EAS1601: Habitable Planet
Course Syllabus

Course and Instructor Information

Course: EAS 1601: Habitable Planet
Semester: Spring 2026 *(Aug 24th - Dec 17th)*
Class Schedule: Tuesdays & Thursdays, 3:30 - 4:45 PM EDT
Class Format: Online Synchronous via Zoom
Labs: see Lab Canvas page for details

Instructor: Prof. Heather Chilton, *(she/her/hers)*
Email: htchilton@gatech.edu
Instructor Virtual Office Hours: By appointment
Details for contacting Prof. Chilton are located in the Instructor Details Page

Lecture TA:
Email:
TA Office Hours: By appointment

Lab Coordinator:
Office Hours:

COURSE COMMUNICATIONS

Communication for this class will utilize **Canvas announcements and messages**. Please make sure that your Canvas messaging/announcements is linked to your Georgia Tech email account or that you are frequently checking your Canvas messages and the Canvas page. **It is your responsibility to read all Canvas messages and announcements, including ALL message content.**

COURSE DESCRIPTION

We live in an exciting and challenging time — the human species is dramatically reshaping the Earth system, while the search for life beyond Earth is advancing at incredible speed. This course will explore the history of the solar system and Earth as the one currently known example of a habitable planet—one that can support living organisms. We will consider how stars, elements, and planets form, the important planetary processes that brought about the Earth as it was when life arose and have shaped its evolution as an inhabited planet over billions of years, and the science of searching for life beyond Earth. We will also explore the factors that shape the Earth

today, and some of the physical and societal drivers that will potentially govern its future. This course is geared toward undergraduate students and is meant to be challenging and broadly accessible. The course will draw upon lectures and readings, as well as laboratory exercises to enrich those lessons.

Course materials, including assignments and notes, are not to be archived anywhere online, distributed, or provided to persons outside of this class. Materials are presented for your benefit and evaluation - not to give unfair advantage to select students (usually at a paid cost to the student) or to offer up or sell content instructors have put time and effort into. Any such actions are dishonest and break the code of conduct, and any person found to be in breach of this policy will face disciplinary action.

COURSE OBJECTIVES

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

- Apply a scientific framework to analyze or justify a scientific position.
- Use basic science tools and concepts to outline the timeline, characteristics, and implications of the formation and evolution of both the universe and Earth.
- Analyze the basic properties of stars and planetary systems to identify and justify which are most likely to host potentially habitable worlds.
- Describe the processes, features, and characteristics of a planet's structure, atmosphere, and climate, along with how those affect habitability and methods used to determine basic properties.
- Outline the major thresholds in the rise of life, the co-evolution of life and climate, and the role of humans in recent times.

STUDENT SUCCESS

- Review the course syllabus and course rules for both lecture and lab!
- Watch and participate in all lectures, including asking questions and completing prompts or polls.
- Complete all homework, exams, and other assignments by the assigned due dates and times; in the case of Argos, complete lessons by the recommended due date.
- Attend lab and submit carefully completed work.
- **Adhere to Georgia Tech honor code.**

Expected student background / prerequisites: although this course does not have any university-level prerequisites, it is expected that students have successfully completed high-school algebra II and geometry, as well as a full year of some high-school science. This course is not heavily mathematical, but comfort with those math courses will be beneficial, although we will strive to make course calculations accessible. Conceptual content in this course covers a range of science topics, and no one science course will have covered all the basics, so we build from the expectation that much of this is new, but that students have at least some exposure to scientific ideas and practices.

Student Success in Course Content requires students to:

- Understand lecture and lab material
  - Restate key concepts and facts clearly and simply (learning objectives are great reference points)
  - Explain how content interconnects
  - Make simple analyses and calculations based on material
  - Apply a given concept to new conditions or situations
- Adhere to Course Rules and Georgia Tech Honor Code. See Academic Integrity section of this syllabus

Course Format, Organization, & Structure

- EAS 1601 lecture and lab sections are **FULLY REMOTE**.
- The lecture classes will be conducted online through Zoom **synchronously** (i.e., live), recorded, and uploaded onto the Modules section of the course Canvas page. Some days will have recordings assigned to be watched before class starts to give enough in-class time to work through activities and calculations.
- The course is organized into two units: (1) Building a Planet, (2) Supporting Life and Intelligence; normally this is in three sections with three exams, but is being divided differently due to alignment with the online homework. Each lecture will be published once available along with a document of any questions asked during each class.
- **Students will be evaluated on the content of each module/unit via Participation, Homework Assignments (OLI Torus), Final Project & Exam, and Lab assignments.** The lab assignments will complement the material covered during the lectures and provide students hands on learning as best as can be done in a remote setting.

Textbook or Required Resources

TEXTBOOK AND PURCHASED MATERIALS

- **Lecture: No textbook is required**; however, if you are looking for supplemental material, we recommend the textbook *How to Build a Habitable Planet (2012) by Charles Langmuir and Wallace Broecker.* All tested material will be provided through Canvas.
  OLI Torus ($40) is required. This is an adaptive learning platform hosting the Habitable Worlds online content, integrated directly with the Canvas site.
- **Lab:** See lab Canvas page

COURSE TECHNOLOGY REQUIREMENTS

- **Lecture:** As class meets remotely through Zoom and utilize online software, students must have access to a suitable device that will let them see and interact as needed. Phones are a last resort and will highly limit student capabilities to participate in class and complete required materials.
- **Office hours:** Virtual office hours will be hosted through Zoom. Students will be able to communicate with the professor via audio, audio+video, or chat features.
- **Lab:** See lab Canvas page

EXAM PROCTORING (No Exam proctoring software will be used/required for this class)

The following are required of students:

- Students must have a stable broadband internet connection
- Students must have a secure private location to take an exam
- Students may not use other students and people or unauthorized materials to assist with their exam, although these exams will be open notes

Course Dates & Schedule

Course Start Date: 24 Aug 2026
Course End Date: 17 Dec 2026
Final Exam: Tuesday, Dec 8th (This is the final class before the reading period, NOT during the finals block)

COURSE SCHEDULE *(for lab schedule, see Lab Canvas page)*

Fall 2026, TR 3:30 - 4:45pm					
Week	**Date**	**L#**	**Lecture Topic: H. Chilton**	**Homework:** OLI Torus, **Due Sundays, 11:59 PM**	**TENTATIVE Lab Assignment**
1	25-Aug	1	Class Intro & Our Scientific Framework		Labs Do Not Meet
	27-Aug	2	Framework cont. & The Drake Equation		
2	1-Sep	3	Astronomy Basics	**Intro 3**: Science (~25 min); **Intro 4**: Tools (~20 min); **Intro 8**: Astrobiology (~15 min); **R*1**: Distance to Stars (~10 min)	**L01: Foundations & Preconceptions**
	3-Sep	4	Properties of Stars		
3	8-Sep	5	Stellar Life Cycles	**R*2**: Brightness (~40 minutes); **R*3**: Color (~30 min); **R*4**: HR Diagram (~25 min)	**L02: Properties of Stars**
	10-Sep	6	Formation of Elements and Molecules		
4	15-Sep		Catch-up **OR** NO CLASS	R*5: Stellar Lifecycles (~45 min); R*6: Elements (~35 min)	**L03: Element & Planet Building**
	17-Sep	7	Formation of Planetary Systems		
5	22-Sep	8	Exoplanet Detection	fp1: Transits (~45 min) fp2: Radial Velocity (~35 min)	**L04: Planetary Systems**
	24-Sep	9	Our Planetary System		

6	29-Sep	10	Our Planetary System, pt 2	fp 4: Sources of Heat (~40 min)	None
	1-Oct	11	Building a Terrestrial Planet		
7	6-Oct		**NO CLASS: Fall Break**	fp3: Planet Composition (~90 min)	*Fall Break, None*
	8-Oct	12	Planet Structure & Plate Tectonics		
8	13-Oct	13	Planetary Atmospheres	ne 1: Energy Balance (~30 min) ne 3: Gases (~50 min)	**L05: Planet Structure and Atmospheres**
	15-Oct	14	Energy Balance		
9	20-Oct	15	Greenhouse Effect	ne 4: Greenhouse Effect (~35 min)	**L06: Energy Balance**
	22-Oct	16	Earth's Thermostat		
10	27-Oct		Catch-up **OR** NO CLASS	fi/fl 2: End of an Era	**L07: Greenhouse Effect**
	29-Oct	17	Climate Systems 1: Thermostat Failure		
11	3-Nov	18	Climate Systems 2: Earth's Climate	fi/fl 4: First Signatures of Life	**L08: Life & Habitability**
	5-Nov	19	Planetary Evolution & Habitability		
12	10-Nov	20	Life	fc/L 2: A Telltale Trace	**Lab Project, pt 1: Individual work**
	12-Nov	21	Metabolism		
13	17-Nov	22	Evolution & Extinction	fc/L 6: Life Finds A Way	**Lab Project, pt 2: Group work**
	19-Nov	23	Humans in a Planetary Context		
14	24-Nov		Catch-up **OR** NO CLASS		*Fall Break, None*
	26-Nov		**NO CLASS: Thanksgiving Break**		
15	1-Dec	24	Earth's Future	**OLI Torus Project due**	**Lab Project, pt 3: Presentations & Selection**
	3-Dec		Q & A		
16	8-Dec		**Final Exam**		Makeup Labs
			Final Exam: NONE DURING FINAL EXAM BLOCKS --> CONDUCTED ON DEC 8TH		

The above is subject to change

Course Grading and Assessment

The course grading breakdown is as follows:

Participation	**5%**
Homework Assignments (OLI Torus)	**40%**
Final Project	**15%**
Final Exam	**15%**
Labs	**25%**

- ***PARTICIPATION:***
  - During each lecture, there will be several zoom polls. Participation points are based on lecture on-the-spot quizzes / knowledge checks, covering either student impressions or recently covered content. **You must be logged into the zoom session with your gatech email and first/last name for us to correctly award points.** Points are divided up as follows:
    - 75% for submitting an answer (being present and trying)
    - 25% for correct answers - this should motivate students to try and determine the correct answer without overly penalizing for struggling with content

    Please note, there are two dropped lecture participation days, which can be used freely, ranging from unexcused absences, technology problems, etc. with no questions asked.

- ***HOMEWORK ASSIGNMENTS:***
  - **OLI Torus**: This is an online adaptive learning platform hosting the HabWorlds lessons. You may attempt these lessons as many times as you wish to increase your score up to the deadline, and you will be able to review completed work after submitting lessons. As the lessons are synched with the Argos backend, student progress is saved; however, simulations (sims) and sequential answer screens can error if you stop midway through or refresh. To avoid having to restart lessons, try and complete lessons in one sitting.
- ***FINAL PROJECT AND EXAM:***
  - Project: The OLI Torus Project is an excellent application of the skills and knowledge covered in the first half of the course.
  - Exam: The exam picks up where the project leaves off to cover the remainder of the course material. This will be more qualitative, covering ideas around life and maintaining habitability on a planet using Earth as an example.
    - **Exam Date: Tuesday April 28th, during class**
    - **The exam will be open notes and will be available only during class time** *(unless accommodations have been discussed with the instructor)***.**
    - The exam is planned as 2 hrs (120 minutes) long (unless accommodations have been discussed with the instructor).
    - You are allowed one attempt.
    - Exam is open notes, and does not require proctoring software; HOWEVER, academic integrity is taken seriously, so be sure to familiarize yourself with course and university requirements, which are

outlined in more detail in the associated section of this syllabus. Violations include, but are not limited to
    - Students providing input or answers to other students during the exam
    - Students archiving specific question information about the exam that lends an unfair advantage to any student
    - Copying content from other sources on free response questions
- ***LABS:***
    - The Labs complement material discussed in Lectures, and final grades in lab will transfer to your overall course grade.
    - See Lab Canvas Page for more information about how your laboratory grade will be determined.
- ***OPTIONAL QUIZZES*** - There will also be several quizzes available to all course participants through Canvas. These are intended for students to evaluate their understanding of the lecture content and to practice exam-style questions prior to exams. However, these quizzes will not be graded and do not contribute in any way to your final grade in the course.

Late Policy and Dropped Scores (Lecture): Please contact the instructor and Lecture TA at the start of the semester if you anticipate being absent during the scheduled exams (e.g., religious holidays, pre-approved professional activities) or as soon as possible after the absence begins (e.g. unexpected injury or illness). You will have up to 2 weeks (14 days) from the due date of the exams and assignments to communicate with us to discuss possible accommodations for university approved absences only. You must obtain the appropriate approval and you must provide documentation for the absence. ***Missing an assignment or exam will result in a zero unless a university approved absence is provided.*** Similarly, adjustments to grades on exams or assignments must be resolved within 2 weeks of the grade posting.

- Homework can be submitted late for -50%/day, no other late submissions accepted (i.e. lab, exam, project)
- 2 weeks is the magic number - for both reaching out to address missed work or resolving an assignment grade dispute
- One (1) planned dropped participation "days"

GRADING SCALE

Final letter grades will be assigned according to the following scale:

A	$\geq$ 90.0%	Achieved high performance level in course assessment goals, demonstrating content and skill mastery
B	$\geq$ 80.0% and < 90.0%	Achieved good performance level in course assessment goals, demonstrating content and skill fluency

C	≥ 70.0% and < 80.0%	Achieved reasonable performance level in course assessment goals, demonstrating content and skill familiarity
D	≥ 65.0% and < 70.0%	Achieved limited and partial performance level in course assessment goals, demonstrating only basic content and skill understanding
F	**< 65.0%**	Did not meet the minimum required performance level in course assessments

Note 1: Passing is considered a "C" or higher, although individual major requirements may require or accept different thresholds.
Note 2: If taking this course as pass/fail, a "passing" grade requires achieving a C or higher.

Final Grade Rounding: Any final course grade rounding will only be for up to 0.4 percentage points (e.g. a grade of "B" at an 89.6 could round up to a 90.0 for a grade of "A" given good course involvement, but not a "B" at 89.2 which cannot round to a 90.0) and will only be evaluated based on having attended and scored well on participation prompts and polls, indicating involvement and thoughtful analysis throughout the class. This applies only to the final course grade and NOT to individual assignments.

Extra Credit: There is no extra credit planned.

Grade Curve: Curving is highly unlikely but may be applied to exams to reflect a reasonable distribution of the scale described above (**up to the instructor's discretion**).

Course Accessibility and Accommodations

We are committed to creating a fully supportive, accessible, and equitable learning environment for all students, without judgement. If you anticipate or experience any learning barriers in this course, you are invited (but not required) to share your concerns with Prof. Chilton and the Lab coordinators to discuss potential concerns and/or solutions.

A student with a health, physical, or mental condition (or any other similar or related concern) that could impact course performance or needs, we highly encourage you to reach out to Georgia Tech's Office of Disability Services

Links to an external site.. They can help you document your needs and create an appropriate accommodation plan without disclosing any private information to the instructor. The Office of Disability Services can be reached by phone at (404) 894-2563 or email at dsinfo@gatech.edu. If you have already been approved for accommodations through the Office of Disability Services, please alert your instructor(s) as soon as possible to develop an implementation plan together and ensure any specifically awarded accommodations are applied.

STATEMENT ON INCLUSION, DISCRIMINATION, AND HARASSMENT

We are committed to creating a learning environment in which all students feel safe, valued, respected, and included. We are all responsible for creating a space in which we can accomplish this goal. To this end, discrimination or harassment of any kind will **not be tolerated**, whether intentional or unintentional. This includes, but is not limited to, discrimination or harassment based on race, color, religion, sex, pregnancy, ethnic and national origin, age, disability, veteran status, sexual orientation, family status and responsibilities, personal appearance, political affiliation, marital status, gender identity or expression, genetics, or any other classifications, activities, or conditions. You can find the official campus policies regarding diversity, equity, and inclusion here.

Please reach out to the instructor and/or to the Ethics Reporting Hotline Links to an external site. (1-866-384-4277) if you would like to report an incident. Please note that faculty are considered mandatory reporters for any grievance that falls within the scope of Title IX . Find at the end of the syllabus additional support resources for students.

By being empathetic and forgiving, we can best achieve a positive environment for everyone

DIVERSITY, EQUITY, AND INCLUSION (DEI)

Many fields have substantial problems with diversity, equity, and inclusion (DEI); however, science, technology, engineering, and math (STEM) fields in particular struggle to improve the situation. An individual's decision of whether or not to pursue or remain in STEM (or any other) degrees and careers should be rooted in internal desire and not barriers such as lack of representation or resources, discrimination, unwelcoming environments, or any other factor. It can be easy to underestimate the impact of generations of compounded social barriers, unstable or insufficient support, disjointed and underfunded schooling, or physical and mental health challenges. Minorities are disproportionately affected by all of these, and we can't expect students to overcome those added challenges to maintain academic excellence without added support. The pandemic has exacerbated this, giving a more immediate edge to what was already a persistent problem. Whether due to race, gender, culture, sexual orientation, physical impairments, socioeconomic status, or anything else that leads a group to be marginalized, their voice and presence diminished, we should strive for professional and academic communities that reflect society's diversity, thus elevating each other, our community, and science overall. As faculty, staff, and students, we need to listen to those affected and, where appropriate, share our own voices in order for us all to be aware of the challenges; through respect, knowledge, communication, and action, we can be respectful and sensitive to impacts to various groups and proactive in providing support to better achieve DEI goals in academia and society at large.

GATech Office of Diversity, Equity, and Inclusion

NAMES AND PRONOUNS

You are welcome (though not required) to share the name and pronouns you go by in your daily life. This can also be updated on Canvas by editing your User Settings (instructions). or in Zoom

(instructions). It is important that we all respect each other, and part of that is acknowledging and recognizing the person we are interacting with, including their chosen names and pronouns. Mistakes or missteps can happen, so please either gently correct the other person or correct yourself, keeping in mind that some may have trouble remembering or updating due to their own situations; however, mal-intent, disrespect, or similarly negative interactions regarding this or any similar situation will not be tolerated.

As a note, we encourage everyone to update their pronouns regardless; beyond inclusivity, there are many students, staff, and faculty who have names from a diverse array of countries, literature, or elsewhere, and not everyone is always aware of the typically inherent pronouns for a given name. Further, names have become more fluidly applied and typical pronouns are not always the correct ones, and sometimes we all need a little help knowing how to address someone.

Academic Integrity and Honor Code

Course-specific Rules:

We have you sign a rules and policies document in Lab, but the same policies apply for lecture. In addition, specific assignments or exams may have additional specification to which you need to adhere.

Tips to avoid violations

1. Be sure to READ and UNDERSTAND any class rules and policies documents, as we have had situation in the past where students are called up on integrity violations and didn't realize it was in the document they signed in lab. If you have any questions or concerns, just reach out and ask.
2. Your agreement and signature are important, and just because you didn't read something you signed doesn't mean you won't bear the consequences for what it says...(being an adult isn't always fun, but ALWAYS read these sorts of documents, whether for class, work, buying a house, anything financial, etc.)
3. It can be hard in a moment of panic to think of the larger picture, but when faced with a situation, try and walk through if and how an action could be seen as a violation (think from the perspective of an instructor or administrator).
4. This is NOT one of those situations that it is better to ask for forgiveness than permission - you risk your class grade and your academic career with these actions. Further, it degrades the quality of everyone's degree, and unfairly treats students who have properly adhered to the rules, skewing grades against their honest work.

ACADEMIC INTEGRITY AND HONOR CODE :

Georgia Tech aims to cultivate a community based on mutual trust, academic integrity, and honor. As such, all instructors and students are expected to act according to the highest ethical standards,

and are bound by the Georgia Tech Honor Code. For more information on Georgia Tech's Academic Honor Code, please visit: https://catalog.gatech.edu/policies/honor-code/ and https://policylibrary.gatech.edu/student-affairs/academic-honor-code

While we encourage students to help each other learn course material, each student must complete their own work without engaging in plagiarism or other false claims of performance. In addition, course materials, including assignments and notes, are not to be archived anywhere online, distributed, or provided to persons outside of this class. Materials are presented for your benefit and evaluation. ***Any student who breaches this policy and violates the Academic Honor Code will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations (which may include suspension from Georgia Tech).***

SPRING 2022 COVID-19 RESOURCES & POLICIES

Current Campus and CDC COVID-19 Guidelines

Georgia Tech encourages everyone to follow the CDC's recommendations to vaccinate and wear a mask in campus buildings. Learn more about COVID-19 campus guidelines here: https://health.gatech.edu/tech-moving-forward (Links to an external site.)

COVID-19 Vaccination on Campus

COVID-19 vaccines are available on campus for all eligible students, faculty, and staff and their spouses, domestic partners, and dependent children ages 12 years and older (as of May 17, 2021). Georgia Tech is following the vaccine eligibility guidelines (Links to an external site.) set by the Georgia Department of Public Health. Learn more about on campus vaccination here: https://health.gatech.edu/coronavirus/vaccine (Links to an external site.)

CAMPUS RESOURCES AND SUPPORT FOR STUDENTS

In your time at Georgia Tech, you may find yourself in need of support. Please see the appropriate link in Modules.