

**EAS 1601: Habitable Planet
(4 Credit Hours)
Spring 2023**

Course Lecture Meeting Times: TR 8:00 – 9:15 AM EST
Course Lecture Location: Room 144 CULC (Clough Commons)

Instructor: Dr. Zachary Handlos
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Office Hours: 12-2 PM EST MW Room 1251 ES&T (or virtual) or by appointment

Lecture TA: Susan Harrison
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Lab Coordinator: Dr. Michael Porter
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Office Hours: By appointment

Introduction

We live in an exciting time, when the search for life beyond the Earth is advancing at incredible speed. With better and better spacecraft, we are searching our own solar system, and with better and better telescopes we are searching our galactic neighborhood. So what are we looking for, and how will we know when we find it? This course will explore the history of the solar system and the 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 the factors that shape the planet we live on today. This course is geared toward undergraduate students, and is meant to be both challenging and broadly accessible. The course will draw upon a combination of lectures, in-class participation activities, ARGOS modules and laboratory assignments to enrich those lessons.

Course Topics

- Origins of the Universe, Stars and Planets
- What Makes a Planet Habitable?
- Exploring the Only Case Study of Habitability...Earth
- Life and Evolution on Earth and Beyond
- Detecting Habitable Planets

Recommended (but not required) Textbook:

Langmuir, C. and W. Broecker (2012): How to Build a Habitable Planet: The Story of Earth from the Big Bang to Humankind, 2nd Edition, Princeton University Press; ISBN-13: 978-0691140063.

Grading

Your grade in this course will be based on your performance within the following categories:

- In-Class Activities – 29% of grade
- Argos Modules – 10% of grade
- Course Assessments - 36% of grade
- Lab Assignments – 25% of grade

In-Class Activities (29% of Grade)

There are three components to this portion of your grade:

- 1) *Attendance*: Attendance will be taken in class and is worth 15% of your course grade. We will discuss how to report your attendance when you arrive to the classroom.

*****If you will be missing class due to illness, injury, COVID-19, family emergencies, etc... you must do the following to prevent losing attendance credit: 1) contact the Division of Student Life on campus about your absence so it is officially documented, and 2) contact the course instructor before class starts or ASAP. If you do not do both of the above, you will not have an opportunity to retroactively receive attendance credit!*****

- 2) *In-Class Activities*: In-class participation exercises will also be assigned and will be worth 14% of your course grade. The in-class exercises are to be completed during class unless more time is required for completion (which will be specified by the course instructor). Activities will include: working individually or in groups on practice problems for the quizzes or final exam, discussion activities about topics in the news related to this class, “think-pair-share” activities related to course material and short reflection assignments.

Argos Modules (10% of Grade)

Throughout the semester, you will be tasked with completing various Argos modules, which are modules designed to further explore concepts related to planetary science and habitable planets. Argos will cost \$25 to purchase for the semester, and logistics regarding how to access and complete these assignments will be discussed during the first week of the semester.

Course Assessments (36% of Grade)

There will be 6 course quizzes that will be completed during class on Canvas. Quizzes will assess students’ understanding of course theory and concepts. These quizzes will be non-cumulative. Quiz question format will be a mix of multiple choice, multiple answer, true/false and short answer questions.

There will also be a cumulative final exam at the end of the semester. You will have the option to complete the final exam if you wish to replace your final exam score in place of your two lowest quiz grades.

- If all 6 course quiz scores are kept: 6 quizzes x 6% = 36% of grade
- If top 4 course quiz scores are kept + cumulative final exam: 4 quizzes x 6% + 1 exam x 12% = 36% of grade

Lab Assignments (25% of Grade)

See lab syllabus for more information about how your laboratory grade will be determined.

Grading Scale

| Grade | Percentage |
|-------|-------------|
| A | 100 – 90.0 |
| B | 89.9 – 80.0 |
| C | 79.9– 70.0 |
| D | 69.9 – 60.0 |
| F | <60 |

Grade Adjustment and “Pass/Fail” Grading

Depending on the distribution of student scores at the end of the course, the scores may be curved to reflect the scale described above (up to the instructor’s discretion).

Note: If taking this course as pass/fail, a “passing” grade requires achieving a C or higher.

Other Course Procedures & Policies

Communication: Communication regarding anything and everything related to 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 messages, including ALL message content.**

Late Policy: For each day that an assignment is late, 10% of your total score will be deducted. If the assignment is more than 3 days late, a “0” score will be provided. Exceptions will apply (due to ANY illness, family emergency, or other emergency matters) with communication of at least 24 hours in advance of assignment due date.

Extra Credit: In fairness to all students, no extra credit will be offered unless otherwise specified by the course instructor.

Academic Honor Code

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. The instructor, teaching assistants and students in this class, as members of the Georgia Tech

community, are bound by the Georgia Tech Academic Honor Code. Please see <http://www.catalog.gatech.edu/policies/honor-code/> for Georgia Tech’s Academic Honor Code, which you are required to uphold.

Cheating will not be tolerated in this course. Cheating includes the following: 1) copying answers from another student, 2) using unauthorized resources to study for course quizzes and assessments, which includes the use of electronic devices, 3) posting solutions to course quizzes and other assignments on the Internet, and/or 4) any other activity that would be considered “academic misconduct”.

Students will be asked to acknowledge their acceptance of this stipulation and their willingness to abide by all terms of the honor code on all quizzes, assignments, labs and the final exam. Any student suspected of cheating or plagiarizing will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty.

*****To summarize, do not cheat; it is not worth jeopardizing your future.*****

Access and Accommodations

If you anticipate or experience physical or academic barriers based on disability, you are welcome to let me know so that we can discuss options. You are also encouraged to contact the Office of Disability Services to explore reasonable accommodations.

The Office of Disability Services can be contacted by:

Phone: **404-894-2563**

Email: dsinfo@gatech.edu

Website: <https://disabilityservices.gatech.edu/>

Resources

Academic Support

- [Center for Academic Success](#)
 - [1-to-1 tutoring](#)
 - [Peer-Led Undergraduate Study \(PLUS\)](#)
 - [Academic coaching](#)
- Residence Life's [Learning Assistance Program](#)
- [OMED Educational Services](#) - Group study sessions and tutoring programs
- [Communication Center](#) - Individualized help with writing and multimedia projects
- [Academic advisors](#) for your major

Personal Support

Georgia Tech Resources

- The [Office of the Dean of Students](#) | **404-894-6367** | 2nd floor, Smithgall Student Services Building; You also may request assistance [here](#)
- [Counseling Center](#) | **404-894-2575** | Smithgall Student Services Building 2nd floor
 - Services include short-term individual counseling, group counseling, couples counseling, testing and assessment, referral services, and crisis intervention.
 - *Students in crisis may walk in during business hours (8am-5pm, Monday through Friday) or contact the counselor on call after hours at 404-894-2204.*
- [Students’ Temporary Assistance and Resources \(STAR\)](#)

- Can assist with interview clothing, food, and housing needs.
- [Stamps Health Services](#) | 404-894-1420
- [OMED Educational Services](#) | 404-894-3959
- [Women’s Resource Center](#) | 404-385-0230
- [LGBTQIA Resource Center](#) | 404 385 4780
- [Veteran’s Resource Center](#) | 404-385-2067
- [Georgia Tech Police](#) | 404-894-2500

National Resources

- The [National Suicide Prevention Lifeline](#) | 1-800-273-8255
 - Free and confidential support 24/7 to those in suicidal or emotional distress
- The [Trevor Project](#)
 - Crisis intervention and suicide prevention support to members of the LGBTQ+ community and their friends
 - Telephone | 1-866-488-7386 | 24 hours a day, 7 days a week
 - [Online chat](#) | 24 hours a day, 7 days a week
 - Text message | Text “START” to 687687 | 24hrs day, 7 days a week

Course Schedule (subject to change)

| | Week | Date | Lecture | Argos (due various Tues. 3pm) | Lab Assignment |
|--------|------|-----------------|---|---|------------------------|
| Quiz 1 | | 10-Jan | Intro: Science, Space and Time | | |
| | 1 | 12-Jan | Drake Eq and Astron. Basics | | |
| | 2 | 17-Jan | The Big Bang: The Birth of the First Atoms and Stars | <i>Due Tue Jan 17th: Intro 3: Science (~25 min); Intro 8: Astrobiology (~15 min)</i> | |
| | | 19-Jan | Properties of Stars | | L01: Universe to Stars |
| Quiz 2 | | 24-Jan | Formation of Elements I: Stellar Lifecycles | <i>Due Tue Jan 24th: R*2: Brightness (~40 min); R*3: Color (~30 min)</i> | |
| | 3 | 26-Jan | Formation of Elements II: Stars, Elements, & Habitability | | L02: Star Properties |
| | 4 | 31-Jan | Elements to Molecules | <i>Due Tue Jan 31st: R*4: HR Diagram (~25 min); R*5: Stellar Lifecycles (~45 min)</i> | |
| | | 2-Feb | Formation of Planetary Systems | | L03: Elements |
| | 5 | 7-Feb | Our Planetary System | <i>Due Tue Feb 7th: R*6: Elements (~35 min)</i> | |
| 9-Feb | | Overflow | | L04: Planet Formation | |
| Quiz 3 | | 14-Feb | Heat Flow and Planet Composition | <i>Due Tue Feb 14th?: fp 4: Sources of Heat (~40 min)</i> | |
| | 6 | 16-Feb | Planet Structure | | L05: Planet Structure |
| | 7 | 21-Feb | Planetary Atmospheres | <i>Due Tue Feb 21: ne fp3: Planet Composition, Atmosphere section only (~40 min)</i> | |
| 23-Feb | | Energy Balance | | L06: Atmosphere | |

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|--------|--------|------------------------------------|--|--|--------------------------------------|
| Quiz 4 | 8 | 28-Feb | Greenhouse Effect | <i>Due Tue Feb 28th: ne 1: Energy Balance (~30 min)</i> | L07: Energy Balance |
| | | 2-Mar | Earth's Thermostat | | |
| | | 7-Mar | Climate System 1: "Modern" Earth | <i>Due Tue Mar 7th: ne2 Greenhouse Effect</i> | L08: GHE & Thermostat / Climate |
| | 9 | 9-Mar | Climate System 2: Snowball Earth | | |
| | 14-Mar | Overflow / In-class workday | <i>Due Tue Mar 14: ne 3: Gases (~50 min)</i> | None / Make-up Labs | |
| 10 | 16-Mar | Overflow / In-class workday | | | |
| | | 21-Mar | Spring Break | | none |
| | 11 | 23-Mar | Spring Break | <i>none</i> | |
| Quiz 5 | | 28-Mar | Exoplanet Detection | <i>Due Tue Mar 28th: fp1: Transits (~45 min), fp2: Radial Velocity (~35 min)</i> | Organize Project |
| | 12 | 30-Mar | Habitability | | |
| | | 4-Apr | Planetary Evolution | <i>Argos digital field trip lesson?</i> | L09: Habitability |
| 13 | 6-Apr | Life and Metabolism 1 | | | |
| | 11-Apr | Life and Metabolism 2 | <i>Argos digital field trip lesson?</i> | Project workday | |
| 14 | 13-Apr | Evolution and Extinction | | | |
| Quiz 6 | | 18-Apr | Humans in a Planetary Context | | Elevator pitch + proposal selection? |
| | 15 | 20-Apr | Earth's Future | | |
| | | 25-Apr | Q&A Session | | None / Make-up Labs |
| | 16 | 27-Apr | Reading Day | | |
| | | 1-May | Exam (8:00 - 10:50am) | | |