



## Course Syllabus

**Unique# 48270    Fall 2023**

### Course and Contact Information

<b>Instructor:</b> Dr. Michael Endl  <b>e-mail:</b> <a href="mailto:mike@astro.as.utexas.edu">mike@astro.as.utexas.edu</a> (best way to communicate with me!)	<b>Teaching Assistant:</b>  Samarth Bonthala Email: <a href="mailto:samarth.bonthala@utexas.edu">samarth.bonthala@utexas.edu</a>
<b>Lecture Hours:</b> M,W,F 10:00-11:00am	<b>Lecture Location:</b> WEL 3.502
<b>Office Phone:</b> 512-471 8312	<b>Office Location:</b> PMA 17.328
<b>Office Hours:</b> Friday 11:10am-12:10pm (in my office at PMA, or via zoom if needed) TAs: TBD	
<b>Course Website:</b> CANVAS ( <a href="http://canvas.utexas.edu">http://canvas.utexas.edu</a> )	

### Basic Course Information

#### Course Description

This is an introductory astronomy course for non-science majors about one of the most interesting and fascinating questions that humans ever asked themselves: *Are We Alone in the Universe?* The course consists of a study of our solar system with an emphasis on the habitability of planets and moons and the search for extraterrestrial life. We will discuss theories about the structure and formation of the solar system, with a focus on the factors that were important for the emergence of life on our planet and the potential for its existence elsewhere. It includes a scientific investigation of other planetary systems around other stars than the Sun (i.e. extrasolar planets) and the possibilities to search these exoplanets for extraterrestrial life. Many of the topics that we will

discuss are very recent scientific discoveries! Astrobiology is a relatively new science that constitutes an interdisciplinary approach to this topic. ***Be prepared to deal with topics ranging from geology, biology, chemistry and astrophysics, as well as sociology and even philosophy.***

The concepts that we will discuss are primarily qualitative, but there will be some little amount of (high school-level) algebra in the course.

### **Prerequisites and Core Requirements:**

This course has **no prerequisites**. It is designed for non-College of Natural Sciences majors. May not be counted toward a degree in the College of Natural Sciences.

This course will include work designed to develop skills in critical thinking, communication, quantitative analysis, and teamwork. This will involve such activities as discussions, in-class teamwork to solve mini-quizzes and critical analysis of key concepts, and quantitative problem solving. Communication in the course will consist of student questions and subsequent classroom discussions during lectures and homework assignments. The course material will emphasize the synthesis of observation and theory to gain insight into the operation of the natural world, drawing on other fields such as physics, chemistry, geophysics and biology. The mathematical skills required to solve the problems in this course do not exceed high school algebra level.

### **About me:**

I am a former Senior Research Scientist with the University of Texas at Austin's McDonald Observatory and a current Lecturer in the Astronomy Department. I am also a member of the Center for Planetary Systems Habitability at UT. My own field of research is the study of extrasolar planets, in particular those which could be deemed habitable. For instance, I was involved in the discovery of *Proxima b*, a potentially habitable super-Earth planet around the closest star to the Sun (Proxima Centauri). ***This is my favorite course to teach at UT.***

### **Class Website:**

This course will be run through the Canvas system at [canvas.utexas.edu](https://canvas.utexas.edu). All class activities and communications (lectures, exams, in-class activities (instapolls), homework assignments, etc.) will be done through Canvas.

### **Required Texts/Materials**

- **"Life in the Universe"**, 5<sup>th</sup> Edition – by Bennett & Shostak (e-text or hardcopy). We are using the Longhorn Textbook Access (LTA) program.
- **A device to participate in online polls during class (cell phone, tablet, or laptops)**
- Scientific calculator for use on (occasional) problems

## Grading System:

4 Exams	60%
4 Homework	24%
Instapolls	16%
Extra Credit (not required)	(1-6%)
Total:	
	<b>100%</b>

This class will not be graded on a curve. The percentage in each of these grade components will be added by the above percentages to derive the final course grade, which will be assigned as follows (where the numbers represent the percentage of total points):

93–100 = A 90-92.9 = A–  
 87-89.9 = B+ 83-86.9 = B 80-82.9 = B–  
 77-79.9 = C+ 73-76.9 = C 70-72.9 = C–  
 67-69.9 = D+ 63-66.9 = D 60-62.9 = D–  
 < 59.9 = F

### **Your grades will be posted on Canvas during the semester.**

Grades are **non-negotiable**. These are the grades that **you** earn (and are not “given” by the instructor). Follow your progress over the semester in the grade center on Canvas and check if you will meet your goals. Talk to the instructor or TA if you have questions regarding your progress. *There is no last-minute extra credit.* There is ample opportunity for extra credit during the semester to improve your grade. Please read this syllabus carefully, it is your responsibility to be aware of all the requirements to achieve a certain grade. *Note that the running percentage on Canvas during the semester is not necessarily an exact proxy of your final grade*, as some grade components will only be entered at the end of the course! When in doubt, please contact me or one of the TAs!

## Course Policies:

All lectures will be recorded and the recordings will be available on Canvas. You are free to re-watch these at any time after the class. I will also post all my lecture slides on Canvas. ***These lecture slides and your lecture notes are your primary source of information in preparing for the exams.***

During each lecture, I will describe, explain and discuss with you the important concepts of each chapter. Every once in a while, we will take a break from lecturing and do an in-class activity that is an online poll (Instapoll). These activities will help you digest and review the material and help to deepen your understanding of the concepts. This is an introductory astronomy course for non-science majors, so we will focus on **conceptual understanding**. Any quantitative problems will not require math that exceeds your high school algebra level.

The course webpage on the Canvas system will be updated with course announcements, homework assignments, and deadlines. *It is your responsibility to check these on a regular basis.* Please come to

class prepared to participate in in-class discussions and activities, this is for your benefit.  
Cell phones: please silence and pack away your cell phone during classes. Please be considerate.  
 Please do not text during the lecture unless it is an emergency.

### **Exam policies:**

**There will be 4 exams throughout the semester, each exam is worth up to 15% of your final grade. *There is no comprehensive final exam.*** Note the test dates in the course calendar and please enter them in your personal calendar. We conduct all tests during nominal lecture hours using Canvas. *All tests will be multiple-choice tests.* The TA and myself will support and proctor the exams. We will use **Gradescope** for the tests.

**The questions on each test will quiz you on the major concepts that we discuss in the section leading up to the test.** Except for some very general fundamental concepts (like the concept of gravity, evolution, etc), each test will cover only the material in the section since the last test (i.e. in test 2 you will not be quizzed in detail on section 1, and so on...). *Also, you will not be quizzed on anything that I did not cover during the lectures, or that was not subject to homework assignments.* However, I encourage you to read the complete chapters of the textbook, also the sections I did not cover, for an improved understanding of the course material.

**Study Guide:** each set of lecture slides starts with a list of learning goals. These learning goals will help you to focus on the most important concepts that will be subject of the tests.

**Missed Exams:** in case you have an emergency that prevents you from taking a test, please contact the **Student Emergency Services:** <https://deanofstudents.utexas.edu/emergency/>

They will help you in managing any emergency situation and also contact your instructors.

**Instapolls:** during lectures we will frequently perform small polls (2-5 mins) to check your understanding of the material covered in that lecture. You can use textbook, lecture slides and the internet to complete the activity. We will use *Instapoll* on Canvas to do these activities. All submitted and correct answers will count for your *in-class activity* score (16% of your final total). **If you answered 70% of all Instapolls correctly you will get the whole 16 points.** If you have less than 70% correct, the points will be adjusted accordingly. **It's NOT an all or nothing grade.** Example: if you get 60% of the Instapolls correct, you will receive 86% of the 16 points, so 13.8 points (because  $60/70$  is 0.86). We will do all Instapolls during our regular classes. The limit of 70% is chosen on purpose to accommodate **any technical issues** or other things that prevent you from participating. *Therefore, there are no makeup opportunities for the Instapolls.*, but the 70% for full credit means that you do not need to be present every class. Your Instapoll percentage is updated after every poll, so keep an eye on your percentage during the semester.

*Never hesitate to ask a question in the classroom* (there are no stupid questions in my course, in fact those questions perceived to sound stupid, often are the most interesting!). Just raise your hand and I will react. Also, please speak up whenever I ask a question to the classroom. If you have heard some interesting astronomy news, please also share them with our class!

### **Homework Policies:**

We will post homework assignments on Canvas. These assignments are individual assignments, but I encourage discussions and collaborations between students. Please do not hesitate to ask me if something seems unclear. **Doing the homework is essential for a better understanding of the course material and it is a sure recipe to be successful in this class.** The questions are closely connected to the course material and the corresponding chapters in the *Life in the Universe* textbook. Each homework assignment consists of two parts. In part1 you will watch a video and submit a short summary report of what you have learned from watching the video. Part 2 consists of a set of multiple-choice questions. **These part 2 questions are very similar to the questions on the exam.**

There are four homework assignments, one for each module. They are due the day before the test at midnight. After midnight, the correct answers of the multiple-choice questions (part2) will become visible. This allows you to check which answers you got correct, and which ones are incorrect. This will help for the test preparation. Unfortunately, since the correct answers will be released at that time, **no late homework can be accepted**, unless you have a valid excuse (e.g. you got sick).

**The homework grade is important as it constitutes up to 24% of your total grade!**

### **Extra Credit**

There will be many extra credit opportunities over the course of the semester. Each exam and homework assignment will contain bonus questions that will give you an opportunity to earn extra, additional points. **I want my students to learn and succeed.** The extra credit is – of course – not required to achieve 100% in this course. Besides the bonus questions, here are the 3 major ways to earn extra credit points:

- (1) *Never hesitate to ask or answer a question in the classroom* (there are no stupid questions or answers in my course! In fact, those questions perceived to sound stupid, are often the most interesting!). Just raise your hand and I will react. Also, please speak up whenever I ask a question to the classroom. If you have heard some interesting astronomy news, please also share them with the class! **Students who frequently participate in in-class discussions will be rewarded with extra credit points (up to 2 extra points to your total).**
- (2) *Discussion board*: Canvas offers a *discussion board* that allows students to talk about course-related topics. You can use this board to discuss topics with your fellow classmates. The topics must be course related and interesting. Solutions for homework assignments may not be posted on Canvas (prior to the submission deadline). Similar to the in-class participation, the more active you are on the discussion board, the more points you can earn (up to **2 extra points** to your total).
- (3) *Zooniverse*: I will post a special extra credit opportunity using the citizen science website Zooniverse in the second half of the semester. This activity will allow you to gain up to **3 extra points** to your final total.

Please keep track of your grade and be pro-active with extra credit if you want to improve. *There will be no extra-extra credit at the end of the course!* If you have any questions about your grade, just ask me or a TA.

**Instructor Absences:** I am a professional research astronomer, *which might require absences during the semester*. I will do my best to minimize the impact of these activities, and will maintain email and Canvas communication at all times. I might be able to teach a class or two remotely depending on the nature of my absence. When I cannot teach a lecture, another UT astronomy professor will lead the class in my place (using my slides and instructions) or we perform in-class activities directed by the TA.

**Academic Dishonesty:**

*University of Texas Honor Code:* The core values of The University of Texas at Austin are learning, discovery, freedom, leadership, individual opportunity, and responsibility. Each member of the university is expected to uphold these values through integrity, honesty, trust, fairness, and respect toward peers and community. Students who violate University rules on scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and/or dismissal from the University. Standards for Academic Integrity are posted at <http://deanofstudents.utexas.edu/conduct/index.php>

*Plagiarism:* As a research university, the University of Texas at Austin takes plagiarism very seriously. Do not risk getting involved in a plagiarism infraction - the consequences simply aren't worth it. Always cite your sources, and when in doubt consult a professor or librarian. You may also read more about plagiarism at the Student Judicial Services website: <http://deanofstudents.utexas.edu/conduct/academicintegrity.php>

**Documented Disability Statement:**

Please notify me of any modification/adaptation you may require to accommodate a disability-related need. The University of Texas at Austin provides upon request appropriate academic accommodations for qualified students with disabilities. For more information, contact Services for Students with Disabilities at 471-6259 (voice) or 232-2937 (video phone) or <http://diversity.utexas.edu/disability/>

**Email:**

Email is recognized as an official mode of university correspondence; therefore, you are responsible for reading your email for university and course-related information and announcements. Please check your email regularly and frequently.

## **Course Outline:**

**Course Module 1:** Science, Astrobiology Fundamentals, Earth's Habitability, Origin of Life

**Course Module 2:** Life on Earth, History & Evolution of Life on Earth, Mars, Jovian Moons

**Course Module 3:** Extrasolar Planets, Biosignatures, The Rare Earth Hypothesis

**Course Module 4:** SETI, Technosignatures, Fermi Paradox & Interstellar Travel



## Course Calendar

*(topics are subject to change, depending on overall progress, test dates are permanent)*

### --- Module 1: ---

Week 1 – Aug 21: Introduction/Welcome/Syllabus review  
 Week 1 – Aug 23: Scientific Method & Astrobiology  
 Week 1 – Aug 25: Solar System Overview

Week 2 – Aug 28: Earth Habitability 1  
 Week 2 – Aug 30: Earth Habitability 2  
 Week 2 – Sep 2: Earth Habitability 3

Week 3 – Sep 4: **Labor Day (no class)**  
 Week 3 – Sep 6: Earth Habitability 4  
 Week 3 – Sep 8: Origin of Life on Earth 1

Week 4 – Sep 11: Origin of Life on Earth 2  
 Week 4 – Sep 13: Origin of Life on Earth 3  
 Week 4 – Sep 15: Origin of Life on Earth 4

Week 5 – Sep 18: Evolution of Life on Earth 1  
 Week 5 – **Sep 20: TEST 1 (Homework 1 due Sep 19 at midnight!)**

### --- Module 2: ---

Week 5 – Sep 22: Evolution of Life on Earth 2

Week 6 – Sep 25: Evolution of Life 3  
 Week 6 – Sep 27: Evolution of Life 4  
 Week 6 – Sep 29: Mass Extinctions

Week 7 – Oct 2: Mars 1  
 Week 7 – Oct 4: Mars 2  
 Week 7 – Oct 6: Mars 3

Week 8 – Oct 9: Jovian Moons 1  
 Week 8 – Oct 11: Jovian Moons 2  
 Week 8 – **Oct 13: TEST 2 (Homework 2 due Oct 12 at midnight)**

### --- Module 3: ---

Week 9 – Oct 16: Exoplanets – Detection Techniques 1  
 Week 9 – Oct 18: Exoplanets – Detection Techniques 2  
 Week 9 – Oct 20: Exoplanets – Discoveries 1

Week 10 – Oct 23: Exoplanets – Discoveries 2  
 Week 10 – Oct 25: *Kepler* & Habitable Exoplanets  
 Week 10 – Oct 27: Biosignatures 1

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Week 11 – Oct 30: Biosignatures 2  
Week 11 – Nov 1: The Rare Earth Hypothesis 1  
Week 11 – Nov 3: The Rare Earth Hypothesis 2

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Week 12 – **Nov 6** **TEST 3 (Homework 3 due Nov 5 at midnight)**

**--- Module 4: ---**

Week 12 – Nov 7: *The Drake Equation* 1  
Week 12 – Nov 9: *The Drake Equation* 2

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Week 13 – Nov 13: SETI 1  
Week 13 – Nov 15: SETI 2  
Week 13 – Nov 17: Technosignatures (Artifact SETI)

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Week 14 – Nov 20: **Thanksgiving Break (no class)**  
Week 14 – Nov 22: **Thanksgiving Break (no class)**  
Week 14 – Nov 24: **Thanksgiving Break (no class)**

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Week 15 – Nov 27: Interstellar Travel  
Week 15 – Nov 29: *The Fermi Paradox* 1  
Week 15 – Dec 1: *The Fermi Paradox* 2

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Week 16 – **Dec 4: TEST 4 (Homework 4 due Dec 3 midnight)**

- **End of course**

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