



SES 106: Habitable Worlds

I. COURSE OVERVIEW

SES 106, Habitable Worlds, teaches science concepts and scientific thinking by engaging students in the scientific search for an answer to the question "Are We Alone?" This is a cutting-edge question in modern science. It is at the heart of an emerging area of science called [astrobiology](#) which has become a major focus of space exploration.

Using the "[Drake Equation](#)" as a lens, the course focuses in particular on the possibility that life may exist on worlds orbiting stars other than the Sun ("extrasolar planets" or "exoplanets"). It does so by walking through topics including the origin and properties of stars and planets, the history of life, and the sustainability of civilizations. Students explore techniques used by scientists and apply these concepts to their own simulated search for habitable worlds.

The course is 4 credits and can be used to satisfy your general studies SQ requirement. As such, you should expect to invest some serious effort. You should also expect to encounter some math, and basic science concepts. The course is geared to the freshman level but assumes basic mastery of pre-college math and science in line with Arizona standards. Depending on your background, you may need to brush up a bit, and to budget your time accordingly.

Habitable Worlds is an innovative course with a format different from most online courses. It is built around interactive activities with rich adaptive feedback. These are not videos or simple readings and quizzes. Usually they are problem-solving

activities through which you will be introduced to key concepts, and master them, in a question-driven "learn-by-doing" approach. Often they will be designed around game-like simulations that you can manipulate, or virtual field trips that you can explore. In some ways, these activities and the Project can feel like a serious game! That's not an accident: That's in fact how the pursuit of science feels to professional scientists.

Just like real science, *Habitable Worlds* can be challenging fun, but just like real science - or like any serious game - you can't just skip through and expect to succeed. We know from the thousands of students who have taken this course before you that students who start each lesson early and who do them in the recommended order do very well. Typically, 40 - 50% of the class earns some form of "A" or "B" grade! This is a class that really rewards you for the time you put into it. But you have to give yourself the time. Please plan to do so!

Learning Outcomes and Topics

A detailed list of learning objectives for each unit of *Habitable Worlds* can be found [here](#).

These specific objectives support the overarching objectives of the course. Our goal is that students successfully completing the course can:

- Explain the conditions that can make a planet habitable.
- Identify and justify the steps necessary to determine if an exoplanet is habitable.
- Describe the history of Earth as an inhabited world and how this knowledge informs the search for life on other worlds.

More broadly, our hope is that students who succeed in this course improve their ability to navigate new challenges by:

- Describing and interpreting observations using...
 - data analysis (e.g., reading charts and graphs),
 - foundational mathematics (e.g., fractions, formulae, exponents),

- accessible computational methods (e.g., calculators, spreadsheets).
- Applying scientific reasoning, particularly...
 - using hypothesis-driven processes to create scientific models.
 - testing models using basic qualitative and quantitative reasoning.
 - choosing among competing ideas that have different levels of uncertainty.
- Applying problem-solving skills including...
 - breaking complex problems into multiple steps,
 - identifying the knowledge needed to solve each step,
 - and obtaining and interpreting that knowledge quantitatively and qualitatively.

II. WEEKLY ACTIVITIES AND TIME COMMITMENT

Class preparation means reviewing all material required in a given module and completing all assignments as indicated. Attendance in an online course means logging into the platform on a regular basis and participating in all of the activities posted.

As a 4-credit course, SES 106 requires 180 hours of work. Therefore, expect to spend approximately 24 hours per week preparing for and engaging in this course.

Course Content and Assignments

The course is organized around an overarching **project** that you need to solve: Find a potentially habitable world in a field of 500 stars. The project is open for you to work on at your own pace.

In addition to the project, you will need to complete **training exercises** and **assessment exercises** that are designed to teach you the concepts necessary to master the project. Your best strategy for success is to complete the training exercises before attempting the assessment exercises.

In this course, **you will encounter activities that you must complete before you can proceed to the next part of the course.** In some cases, you will be held on a particular activity or assessment page until you provide the *correct* answer. There are no skip buttons on these pages.

These course components can be accessed via the *HabWorlds LearnSpace*, which is accessed via the "Habitable Worlds - Access here" section of the course outline.

Training Exercises

The course is made up of training exercises that you will complete. You will earn points as you complete each training exercise, with more points awarded towards the end of the exercise than near the beginning. Training exercises are only graded for how much you complete. They are not graded for correctness. Training exercises are open all session and can be revisited and retried as often as you want. These exercises teach you what you need to know to complete the assessment exercises.

Assessment Exercises

You will also have assessment exercises to complete. In these exercises, your points are awarded based on how well you complete each assessment task. You can attempt these as often as you want while they are open, but all your attempts will be averaged together to generate your final assessment score.

The Project

The skills you build through the training exercises and assessment exercises will enable you to complete the overarching project. Points for the project are awarded based on how well you complete the tasks required. Within the project you can revise your answers to improve your score until you submit. The project can be retaken after you submit it. The highest score of all your attempts on the project will be used as your final project score.

Textbook

There is no textbook for this course. All necessary materials will be provided through the online interface.

III. COURSE REQUIREMENTS AND COMMUNICATION

Course Requirements

Recommended Prior Knowledge: To be successful in this course, we recommend basic pre-college math and science, English language fluency and computer literacy.

Online Course Requirements: You will find all content and learning activities within the course and HabWorlds LearnSpace. All course interactions use Internet technologies. It is your responsibility to complete all graded and ungraded assessments. You are encouraged to interact with your peers and course team in the discussion forums, and ask questions there as well.

Course Communication

All communication will take place via the discussion board, course updates, and course home page.

We are here to help you, and we encourage you to help each other as well. You can access the course discussion forum via the “Discussions” tab in the course. The teaching staff and your fellow students will try to help you there. You can also review the discussion forum to see if your question has already been asked (and answered) by someone else.

IV. STUDENT EVALUATION

Your final total grade for the course is determined by your total points at the end of the course. There are a total of 872 points possible in the course. Final course grades will be allocated as shown in the table below:

| Final Points | Final Grade |
|---------------|-------------|
| 785 or higher | A |
| 698 - 784 | B |
| 610- 697 | C |

There are no exams in the course. There is no final exam. There is no extra credit available.

The most update-to-date view of your total points score will be in the HabWorlds Learnspace. Your scores shown in the course progress page are only updated periodically (approximately weekly) and may not reflect your most recent activity.

There will be no + or - added to grades.

Course Units

Although this course is self paced, we suggest that you complete one unit per 1-2 weeks in order to stay engaged and active in this course. The units and points per unit are provided below.

| Unit | Activities | Points |
|--------------|---------------------------|--------|
| Introduction | 8 Training Exercises | 75 |
| Project | Habitable Hunt | 260 |
| R*: Stars | 6 Training + 6 Assessment | 145 |
| fp: Planets | 4 Training + 4 Assessment | 108 |

| | | |
|------------------|-------------------------------|------------|
| ne: Habitability | 6 Training + 6 Assessment | 152 |
| fl/fi: Life | 4 Training Exercises | 48 |
| fc/L: Survival | 7 Training Exercises | 84 |
| | Total points possible: | 872 |

Credit Eligibility

You must pass the course with a grade of C (70%) or higher and be on the Credit Eligible Track.

*Note: You have **up to one year to purchase credit** after you become eligible. Please see Section IX, below, “Taking this Course for ASU Credit” for more information.*

V. POLICIES

Assignment Deadlines: This is a self paced, online course. Your instructional team will provide all content and learning activities on your course site. All course interactions will use Internet technologies; it is your responsibility to review all content, fulfill all assignments on time, and ask any questions you have in our designated discussion area.

There are no unit deadlines, but all course work must be completed by the end of the course: August 31, 2021 at 06:59 UTC. For more information on UTC time zone, please see section VI, “UTC Time Zone” below.

Subject to Change Notice: This syllabus is to be used as a guide only. Information contained here, such as assignments, grading scales, deadlines, and other

materials are subject to change. It is your responsibility to read the course announcements regularly to be aware of any changes or updates in the course.

Academic Integrity: Academic honesty is expected of all students in all coursework and exams. The possible sanctions include, but are not limited to, appropriate grade penalties, course failure (indicated on the transcript as a grade of E), course failure due to academic dishonesty (indicated on the transcript as a grade of XE), loss of registration privileges, disqualification, and dismissal. For more information, review ASU's [Academic Integrity Policy](#) and [Terms of Use](#).

Prohibition of Commercial Note Taking Services: In accordance with ACD 304-06 Commercial Note Taking Services, written permission must be secured from the official instructor of the class in order to sell the instructor's oral communication in the form of notes. Notes must have the notetaker's name as well as the instructor's name, the course number, and the date.

Title IX: Title IX is a federal law that provides that no person be excluded on the basis of sex from participation in, be denied benefits of, or be subjected to discrimination under any education program or activity. Both Title IX and university policy make clear that sexual violence and harassment based on sex is prohibited. An individual who believes they have been subjected to sexual violence or harassed on the basis of sex can seek support, including counseling and academic support, from the university. If you or someone you know has been harassed on the basis of sex or sexually assaulted, you can find information and resources at <https://sexualviolenceprevention.asu.edu/faqs>.

As a mandated reporter, I am obligated to report any information I become aware of regarding alleged acts of sexual discrimination, including sexual violence and dating violence. [ASU Counseling Services](#) is available if you wish to discuss any concerns confidentially and privately.

Copyright Materials: This course contains copyrighted materials. Students should not share outside the class, upload, sell or distribute course content without consulting with the instructor.

VI. UTC TIME ZONE

This self paced course has no deadlines except for the last day of the course. All coursework needs to be completed by August 31, 2021 at 06:59 UTC.

To accommodate students from across the globe, any deadlines are posted in UTC time, the global standard. Please see “Deadlines and the UTC Time Zone” section of “Before the Course Begins” section for a detailed explanation.

Remember, it is your responsibility to understand UTC and determine the due dates and times for your time zone.

VII. GENERAL AND TECHNICAL REQUIREMENTS

This course is best accessed by a reasonably modern browser on a laptop or desktop computer. Chrome or Mozilla Firefox are suggested browsers, and Safari is **not** compatible with this course. Additionally, you will need a microphone (optional) and speaker.

VIII. GENERAL AND TECHNICAL ASSISTANCE

Student Support and Accessibility: Please review the “Student Support” page in the “Before the Course Begins” section for further information.

This course uses the Smart Sparrow platform to provide an interactive experience. The implementation of the course is more complex than many other online courses. While we have done our best to identify and resolve any technical issues before offering the course, like for any complex software, new technical bugs may

become apparent with additional use during the semester. The instructors and technical support staff will address these issues as quickly as possible.

We highly recommend that you explore the [Habitable Worlds webpage here](#).

IX. TAKING THIS COURSE FOR ASU CREDIT

ASU Credit: Students wishing to take this course for ASU credit are required to do the following:

- Upgrade your course to the credit eligible track by July 6, 2021 at 06:59 UTC.
- Submit the “Credit Eligibility Question” in the last section of the course
- Pass the course with a C or better (70% or higher)

Purchasing Credit

Important: Provided you have met all requirements for this course, you can purchase credit from ASU for **up to one year** after you become credit eligible.

Your date of eligibility **may differ** from the course end date. Please visit your course progress page, specifically the “Requirements for Course Credit” section, to see the status of your credit eligibility.

Please review the information on credit eligibility in the “Before the Course Begins” section for additional details.

Note: Potential limitations of internet connectivity by some countries may limit the ability of a credit eligible student residing in those countries to complete all the assessments, and therefore potentially impede the eligibility to earn college credit.