

Course Description

This course is designed for science and nonscience majors and focuses on life as an emergent phenomenon in the universe. Topics covered will include how scientists define life; competing theories on the origin of life on Earth (including the RNA world, metabolism-first, and panspermia); major events that shaped the evolution of terrestrial life; and “extreme” environments on Earth that have expanded scientific understanding of the limits of life and offer clues to life on other worlds, including deep sea hydrothermal vents, hot springs, acid mine drainages, Chile’s Atacama Desert, and Antarctica’s McMurdo Valley. We will also explore how life has transformed Earth, from the prehistoric cyanobacteria that generated the oxygen in our atmosphere, to the human activity that is rapidly changing our climate today. Possible techniques for searching for life on other planets and moons will be covered, including promising locations for extraterrestrial life within and outside our Solar System. The course will also discuss the possibility of terraforming and/or settling on other worlds, planetary protection, and the risks of applying a colonialist attitude to space exploration. Course material will be interwoven with classical and current scientific literature on astrobiological topics, as well as examples of alien life and space exploration in literature and film. The objective of the course is to give students an introduction to the discipline of astrobiology, including the scientific discourse around defining life and searching for it on other worlds, and how questions asked by astrobiologists have captivated the human imagination.

Teaching Goals and Student Expectations

The course will be taught in a lecture and discussion format, where ideas will be presented by the instructor and then opened up for consideration by the class. Students will be provided with the scientific data to discuss varying strategies and opposing theories in astrobiological research. The ability to critically analyze and effectively communicate scientific ideas will be stressed throughout the course.

Course Readings

Astrobiology: A Very Short Introduction by David C. Catling

What Is Life? by Erwin Schrödinger

“The Astrobiology Primer v2.0,” Domagal-Goldman and Wright et al., *Astrobiol* 2016

“Astrobiology and the possibility of life on Earth and elsewhere,” Cottin et al., *Space Sci Rev* 2015

“Electrons, life and the evolution of Earth’s oxygen cycle,” Falkowski and Godfrey et al., *Philos Trans R Soc Lond B Biol Sci* 2008

“Transformation of matter in living organisms during growth and evolution,” Hansen et al., *Biophys Chem* 2021

“How nonequilibrium thermodynamics speaks to the mystery of life,” Ornes, *PNAS* 2017

“Cofactors are remnants of life’s origin and early evolution,” Goldman and Kacar, *J Mol Evol* 2021

“The drive to life on wet and icy worlds, Russell et al., *Astrobiol* 2014

Readings will also include brief selections from:

Atom and Void: Essays on Science and Man’s Community by J. Robert Oppenheimer

Compendium of Astrobiological Classics: Perspectives on Foundational Texts edited by Sanjoy M. Som

Life’s Engines: How Microbes Made Earth Habitable by Paul Falkowski

Wonderful Life: The Burgess Shale and the Nature of History by Stephen Jay Gould

Blindsight by Peter Watts

Dune by Frank Herbert

“The Color Out of Space” by H.P. Lovecraft

The Martian Chronicles by Ray Bradbury

Red Mars by Kim Stanley Robinson

The Lathe of Heaven by Ursula K. LeGuinn

Oryx and Crake by Margaret Atwood

The Hitchhiker’s Guide to the Galaxy by Douglas Adams

Course Viewings will include brief selections from:

2001: A Space Odyssey

The Abyss

Alien

Contact

Invader Zim

Star Trek: The Original Series

A Trip to the Moon

The Twilight Zone

Semester Plan: Topics Covered

A Brief History of Astrobiology

-In-class discussion: My Favorite Alien

What Is Life? Information, Self-Perpetuating Engines, and Other Stuff That Will Blow Your Mind

-In-class activity: Develop a definition for life.

The Origin of Life on Earth

-In-class discussion: Argue in favor of one of the prevalent origin of life hypotheses.

How Planets Shape Life, and How Life Transforms Planets

-In-class discussion: Can a planet be considered “alive”?

“Extreme” Environments

-In-class activity: Searching for the limits of life.

Biosignatures and the Search for Life Elsewhere

-In-class discussion: Is life rare, random, or inevitable?

Is There Life on Mars (or Venus, or Europa, or...)?

-In-class discussion: Where in our Solar System are we most likely to find extraterrestrial life?

The Drake Equation and Exoplanets

-In-class discussion: Will we find extraterrestrial life in this century?

Fermi’s Paradox and “Intelligent Life”

-In-class discussion: What is intelligence? What is consciousness?

Space Exploration and Colonization in the Anthropocene

-In-class discussion: Should we terraform and colonize other worlds?

Student presentations

Assignments

Students will be assessed based on participation in class activities and discussions (20% of final grade), short answer format quizzes (40%), an in-class presentation on an astrobiologically relevant topic (20%), and a comprehensive final exam (20%).

GENERAL STUDIES AGREEMENT FORM For New General Studies Courses

Please complete and attach all materials for your General Studies Course Proposal Application to this form. If you have questions about the General Studies process or would like to discuss your course prior to submitting your Application, please contact the Convenor of the appropriate General Studies Course Review Committee. The completed application should be sent to the Dean of the School of General Studies.

If you design your own course, you will be asked to submit a Proposal Application. Refer to the document entitled “How to Propose a General Studies Course” for description of the course proposal process and guidelines for completing your Proposal Application.

If you propose to teach an existing course or a section of a course with multiple sections, it will suffice to submit a standard syllabus. However, if you propose to teach a course that is part of the College’s course inventory but may have fallen into disuse because a faculty member either departed or no longer teaches the course, please submit a complete Proposal Application as if the course were new.

Adjuncts of courses that are not part of multiple section offerings agree to meet with the apropos General Studies committee during the second and fourth years of a course offering to review their experience; after that, adjunct faculty will review their course every 5 years. This course review follows the course review process described in the document entitled “How to Propose a General Studies Course”; refer to that section for fuller explanation of the review process and procedures.

All faculty members whose General Studies courses are approved agree to submit their courses for a review process every five years. A section of the web page entitled "How to Propose a General Studies Course" describes the review process; refer to that section for an explanation of the review process and procedures.

Finally, all instructors are advised that the approval of a General Studies course does not automatically insert such a course into an interdisciplinary minor no matter how suitable such inclusion may be. Decisions about faculty membership in the minor and about inclusion of courses in the curricula of minors are at the discretion of the program faculty of the minor. Similarly, courses do not receive attributes or subscripts automatically, either. Nor does a course become part of the Freshman Seminar Program concurrent with its approval as a General Studies course. Attribute and subscript designation and inclusion in the Freshman Seminar Program require separate approval after the course has gone through the General Studies course approval process. Faculty members interested in such designations should contact the appropriate coordinator.

Please sign this page and submit it together with your General Studies Course Proposal Application materials to the Dean of the School of General Studies.



Signature

Date

Please print your name clearly here

Please send this form and any attachments to the Dean of the School of General Studies at least two weeks prior to a scheduled new course proposal meeting. Sample, completed new course forms are accessible on the [General Studies website](#).

GENERAL STUDIES NEW COURSE PROPOSAL FORM

These sections should be completed by the faculty/staff member proposing the course.

Acronym	Course Level (1XXX 2XXX 3XXX 4XXX 5XXX 6XXX)	Credits

Schedule Type	<input type="checkbox"/> Lecture (1-5)	<input type="checkbox"/> Seminar (0-6)	<input type="checkbox"/> Tutorial (7)	<input type="checkbox"/> Independent study (8)	<input type="checkbox"/> Internship (9)
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Instructor Name	Program	School

Complete Course Title (30 characters maximum)

Prerequisite	<input type="checkbox"/> Yes <input type="checkbox"/> No
If yes, list prerequisite by Acronym & Number	

Course Status:	<input type="checkbox"/> New <input type="checkbox"/> Adapted
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NOTE: All Subscript designations and/or W/Q approvals must be submitted through the appropriate Convenor.

Course Description for the Bulletin – must be approximately 45 words

The sections below should be completed by the General Studies Convenor.

Review Outcome:	Yes	No	
	<input type="checkbox"/>	<input type="checkbox"/>	Course meets guidelines for "G" category
	<input type="checkbox"/>	<input type="checkbox"/>	Course meets at least two General Studies objectives List Objective Numbers _____

Course As A Whole Is:	<input type="checkbox"/>	Approved Unanimously	<input type="checkbox"/>	Disapproved With A Split Vote
	<input type="checkbox"/>	Approved With A Split Vote	<input type="checkbox"/>	Disapproved Unanimously

Subcommittee Members Present:	
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Recommendations:	
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Program Convenor: _____ Date: _____

Dean of General Studies: _____ Date: _____

1. General Studies Category

Identify and explain the ways in which the course fits the selected [course category](#) (GAH, GEN, GIS, GNM or GSS):

Select Course Category:

Explanation of chosen course category:

2. Course Description (250-300 word explanation of the course, overall focus, and academic rationale):

3. Course Proposal Narrative

Explain the new learning opportunities provided by the course and the interdisciplinary nature of the course; in addition provide a course outline/syllabus, including overall organization of the course – learning modules, breakdown of the in-class and out of class work -- readings and assignment descriptions; please refer to the document entitled "[How to Propose a General Studies Course](#)" for a fuller description.

Interdisciplinary Nature:

Difference from a Program Course in an Academic Discipline

Describe the ways in which the course is different in content, goals, and objectives from a Program course in a discipline:

4. Alignment of Course Goals to Assignments

Identify the objectives met by this course. All courses are expected to meet at least two [General Studies objectives](#) and one or more college-wide ELOs. Content goals specific to the course should also be given here.

Course Content Goals:

List specific goals here (e.g. For a Food Science course - Students will explain the physics of heat transfer and how this influences cooking with different materials)

General Studies Objectives

ELOs

IDEA

Explain how the goals identified above will be met and assessed, for example through specific readings and assignments. If you need more space, please attach additional information with your completed form.

Adjunct faculty proposing a new General Studies course should, in addition, complete a Sponsor Form and attach a CV.

Please send this form and any attachments to the Dean of the School of General Studies at least two weeks prior to a scheduled new course proposal meeting. Sample, completed new course forms are accessible on the [General Studies website](#).