MSL 294 Astrobiology:

Planets, Oceans, and Life

Spring 2015

Instructor

Dr. Eric Collins
207B O'Neill
(907) 474-6482
recollins@alaska.edu

office hours: Monday/Thursday 3:15 – 4:15 & by appointment

Astrobiology is the study of the origins, evolution, and future of life on Earth and elsewhere in the Universe. From humble beginnings as self-replicating chemical systems in primordial oceans to advanced civilizations capable of interplanetary flight, life has survived and thrived on Earth for billions of years. *But are we alone?* The **goal of this course** is to discover what scientists have learned about life in the universe while working to answer that question.

Textbook

Life in the Universe (3rd Edition) – J. Bennett and S. Shostak (2011) Addison-Wesley

Suggested supplementary readings:

The Astrobiology Primer: An Outline of General Knowledge – L.J. Mix and 21 others (2006) URL http://arxiv.org/abs/astro-ph/0610926

Astrobiology: A Multidisciplinary Approach – J. Lunine (2005) Addison-Wesley

Course outline:

- MWF 1:00—2:00 (3 hours per week), Room 201 O'Neill
- First Day of Classes: Friday, 16 January, 2015
- Mid-term Examination 1: Friday, 13 February, 2015
- Mid-term Examination 2: Friday, 10 April, 2015
- Last Day of Classes: Monday, 4 May, 2015
- Final Examination: XXX, XXX--XXXpm, Room 201 O'Neill

Course description:

MSL 294, Astrobiology, 3+0 credits
Prerequisites: ENGL 111X and one of the following: BIOL 103X, CHEM 103X, GEOS 101X, PHYS 102X.
Study of life in the universe from a transdisciplinary perspective, bringing together insights from physics, astronomy, geology, chemistry, and biology. Topics include the evolution of the universe, planets, oceans and life. Past and present oceans found in the Solar System provide case studies from which to examine the potential for life on and off the Earth. Societal questions related to the origins of life, global climate change, and the possibility of extraterrestrial life will be discussed.

Learning Outcomes:

- Understand and explain the basic physical and chemical structure of the universe
- Evidence knowledge of major planetary formation and evolutionary processes
- Understand and discuss the relevance of water for the origins and evolution of life
- Describe the oceans of the Solar System, and predict their evolution over geologic time
- Explain the planetary geologic processes that influence global climate change
- Engage with peers' views on the origins and future of life on Earth

Instructional Methods: Lectures and small group discussions. Distance delivery available. All class presentations will be posted as Powerpoint slides on Blackboard. Instructor will use the Blackboard system to communicate with students.

Schedule for Astrobiology Spring 2015

Tentative Start Date	Topic	Reading (in textbook)
January 16	Introduction, syllabus discussion	
January 19	The New Science of Astrobiology	Chapter 1
January 26	The Old Question: Are we alone?	Chapter 2
February 2	The Structure of the Universe	Chapter 3
February 9	How to Make a Planet	Chapter 3
February 13	**Midterm 1 (20%)**	
February 16	The Habitability of Earth	Chapter 4
February 23	Climate regulation and change	Chapter 4
March 2	Defining Life	Chapter 5
March 9	Life at the Extreme	Chapter 5
March 13	**Essay 1 due (15%)**	
March 16—20	*Spring Break*	
March 23	The Origin of Life	Chapter 6
March 30	The Evolution of Life	Chapter 6
April 6	The Habitable Zone Concept	Chapters 7+10
April 8	The Future of Life on Earth	Chapter 10
April 10	**Midterm 2 (20%)**	
April 13	Extinct Oceans: Venus and Mars	Chapter 10
April 15	Living Oceans: Earth	Chapter 8
April 17	Icy Oceans: Europa and Ganymede	Chapter 9
April 20	Weird Oceans: Titan	Chapter 9
April 22	Extrasolar planets	Chapter 11
April 24	**Essay 2 due (15%)**	
April 27	Rare Earth	Chapter 11
April 29	Drake Equation & Fermi Paradox	Chapters 12+13
May 4	Contact & the Future of Astrobiology	Chapters 12+13
May [5—8]	**Comprehensive Final Exam (30%)**	

Evaluations:

Will be based on 2 mid-term exams, 2 essays, and a cumulative final exam. Grading is absolute.

20% (200 points) Mid-term examination 1: short answer and multiple choice
15% (150 points) Essay 1: see topics and format below
20% (200 points) Mid-term examination 2: short answer and multiple choice
15% (150 points) Essay 2: see topics and format below
30% (300 points) Comprehensive Final exam: short answer and multiple choice

Essay topics:

How will human impacts on Earth's oceans affect the future evolution of life on Earth and in our Solar System?

If human civilization ended tomorrow, what evidence of our existence would be left for extraterrestrial archaeologists to discover after one thousand, one million, and one billion years?

For each topic, provide an essay (up to 2000 words) plus a complete bibliography of all used resources, which can include secondary literature but should also include **primary** literature. The essays can be completed in either order and should be submitted to recollins@alaska.edu by midnight on the date that they are due. Late submissions will not be accepted. Preferred format: 12 pt font, single line spacing, 1" margins.

Course Policies: Students are expected to attend class and read the relevant chapter prior to the first lecture on that topic. This greatly facilitates participation during lectures, which is expected. *You are smarter than your phone. The use of cell phones, texting or other electronic communication (e.g. email, twitter, facebook etc.) during class is considered inappropriate.* Students should be familiar with the UAF Honor Code (you find it in the catalog). Neither cheating, plagiarism nor fabrication will be tolerated. Any student found cheating during the exams or to have plagiarized or fabricated statements (including passages from web pages) will receive an automatic 'F' for the **class**.

*The following **non-curved** grading system will be used for the entire course:*

A+ >95%	C >63 – 67%
A >90 – 95%	C− >60 – 63%
A− >85 – 90%	
B+ >80 – 85%	*Grades below C− will not count toward the major or minor degree requirements*
B >75 – 80%	D 50 – 60%
B− >70 – 75%	F <50
C+ >67 – 70%	

Support Services: At UAF, the Office of Disability Services (203 WHIT; 474-5655; TTY 474-1827; fydso@uaf.edu) ensures that students with physical or learning disabilities have equal access to the campus and course materials. If you have specialized needs, please contact this office or the instructor to make arrangements. The UAF Writing Center (801 Gruening Bldg) is available for helping students in brainstorming and generating topics, organizing ideas, developing research strategies, the use of citations, and editing for clarity and correctness. Contact them at http://www.uaf.edu/english/writing-center

Important contact information for long distance delivery students: The phone number for Lecture room 201 O'Neill in Fairbanks is 907 474-5377.