

Are We Alone? Probability and Implications of Finding ET Life

Quest 2

I. Course Information

Spring 2021

Meeting Day/Time: MWF, 4th Period (10:40 am – 11:30 am)

Location: Online

Instructor

Naibi Marinas – marinas@ufl.edu

Office location: Online

Office hours: Mondays 1 pm to 2 pm or by appointment – Zoom Conferences

Course Website: <https://ufl.instructure.com/courses/416652>

Course Communication

For any class-related logistic or content questions outside class time, students should use **Course Questions** discussion board. This will benefit all students that might have similar questions and avoid repetitive questions. The instructor will regularly answer all questions posted in the board.

For private questions, students should contact the instructor using the **Inbox in Canvas**.

If students use the Course Questions or Canvas Inbox, they can expect a reply from the instructor within 24 hours during weekdays, unless the question is posted during the two final weeks of classes. If a post is made Friday afternoon or during the weekend, it will not be answered until Monday.

The instructor will use the **Announcements** in the class website to communicate with the whole class outside class time. Students should frequently check the Announcement page. The class settings can be adjusted so that announcements are sent directly to emails.

Prerequisite Knowledge and Skills

There are no higher education prerequisites or co-requisites for this course. However, a high school level knowledge of mathematics is needed.

Required & Recommended Course Materials (to purchase/rent)

Life in the Universe by Bennett and Shostak, Fourth Edition, *Publisher: Pearson/Addison-Wesley, San Francisco.* (Selected readings)

Please note that this course will be participating in the **UF All Access** program. Login at <https://bsd.ufl.edu/allaccess> and Opt-In to gain access to your required course materials, eBook for Life in the Universe by Bennett. UF All Access will provide you with your required materials digitally at a reduced price and the charges will post directly to your student account, allowing any available Financial Aid funds to cover the cost of your materials. This option will be available starting 1 week prior to the first day of classes, January 11th, and ending 3 weeks after the first day of class, February 3rd.

Additional Reading Material: All additional reading material will be provided by the instructor free or charge.

Course Description

“Are we alone?” is a question that has always been fundamental to humans, but that only recently, has become the subject of empirical science. This course will focus on major scientific developments in biology and astronomy to help us understand the nature of life, the distribution of habitable environments in the Universe, and the possibility of encountering extraterrestrial life. We will also look at previous reactions to claims of extraterrestrial life and historical analogies of encounters with different civilizations to reflect on the societal impact of finding ET life. The course will be divided into four units: “What is Life?”, “What kills life?”, “Where can we find ET life?”, and “What will be the societal impact of finding ET life?”. We will discuss and evaluate international views and policies to pressing world challenges related to the course and demonstrate the need for a global approach when answering those challenges. Students will practice scientific inquiry and critical thinking skills to gain new understanding of the dynamic nature of scientific discoveries and their impact in society.

General Education

IDS 2935: Probability and Implications of ET Life has been designated a General Education Physical Science (P) and International (N) course. A minimum grade of “C” is required for general education credit.

Physical science courses provide instruction in the basic concepts, theories and terms of the scientific method in the context of the physical sciences. Courses focus on major scientific developments and their impacts on society, science and the environment, and the relevant processes that govern physical systems. Students will formulate empirically-testable hypotheses derived from the study of physical processes, apply logical reasoning skills through scientific criticism and argument, and apply techniques of discovery and critical thinking to evaluate outcomes of experiments

International courses promote the development of students’ global and intercultural awareness. Students examine the cultural, economic, geographic, historical, political, and/or social experiences and processes that characterize the contemporary world, and thereby comprehend the trends, challenges, and opportunities that affect communities around the world. Students analyze and reflect on the ways in which cultural, economic, political, and/or social systems and beliefs mediate their own and other people’s understanding of an increasingly connected world.

II. Coursework & Schedule

1. List of Graded Work

Assignment	Description	Requirements	%
Reading Quizzes (14)	Weekly multiple-choice reading quizzes (online)	Complete reading assignments and take online quiz	15
Online Experiments	<p>Experiment 1: Defining Life and The Viking Experiments Compare live and dead objects to brainstorm ideas of what life is. Play a 20 Question game to refine the definition of life. Test the definition on the results of the historical Mars Viking Mission experiments.</p> <p>Experiment 2: Impacts Use the Earth Impact Effects interactive program to estimate regional environmental consequences of an impact depending on impactor properties. Learn about famous impact craters on Earth and compare their impact effects. Change impactor size, density, impact angle and velocity to derive a first order approximation to the relation between properties of impactor and crater size.</p> <p>Experiment 3: Detecting Extrasolar Planets Use the an interactive exoplanet transit tool to collect data and derive properties of extrasolar planets.</p>	Complete in-class experiment and report	20
Class Group Project: Colonize Your Planet Competition.	Examine the environments of discovered habitable extrasolar planets in terms of nutrients, energy sources, liquids, temperature, and atmosphere. Plan a mock mission to one of the habitable extrasolar planets. Create a short advertising video to gather support for the mission. Depending on class size, mock missions will compete for funding. Class presentation.	Research extrasolar planet, complete mock mission proposal and advertising video. Class presentations.	20
Journal Reflection	Students will write a reflection entry answering the questions that organize the class content before and after covering the content in class. For the second entry, students will read or view a science fiction work that answers the same question and evaluate the plausibility of the stories taking into consideration what they have learned. They will also re-evaluate their first post on the topic and reflect on the lessons about themselves and humanity that can be learned from the imaginary scenarios	2 – 3 paragraphs per journal entry	20

	presented in the science fiction work. (The list of short stories and movies is included in the Course Material section.)		
Panel	Four student led discussion sessions will be scheduled during the semester. The four panels are: International ethics of human genetic manipulation, Global Environmental Policies, Ethics of space exploration and colonization, and Ethics and Astrobiology. Panelists will research their topic and lead the class discussion for that topic. The panelists will formulate a new set of global policies taken into consideration the class discussion. (The list of readings for each panel is included in the class website.)	Complete reading, present to class, lead discussion, answer questions, formulate new policies	20
In-class Discussions	Participation in in-class discussions and peer evaluation of presenters.	Submit questions for discussions. Peer evaluations.	5
Outside the Classroom Events (Extra Credit)	Students will attend an outside class research talk or virtual tour of a research institution related to astrobiology.	Submit a short one-paragraph summary of the event.	5

2. Weekly Course Schedule

Week/ Date	Activity	Topic/Assignment (Question/Subject)
Week 1 Jan 11, 13, 15	Topic	Unit I – What is Life? - Defining Life
	Summary	Introduction to class. Form student groups. Multiple definitions of life. The problem of defining life. Properties of Life. Simplest life forms today.
	Readings/Works	Bennett, Sections 5.1, 5.2, 5.3, 5.4, p. 153-183
	Assignment	Reading Quiz
		Student sign up as panelists for one of the four discussion panels
		Journal Reflection 1 – First Entry
Week 2 Jan 18, 20, 22	Topic	Earth Life
	Summary	Chemistry of Life. CHON (carbon/water) life. Liquid and life. Common characteristics of all life on Earth. DNA, genetic code. Mutation and Evolution. Experiment 1: Defining Life
	Readings/Works	Bennett, Sections 6.1, 6.2, 6.3, 6.6 p. 199-221, 233-238
	Assignment	Reading Quiz
		Panel 1 students prepare to present and lead discussion (reading material included in course material list)
Week 3 Jan 25, 27, 29	Topic	Evolution and alternatives to CHON life
	Summary	Origin of Life. Evolution of life on Earth. Diversity of Earth Life. Convergent evolution. Intelligence. Plausible alternatives to CHON life.

Week/ Date	Activity	Topic/Assignment (Question/Subject)
		Panel 1 Discussion: Beyond Evolution: International ethics of human genetic manipulation
	Readings/Works	Bennett, Chapter 4, p. 104-144
	Assignment	Reading Quiz
		Journal Reflection 1 – Second Entry
		Journal Reflection 2 – First Entry
Week 4 Feb 1, 3, 5	Topic	Unit II – What kills life? - Environment and Life
	Summary	Planetary evolution and life. Evolution of Earth and its atmosphere. The rise of oxygen. Magnetic field, ozone layer, greenhouse effect, the Moon, and their role in the evolution of life.
	Readings/Works	Bennett, Sections 5.5, 183-189
	Assignment	Reading Quiz
		Panel 2 students prepare to present and lead discussion (reading material included in course material)
Week 5 Feb 8, 10, 12	Topic	Environmental limits of Life
	Summary	Extremophiles (thermophiles, Psychrophiles, Halophiles, Acidophiles, Radioresistant, Endoliths). Panel 2 Discussion: Global Environmental Policies
	Readings/Works	Bennett, Chapter 10, p. 333-364
	Assignment	Reading Quiz
Week 6	Topic	Environmental and space threats to life (part 1)

Week/ Date	Activity	Topic/Assignment (Question/Subject)
Feb 15, 17, 19		
	Summary	The habitable zone. Evolution of the habitable zone and stellar evolution. Properties and evolution of Venus and the future of Earth. Runaway greenhouse effect.
	Readings/Works	Bennett, Section 6.4, p. 221-228 Gaia Hypothesis: http://www.gaiatheory.org/overview/ (two pages, 45 min video) Medea Hypothesis: Life is out to get you: https://blogs.scientificamerican.com/observations/paleontologist-peter-wards-medea-hypothesis-life-is-out-to-get-you/
	Assignment	Reading Quiz
Week 7 Feb 22, 24, 26	Topic	Environmental and space threats to life (part 2)
	Summary	Major extinction events. NEO. Radiation. End of universe scenarios. Technological threats to life. The Gaia vs. the Medea Hypothesis. Experiment 2: Impacts
	Readings/Works	Bennett, Section 7.1, p. 243-249
	Assignment	Reading Quiz
		Journal Reflection 2 – Second Entry
		Journal Reflection 3 – First Entry
Week 8 Mar 1, 3, 5	Topic	Unit III: Where can we find ET life? - Habitability
	Summary	What is necessary for habitability? Elements of Life: Nucleosynthesis (Big Bang, stellar nuclear fusion, supernova events and neutron star collisions). Stable energy sources: stellar, chemical, physical (tidal). Liquids/solvents. Stable environmental conditions.
	Readings/Works	Bennett, Chapter 8, p. 267-297
	Assignment	Reading Quiz

Week/ Date	Activity	Topic/Assignment (Question/Subject)
		Panel 3 students prepare to present and lead discussion (reading material included in Course Materials)
Week 9 March 8, 10, 12	Topic	ET Life on Mars
	Summary	Fantasies of Martian life. Properties of Mars. Past and future of Mars. Missions to Mars. Signature of probable Martian Life: Viking missions. AHL84001: Martian meteorite. Ammonia and methane detection as bio-markers.
	Readings/Works	Bennett, Sections 9.1, 9.2, 9.3, p. 302-327
	Assignment	Reading Quiz
Week 10 March 15, 17, 19	Topic	ET Life on the Jovian Moons
	Summary	Europa. Properties of Europa. Radiation. Liquid water and tidal heating. Life on Europa. Missions to Europa. Titan. Properties of Titan, atmosphere, liquids on Titan, methane/ethane cycle, cryovolcanoes. Life on Titan. Missions to Titan. Panel 3 Discussion: Ethics of space exploration
	Readings/Works	Bennett, Chapter 11, p. 369-415 (week 10-11)
	Assignment	Reading Quiz
Week 11 March 22, 24, 26	Topic	ET life in extrasolar planets (part 1)
	Summary	Star and planetary system formation. Best stars to search for habitable planets. Stellar lifetimes and life evolution timescales. The habitable zone and stellar luminosity.
	Readings/Works	Bennett, Section 11.3, 11.4
	Assignment	Reading Quiz

Week/ Date	Activity	Topic/Assignment (Question/Subject)
Week 12 March 29, 31, April 2	Topic	ET life in extrasolar planets (part 2)
	Summary	Detecting extrasolar planets (direct and indirect methods of detection). Properties of extrasolar planets and comparison with planets in our solar system. Extrasolar planets in the habitable zone. Experiment 3. Detecting Extrasolar Planets
	Readings/Works	Bennett, Sections 12.1, 12.2, 12.3 & Section 13.3, p. 423-448, 479-490
	Assignment	Reading Quiz
		Journal Reflection 3 – Second Entry
		Journal Reflection 4 – First Entry
Week 13 April 5, 7, 9	Topic	Unit IV: What would be the impact of finding ET life? – Communicating with ET Intelligence
	Summary	Drake Equation. The Search for ExtraTerrestrial Intelligence program (SETI). Radio searches. WOW signal (1977). Communicating with aliens. Messages sent from Earth: Arecibo broadcast of 1974, Pioneer 10 and 11 plaques, Voyager 1 and 2 plaques and records. Group Project Work: Colonize Your Planet
	Readings/Works	Dick, Astrobiology, Discovery and Society Impact, Chapter 1: History, p. 13-36
	Assignment	Reading Quiz
		Panel 4 students prepare to present and lead discussion (reading material included in Course Materials)
Week 14 April 12, 13, 16	Topic	Societal impact of ET contact
	Summary	Historical reactions to claims of encounters with ET life. Using historical analogies: pre-Columbian civilizations. The Fermi Paradox and possible solutions.

Week/ Date	Activity	Topic/Assignment (Question/Subject)
		Group Project Presentations: Colonize your planet presentations.
	Assignment	Journal Reflection 4 – Second Entry
Week 15 April 19, 21, 23	Topic	Ethics and Astrobiology
	Summary	Panel 4 Discussion: Ethics and Astrobiology
	Readings/Works	N/A
	Assignment	N/A
	Final	N/A

III. Grading

3. Statement on Attendance and Participation

Attendance and Participation:

Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found at: <https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/>

- **Participation:** Consistent informed, thoughtful, and considerate class participation is expected.
- **NOTE:** If you have personal issues that prohibit you from joining freely in class discussion, e.g., shyness, language barriers, etc., see the instructor as soon as possible to discuss alternative modes of participation.

4. Grading

Assignment	Weight
Weekly Reading Quizzes – Class Preparation	15 %
In-class Experiments (3)	20 %
Group Project	20 %
Journal Reflections (8)	20 %
Panel	20 %
In-class Discussions	5 %
Extra Credit	5 %

For information on how UF assigns grade points, visit: <https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/>

A	94 – 100% of possible points		C	74 – 76%
A-	90 – 93%		C-	70 – 73%
B+	87 – 89%		D+	67 – 69%
B	84 – 86%		D	64 – 66%
B-	80 – 83%		D-	60 – 63%
C+	77 – 79%		E	<60

Weekly Reading Quizzes (15 %): A major responsibility for this class will be to complete the reading assignments before we meet for class. Online multiple-choice reading quizzes based on the reading will be assigned each week.

Online Experiments (20 %): A set of virtual experiments will be used for further exploration of the topics we study. They will allow you to experience the process of science. You will be evaluated based on your participation and your answers to a set of questions about each experiment.

Journal Reflections (20 %): You will complete eight reflection journal entries throughout the term, one before and after each of the four class units. In the first entry, you will reflect on the main question organizing the class content for that unit and provide a personal answer to the question **before** we cover the material in class. At the end of each unit, you will read or view a science fiction work (lists included in the Course Material subsection of this syllabus) that also answers the question to gain insight and critically examine an alternative scenario. You will write a second journal entry evaluating the plausibility of the story taking into consideration the boundary between real science and science fiction and what you learned in class. You will also reflect on the lessons about yourself and humanity that can be learned from the imaginary scenarios presented in the story and how scientific knowledge shapes our views by re-evaluating your first journal entry to each question. While the due date for both entries are different, they will be graded as one assignment using the following rubric.

Criteria	Exemplary	Accomplished	Developing	Unsatisfactory	Total
Content Reflection	50 points Reflection demonstrates a high degree of critical thinking in applying, analyzing, and evaluating key course concepts and theories from readings, and lectures. Insightful and relevant connections made through contextual explanations, inferences, and examples.	40 points Reflection demonstrates some degree of critical thinking in applying, analyzing, and/or evaluating key course concepts and theories from readings and lectures. Connections made through explanations, inferences, and/or examples.	30 points Reflection demonstrates limited critical thinking in applying, analyzing, and/or evaluating key course concepts and theories from readings and lectures. Minimal connections made through explanations, inferences, and/or examples.	15 points Reflection lacks critical thinking. Superficial connections are made with key course concepts and course materials, activities, and/or assignments	/50
Personal Growth	30 points Conveys strong evidence of reflection on own first entry to the question with a personal response to the self-assessment questions posed. Demonstrates significant personal growth and awareness of deeper meaning through inferences made, examples, well developed insights, and substantial depth in perceptions and challenges. Synthesizes current	20 points Conveys evidence of reflection on own first entry to the question with a personal response to the self-assessment questions posed. Demonstrates satisfactory personal growth and awareness through some inferences made, examples, insights, and challenges. Some thought of the future implications of current experience.	10 points Conveys limited evidence of reflection on own first entry to the question in response to the self-assessment questions posed. Demonstrates less than adequate personal growth and awareness through few or simplistic inferences made, examples, insights, and/or challenges that are not well developed. Minimal thought of the future	5 points Conveys inadequate evidence of reflection on own first entry to the question in response to the self-assessment questions posed. Personal growth and awareness are not evident and/or demonstrates a neutral experience with negligible personal impact.	

	experience into future implications.		implications of current experience.	Lacks enough inferences, examples, personal insights and challenges, and/or future implications are overlooked.	
Writing Quality	20 points	17 points	12 points	8 points	/20
	Well written and clearly organized using standard English, characterized by elements of a strong writing style and basically free from grammar, punctuation, and spelling errors.	Average and/or casual writing style with some organization problems. Writing is free from grammar, punctuation, and spelling errors.	Average and/or casual writing style that is sometimes unclear and/or with some errors in grammar, punctuation, and spelling.	Poor writing style lacking in standard English, clarity, language used, and/or frequent errors in grammar, punctuation, and spelling. Needs work.	
TOTAL POINTS (sum of 4 Criteria)					/100

Panel Discussions (20 %): You will select one of the following topics to lead (International ethics of human genetic manipulation, Global Environmental Policies, Ethics of space exploration and colonization, Ethics and Astrobiology) and participate in a panel discussion. These four topics are at the center of each of the four units covered in this course.

A panel discussion is a discussion of a subject of public interest by a group of persons forming a panel before an audience. You and your partners will present the views and regulations of the topic in different regions of the world and examine the cultural, economic, geographic, historical, political, and/or social experiences that influence the different approaches as well as global policies in response to the topic. After delivering the presentation, the class will submit questions, and the panel members will answer the questions. The panel will reconvene after the discussion and formulate new global policies for the topic taken into consideration the questions and ideas of the other students in the class.

Basic components of Panel Discussion:

- Group Work – establish “norms” of how your group will work together and adhere to them. At the end, you will assess yourself and your group members.
- Research the topic and include facts, statistics and pertinent information to support your position on the topic.
- Prepare a slide show presentation to present the research to the class.
- Practice and time the slideshow presentation with other panel members.

Slideshow:

- Includes only essential information (facts or important points)
- No more than 3 bullets. No more than 6 words per bullet
- Correct spelling, capitalization and punctuation are used
- Must be legible – dark font on light background or light on dark
- Images, background, themes and animation support ideas so must be on topic.
- Include Works Cited using MLA citations (www.easybib.com makes it easy).

Presentation:

- No longer than 20 minutes to present slideshow and all main points.
- Do not read the information on slides. Refer to slides but keep eye contact with the audience.
- Each panel member presents using appropriate volume and gestures.
- Groups will time the speech when practicing, so you know you can keep it to the time limit – 20 minutes.
- Use flash cards if you want, but they are not required. Avoid reading flash cards and/or slides throughout your presentation.

Panel Discussion

- Follow the Panel Discussion Rules and Guidelines provided.
- Anticipate questions and responses to counter arguments.
- Attentive audience members will be assessed for their ability to record questions for presenters (questions will be written down during the presentation and submitted at the end), listen attentively and pose relevant questions.
- Exit survey: each student will indicate his or her personal opinion of the topic before the panel discussion. After the panel students will indicate if their position has changed and if so, why.

New Global Policies

- Reconvene with panel members and discuss modifications to global policies considering the audience input during the Panel discussion.
- Formulate new global policies that address your concerns and those of your classmates.

Grading: You will be graded on your ability to work well with your partners, research your topic, create a slideshow, present in front of an audience, respond to questions from the audience while following the rules of a panel discussion and address the audience concerns when you formulate the new global policies.

Peer (group members) and self-evaluation (20 %)

Audience panel evaluation (40 %)

Instructor evaluation (40 %)

Class Project (20 %): You will work on a class group project during the semester. For the class project you will need to examine the environments of discovered habitable extrasolar planets in terms of nutrients, energy sources, liquids, temperature, and atmosphere and you will plan a mock mission to one of the habitable extrasolar planets. Each group will create a short advertising video to gather support for the mission and compete with other missions for funding. Each group will have an opportunity to present the mission to the class and the class will rank all missions to prioritize “funding”.

Grading for the Class Group Project will include 40 % self- and group members evaluation score, 60 % instructor evaluation. Depending on class size, other groups will also review the presentations.

In-Class Discussions (5 %): We will have in-class discussions to brainstorm new perspectives on the topics covered in class and how they can alter our society and our future. All students will submit questions during the semester to use in the class discussions. As such, students will be assessed by their participation and contribution to these discussions, including the panel discussions. Completing peer

evaluations for all class presentations will also be part of your discussion and participation grade. Students are expected to write thoughtful, detailed questions and comments.

Rubric for self and peer-evaluation Group Work in Panel and Class Project:

Name	My Name	Member's Name	Member's Name	Member's Name	Member's Name
Collaboration					
Participation					
Preparation					
Quality of Input					
Knowledge of subject					
Communication					
Total Score					

When our group was collaborating together, this person:

- 4- Listens to other's ideas. Gives broad ideas and expands on them or encourages others to do so. Builds on contributions of others.
- 3- Listens well. Contributes ideas but the ideas do not deepen the discussion rather maintain it at current level.
- 2- Listens fairly well but interrupts at times. Rarely deepens the discussion.
- 1- Overbearing. Interrupts. Doesn't allow discussion of ideas other than own and/or does not listen or contribute.

The way in which this person participated was:

- 4- Contributes ideas. Actively speaks up. Brainstorms.
- 3- Contributes some ideas but is mainly passive.
- 2- Sits passively.
- 1- Does nothing.

This person was prepared in the following way:

- 4- Does more than required.
- 3- Does what committed to do.
- 2- Does some of what committed to do.
- 1- Does nothing.

The typical quality of input this person provided was:

- 4- Provides extensive accurate information to group members.
- 3- Information is usually accurate and is an adequate amount.
- 2- Mostly misinforms group or provides little information.

1- Provides group with no useful accurate information.

This person displayed a knowledge of the subject such as:

- 4- Attends class and demonstrates understanding of relevant topics. Takes good notes.
- 3- Misses occasional info., but is generally informed about material covered in class and readings.
- 2- Misses info. often, but knows some class material and readings.
- 1- Misses class and expects others to inform him/her about material.

They way in which this person communicated was:

- 4- Reliably communicates progress to group. Reachable and regularly checks messages/email. Talks with others in group.
- 3- Stays in fairly good touch with the group, but is occasionally difficult to contact.
- 2- Is unreachable but initiates communication with others occasionally.
- 1- Is unreachable and does not communicate with group members about the project.

Peer Review Rubric for Class Group Project Presentation

Group:

Use the scale to fill in the chart to help determine the grade of your classmates.

1-Strongly Agree 2-Agree 3-Somewhat Agree 4-Disagree 5-Strongly Disagree

The preparation for the presentation was very well organised and the performance ran smoothly.	
The information was highly accurate and relevant to the theme	
All the group members participated in the presentation	
Students use words, terms, and examples which the audience clearly understand.	
Presenter speaks in an understandable voice, using clear tone, enunciation, and reasonable pace; message is clearly received.	
Presentation was colorful, creative, and the information was easy to read	
All images in the video were relevant to the information presented	

- 1. Give one fact you learned about this planet

- 2. Would you select this planet for exploration? Why or why not?

3. The presentation area for improvement is:

IV. Quest Learning Experiences

5. Details of Experiential Learning Component

Students will have the opportunity to attend two out-of-classroom learning experiences. Students can attend one of the public nights at the Campus Teaching Observatory (available most Fridays depending on the weather) or a scheduled visit to UF/IFAS Space Plants Laboratory. At the Campus Teaching Observatory students will have the opportunity to use telescopes to observe visible objects in the night sky. At the UF/IFAS Space Plant Lab, students will have the opportunity to talk with plant molecular biologists about the work they are doing to grow plants in space.

6. Details of Self-Reflection Component

Students will complete eight reflection journal entries throughout the term, one before and after each part of the class. In the first entry, students will be asked to reflect on the main question organizing the class content and provide a personal answer to the question before we cover the material in class. At the end of each section, students will read or view a science fiction work (lists included in the Course Material subsection of this syllabus) that also answers the question to gain insight and critically examine an alternative scenario. Students will write a second journal entry evaluating the plausibility of the story taking into consideration the boundary between real science and science fiction and what they learned in class. They will reflect on the lessons about themselves and humanity that can be learned from the imaginary scenarios presented in the story and how scientific knowledge shapes our views by re-evaluating their first journal entry.

V. General Education and Quest Objectives & SLOs

7. This Course's Objectives—Gen Ed Primary Area and Quest

Physical Sciences Objectives →	Quest 2 Objectives →	This Course's Objectives → (This course will....)	Objectives will be Accomplished By: (This course will accomplish the objective in the box at left by...)
Physical science courses provide instruction in the basic concepts, theories and terms of the scientific method in the context of the physical sciences.	Address in relevant ways the history, key themes, principles, terminologies, theories, or methodologies of the various social or biophysical science disciplines that enable us to address pressing questions and challenges about human society and/or the state of our planet.	address concepts, theories and terms of the scientific method in the context of astrobiology that enable us to explore the probability of extraterrestrial life.	weekly reading assignments, lectures, in-class experiments and a group project.
Courses focus on major scientific developments and their impacts on society, science and the environment, and the relevant processes that govern physical systems.	Present different social and/or biophysical science methods and theories and consider how their biases and influences shape pressing questions about the human condition and/or the state of our planet.	cover major scientific developments in the field of biology and astronomy that emphasize the dynamic relation between life and its environment and how changing planetary atmospheres and stellar evolution alter the condition for habitability, consider how their biases and influences shape our definition of life, its needs, and our expectations of life beyond our planet.	weekly reading assignments, lectures, experiments, panel discussions, a final group project and reflective journaling.

Physical Sciences Objectives →	Quest 2 Objectives →	This Course's Objectives → (This course will...)	Objectives will be Accomplished By: (This course will accomplish the objective in the box at left by...)
Students will formulate empirically-testable hypotheses derived from the study of physical processes, apply logical reasoning skills through scientific criticism and argument, and apply techniques of discovery and critical thinking to evaluate outcomes of experiments.	Enable students to analyze and evaluate (in writing and other forms of communication appropriate to the social and/or biophysical sciences) qualitative or quantitative data relevant to pressing questions concerning human society and/or the state of our planet.	enable students to gather, analyze, evaluate data and formulate hypothesis about the definition of life, threats to life, properties and habitability of extrasolar planets, and current international policies on key issues like genetic manipulation, environmental protection, space exploration and encountering ET life.	in-class experiments, group project, panel discussions and reflective journaling.
	Analyze critically the role social and/or the biophysical sciences play in the lives of individuals and societies and the role they might play in students' undergraduate degree programs.	Analyze and evaluate the role astrobology play in answering fundamental questions about ourselves and reflect on the personal and societal impact of the questions.	assigned reading/viewing of science-fiction works, journal reflections, discussion panels.
	Explore or directly reference social and/or biophysical science resources outside the classroom and explain how engagement with those resources complements classroom work.	explore how astrobiologist use telescopes and experiments to prepare us for the colonization of space	outside classrooms visits to the UF Campus Teaching Observatory and UF/IFAS Space Plant Lab

8. This Course's Student Learning Outcomes (SLOs)—Gen Ed Primary Area and Quest

	Physical Sciences SLOs → Students will be able to...	Quest 2 SLOs → Students will be able to...	This Course's SLOs → Students will be able to...	Assessment Student competencies will be assessed through...
Content	Identify, describe, and explain the basic concepts, theories and terminology of natural science and the scientific method; the major scientific discoveries and the impacts on society and the environment; and the relevant processes that govern biological and physical systems.	Identify, describe, and explain the cross-disciplinary dimensions of a pressing societal issue or challenge as represented by the social sciences and/or biophysical sciences incorporated into the course.	Identify, describe, and explain major scientific developments in the field of biology and astronomy that allow us to address the definition and environmental needs of life in our solar system and beyond. Compare how social values and beliefs affect the reception and societal impact of these issues around the world.	Quizzes, Experiments, Panel discussions and journal reflections.
Critical Thinking	Formulate empirically-testable hypotheses derived from the study of physical processes or living things; apply logical reasoning skills effectively through scientific criticism and argument; and apply techniques of discovery and critical thinking effectively to solve scientific problems and to evaluate outcomes.	Critically analyze quantitative or qualitative data appropriate for informing an approach, policy, or praxis that addresses some dimension of an important societal issue or challenge.	Analyze quantitative data to formulate testable hypothesis on the definition of life, threats of impacts and properties and habitability of extrasolar planets. Analyze and evaluate global policies on genetic manipulation, environmental protection, space exploration, and ET contact. Formulate new sets of policies based on class discussions.	Experiments, panel discussions and a group project.

	Physical Sciences SLOs → Students will be able to...	Quest 2 SLOs → Students will be able to...	This Course's SLOs → Students will be able to...	Assessment Student competencies will be assessed through...
Communication	Communicate scientific knowledge, thoughts, and reasoning clearly and effectively.	Develop and present , in terms accessible to an educated public, clear and effective responses to proposed approaches, policies, or practices that address important societal issues or challenges.	Summarize and present global policies on genetic manipulation, environmental protection, space exploration and ET contact, and create new sets of policies. Discuss the reception and societal impact of the policies and their relation to pressing societal challenges. Develop and present a convincing argument to support exploring extrasolar planets.	Panel Discussions and a final Group Project
Connection	N/A	Connect course content with critical reflection on their intellectual, personal, and professional development at UF and beyond.	Connect course content with alternative scenarios presented in science fiction. Critically reflect on the lessons the stories present and their personal and societal impact.	Reflection journal

9. Secondary Objectives and SLOs (Optional)

International Objectives →	This Course's Objectives → (This course will....)	Objectives will be Accomplished By: (This course will accomplish the objective in the box at left by...)
International courses promote the development of students' global and intercultural awareness.	Promote the development of students' global and intercultural awareness.	studying how key issues in astrobiology are viewed in different regions of the world, discussing and evaluating international policies and formulating new global policies
Students examine the cultural, economic, geographic, historical, political, and/or social experiences and processes that characterize the contemporary world, and thereby comprehend the trends, challenges, and opportunities that affect communities around the world.	examine the cultural, economic, geographic, historical, political and social factors that shape how different regions of the world approach genetic manipulation, environmental protection and space exploration and colonization	assigning reading material that cover international and global policies and regulations on these issues and having student panel discussions on these issues.
Students analyze and reflect on the ways in which cultural, economic, political, and/or social systems and beliefs mediate their own and other people's understanding of an increasingly connected world.	discuss, analyze and reflect on the ways in which cultural, economic, political and social systems and beliefs mediate our personal views and approaches to key issues in astrobiology and how the global nature of these issues requires a global approach.	having student led panel discussions, assigning science-fiction reading/viewings that present alternative scenarios, and using reflective journal entries

VI. Required Policies

10. Students Requiring Accommodation

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the Disability Resource Center by visiting <https://disability.ufl.edu/students/get-started/>. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

11. UF Evaluations Process

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

12. University Honesty Policy

UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code (<https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

13. Counseling and Wellness Center

Contact information:

Counseling and Wellness Center (352) 392-1575: <https://counseling.ufl.edu/international-support/>

University Police Department: (352) 392-1111 or 9-1-1 for emergencies.

14. The Writing Studio

The writing studio is committed to helping University of Florida students meet their academic and professional goals by becoming better writers. Visit the writing studio online at <http://writing.ufl.edu/writing-studio/> or in 2215 Turlington Hall for one-on-one consultations and workshops.