

**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.

### Part 2: Course Assessment and Grading

This class involves multiple components: lecture participation, in-class labs, homework, and a Signature Assignment. There is no final exam in this class.

#### Division of Grade

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

Course Component	Allowed range
Lecture Participation	5%
In-Class Labs	0-25%
Homework	35-50%
Signature Assignment	20-60%

selection deadline, which is at the end of the first four 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		Example 2		Example 3	
Lecture Participation	5%	Lecture Participation	5%	Lecture Participation	5%
In-Class Labs	25%	In-Class Labs	0%	In-Class Labs	25%
Homework	50%	Homework	35%	Homework	35%
Signature Assignment	20%	Signature Assignment	60%	Signature Assignment	35%

### Lectures and Participation

The lectures will use Top Hat for in-class participation responses. The purpose of these in-class questions is to encourage students to think about and use the course material. Correct answers are not required for Top Hat responses, but *your participation will be recorded and is a mandatory part of the final grade*. This grade component reflects your efforts in coming to class and proactively thinking about the course material. The Code of Academic Integrity applies to Top Hat as well.

### In-class Labs

The class will have in class activities (labs) that will require work in small groups. The labs will involve elements of quantitative analysis and/or group discussion and must be turned in by the end of class. If you know you will miss class due to illness or university-approved activity and need to make up a lab, please email Dr. Carter in advance so a time can be arranged. These make-ups will occur during office hours or an arranged meeting time.

### Homework and Late Policy

There will be 6 homework assignments throughout the semester, and they will be posted in advance on the D2L website. The homework will be written short response or short (one page) essays. Each homework will have at least one week for completion, then they will be graded over the next week and returned to you. You may discuss the homework with other students but be sure the final work is yours. Late homework will incur a 5% penalty for up to 24 hours late, and a 10% penalty after that. No homework will be accepted more than 1 week late without the approval of the instructor. The first two homeworks will be eligible for revisions to receive a better grade; more details on this process will be provided in class.

### Signature Assignment:

This GenEd course will have a Signature final project that will involve researching material relating to the course and applying this information to produce a final project report. There will be multiple possible projects for you to choose from.

### Final letter grades will be assigned as follows.

- A: 90% or higher
- B: 80 – 89%
- C: 70 – 79%
- D: 60 – 69%
- E: Below 60%

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.

### Extra Credit

Extra credit opportunities may also be provided. These will be worth at most 3-5% of the grade and will be fairly challenging and/or require extra time. The extra credit should not be seen as a potential substitute for the regular course work.

### Regrades

All your work will be graded by a teaching assistant or by Dr. Carter. Although we will make every effort to evaluate your work thoroughly and fairly, we are only human. If you think there is an error in grading your homework or labs, please contact the TAs first. If you have a question about the Signature Assignment grade, or cannot resolve a homework grade with the TAs, please contact Dr. Carter. We will look at your work again and return it to you with a response, usually within a week. *You must report any grading errors within a week of the return of your assignment to receive a regrade!*

### Course schedule/Due Dates

A detailed course schedule and due dates will be available on D2L. A rough schedule of topics is listed here. Details are subject to change and D2L will always have the most current information.

Week	Topic	Assignment	Due Date (5 pm)
1	Intro to the Solar System		
2	The Sun and Stars		
3	Light, energy and gravity	Homework	Jan. 25
4	Early evolution of the Solar System		
5	Studying Early Earth, Age Dating	Homework	Feb. 8
6	The Hadean Earth and Origin of Life		
7	Early life on Earth	Homework	Feb 22
8	Snowball Earth and the first continents	Signature Project Proposal	Mar. 12
9	Plate tectonics and the oxygen revolution	Homework	Mar. 21
10	Mass extinctions		
11	Climate change through history	Homework	Apr. 4
12	Venus: The exoplanet next door		
13	Mars: Early habitability?		
14	Exoplanets		
15	Icy Ocean Worlds	Homework	Apr. 23
16	Life in the Universe	Signature Assignment	Apr. 30

## Part 3: Course policies

### Absence and Class Participation Policy

Participating in the course and attending lectures and other course events are vital to the learning process.

- 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>

*Do not come to class while you are sick!* Lecture slides will be placed online. With sufficient advanced notice we can arrange a lecture recording or remote call-in if you are well enough to participate online. Email the instructor to make arrangements if you will miss significant class time.

### **Makeup Policy for students who register late**

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

### **Classroom behavior policy**

Department policy *forbids any outside food or drink, except water, in the lecture hall*. We all have a shared responsibility to create a positive learning environment free from distractions. If you arrive late to class or need to leave early, please choose a seat on the aisle and enter/exit quietly. Please silence your phone during class. If you need to accept an emergency phone call, exit the lecture hall fully before talking on the phone. Behaviors that could be disruptive to other students are not acceptable, and disruptive students will be asked to cease this behavior. Those who continue to disrupt the class will be asked to leave the lecture, may lose participation points for that class, and may be reported to the Dean of Students in cases of particularly egregious behavior. Examples of potentially disruptive behaviors include chatting, making phone calls, watching movies, tv or video clips, and live streaming or video recording.

### **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. 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**

Every writing assignment will have a description of how AI tools (e.g. ChatGPT) 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.

### **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.