

AY 155: Life in the Universe

Spring, 2012

3 Credit Hours

Primary Instructor: Dr. Murray Silverstone

Core Designation: N/A

Syllabus subject to change.

Office Hours

TBD

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Prerequisites

none.

Course Description

“Life in the Universe” is a survey of the new and rapidly-developing interdisciplinary science of Astrobiology for the non-science major. This science brings the tools of astronomy and biology, as well as geology and chemistry, to attempt to answer questions like: How did life start on the Earth? Did life start elsewhere in our Galaxy? If there is life on other planets, how would we recognize it?

Students taking this course will first be introduced to the science of astrobiology, the process of science, scientific thinking, and the fundamentals of astronomical and physical principles used through the course. Then students will explore our current state of knowledge about the nature of life on the Earth, the geology of the Earth as it makes our planet habitable to life, the origin of life on the Earth, and process of Evolution. We will then apply this knowledge to the question of whether life currently exists, or could have existed in the past, on other bodies in our Solar System including the planets Venus and Mars, the large moons of the planets Jupiter, Saturn, and Neptune, and probe the impact of the history of our Solar System on the habitability of various planets and moons. The final section of the course focuses on the possibilities of life on planets orbiting other stars in our galaxy (and beyond) by surveying what is known and expected from surveys of planets orbiting other stars, the Search for ExtraTerrestrial Intelligence, and the prospects for future interstellar travel.

This course will expose you to the excitement of the new field of astrobiology with a goal of leaving you with a lifelong interest in astronomy, biology, geology, and chemistry (especially as it applies to the central questions of this course) and an appreciation for all science. No knowledge of these sciences is needed as a prerequisite. As scientists are just beginning many studies in astrobiology, new discoveries are constantly being made. This course will describe how our view of life on Earth and elsewhere in the universe has changed over time and cover new discoveries as they occur.

Objectives

By the conclusion of this course, students will:

1. identify key concepts in the sciences, contributing to the development of a broad perspective on the human condition. More particularly:
2. identify the key conceptual advances which, and associated historical figures who, revolutionized the development of modern science in general, and the sciences of astronomy, biology, geology, chemistry, and astrobiology.
3. recognize and explain the scientific method, and evaluate scientific information.
4. demonstrate understanding of the relationship between light, matter, and energy in an astronomical context.
5. identify the content of, and describe the formation and evolution of, planetary systems.
6. describe the necessities for life as we know it, and consider the variety of conditions where such necessities could be found on the Earth, and elsewhere.
7. determine how the concept of the “last common ancestor” allows us to consider the origin of life on the Earth, and the process of evolution.
8. project how our understanding of the nature of living organisms on Earth might be applied to life on other worlds.
9. describe how we could identify scientific evidence of life on other worlds where it might exist and evolve.

Outline of Topics

CHAPTER SCHEDULE (subject to change; updates will be posted on eLearning website; **exam dates will not change** unless university closure requires it):

<u>Lect, #</u>	<u>Date</u>	<u>Topic</u>	<u>Chapter Reading</u>
1	Thursday, January 12, 2012	Introduction & Syllabus	Syllabus
2	Tuesday, January 17, 2012	What is Astrobiology?	1
3	Thursday, January 19, 2012	The Science of Life in the Universe	2
4	Tuesday, January 24, 2012		
5	Thursday, January 26, 2012	The Context of Life	3
6	Tuesday, January 31, 2012		
	Thursday, February 2, 2012	In-Class Exam #1	Chapters 1-3
7	Tuesday, February 7, 2012	The Habitability of the Earth	4
8	Thursday, February 9, 2012		
9	Tuesday, February 14, 2012	The Nature of Life	5
10	Thursday, February 16, 2012		
11	Tuesday, February 21, 2012	The Origin and Evolution of Life	6
12	Thursday, February 23, 2012		
	Tuesday, February 28, 2012	In-Class Exam #2	Chapters 4-6
13	Thursday, March 1, 2012	Life in our Solar System	7
14	Tuesday, March 6, 2012		
15	Thursday, March 8, 2012	Life on Mars?	8
	Tuesday, March 13, 2012	Spring Break	No Classes
	Thursday, March 15, 2012		
16	Tuesday, March 20, 2012	Life on Mars?	8
17	Thursday, March 22, 2012	Life on Jovian Moons?	9
18	Tuesday, March 27, 2012		
19	Thursday, March 29, 2012	Evolution of Habitability	10
20	Tuesday, April 3, 2012		
	Thursday, April 5, 2012	In-Class Exam #3	Chapters 7-10
21	Tuesday, April 10, 2012	Habitability Beyond the Solar System	11
22	Thursday, April 12, 2012		
23	Tuesday, April 17, 2012	SETI	12
24	Thursday, April 19, 2012		
25	Tuesday, April 24, 2012	Interstellar Travel	13
26	Thursday, April 26, 2012		

Exams and Assignments

EXAMS:

Three multiple-choice exams: three in-class during term, plus a Final Exam. The dates for the exams are listed in the schedule and WILL NOT CHANGE. Make a note of these dates. Your lowest score of the three exams will be dropped

from the calculation of your final course score.

The Final Exam will be a comprehensive exam over the entire semester's material, with emphasis on the material covered since the 3rd in-class exam.

HOMEWORK:

Reading Quizzes and Concept Quizzes for each chapter of the assigned text are posted on the publisher's "premium website" http://wps.aw.com/aw_bennett_liu_3 (license code included with new textbook or may be purchased online). These quizzes will be assigned to be completed before (reading) and after (concept) we have covered the relevant material in class. (see the chapter schedule above).

CLICKER QUESTIONS & CLASS PARTICIPATION (see also ATTENDANCE POLICY below):

Each class session will include clicker questions, to be answered using the required TurningPoint Audience Response Pads, available for purchase at the University Supply Store (SUPE Store). These "clickers" must be purchased (ASAP) and registered using the link on the eLearning website for this class (follow the instructions in the guide available through this URL: <http://frc.ua.edu/wp-content/uploads/2009/09/ttstudentguide.pdf>). These questions will be based on both reading content and course lecture material. In some cases, the clicker questions will be the topic for in-class discussion with students to deepen their understanding of a topic. There will also be occasional in-class "lecture-tutorial" worksheets, which will be discussed and completed in groups within the class period. Attendance is mandatory in order to enable these discussions and assessment of your understanding of the course material as it is being presented and discussed in class. There is no regular substitute for this interaction in your learning process, and thus no make-up for the points assessed during the class sessions.

Clicker question scoring will be described in class. In general, you will get a majority of points for giving any answer to a clicker question, and then additional points for giving the correct answer. In cases of in-class discussion, the same question will be asked a second time. In those cases, the bonus points will be awarded for the second time the question is asked, and not the first.

Grading Policy

Grading: Clicker Questions & Class Participation:	20%
Homework Assignments:	20%
In-Class Exams (3 exams, lowest dropped)	30%
Final Exam:	30%

Grades are based on the points received for the items listed below. Historically, students perform in similar ways to the following descriptions achieve these points and thus earn their final letter grades.

Students who receive an **A** are doing truly exceptional work. These students usually do the assigned reading at least twice, once to prepare class and once after class to review the material. They also ask the instructor questions during or after class almost every day to clarify their understanding of a topic. Finally, these students typically solidify their own understanding of the topics by tutoring other students in the class.

Students who receive a **B** are doing very good work. They have *above average* grades in all areas of the class. They have *completed all of the homework* and *show up to each class*. They will ask a question in class occasionally. These students usually do the assigned reading at least once.

Students who receive a **C** are doing *acceptable* work. They have not completed one or two of the assignments and may

have missed a few classes. They will answer a question in class correctly if called upon, but seldom volunteer a response. These students will do the assigned reading when they have a chance, but have likely skimmed or skipped a few chapters.

Students who receive a **D** are doing poor work. They may have difficulty in most graded areas of the class. They have likely missed more than a few classes and forgotten to do a few assignments. The work that they do turn in is below average. These students may have read the first few chapters, but quit preparing for class after that.

The MINIMUM percentage points required for each final letter grade are as follows:

96.7% = A+	86.7% = B+	76.7% = C+	66.7% = D+	0% = F
93.3% = A	83.3% = B	73.3% = C	63.3% = D	
90.0% = A-	80.0% = B-	70.0% = C-	60.0% = D-	

The instructor reserves the right to lower the requirements for each grade but not raise them. Roughly, 20% of the students in this class will receive A's, 30% will receive B's, 30% will receive C's, 15% will receive D's and 5% will receive F's.

Attendance Policy

Class participation (assessed using clickers) contributes 15% of your course grade. Students will receive DEDUCTIONS to their Class Participation grade for instances of inappropriate behavior during class. Examples include the following:

- having discussions about subjects outside of the class material during class time.
- possessing a ringing phone
- using computers or phones improperly during class time, such as instant messaging or web surfing
- eating during class
- sleeping during class
- distracting a classmate or the instructor by talking at inappropriate times

Required Texts

UA Supply Store Textbook Information:

- **BENNETT & SHOSTACK / LIFE IN THE UNIVERSE 3E**
(Required)
- **NONE / RESPONSE PAD XR (XRC-01)**
(Required)

Other Course Materials

Textbook website: The publisher of your textbook has provided an access code to their useful website which includes review quizzes, interactive figures, tutorials, and movies. You will need the **Class ID:** TBD to login to the website http://wps.aw.com/aw_bennett_liu_3. This website also hosts the reading review and concept quizzes which will be assigned for homework in this course.

Extra Credit Opportunities

There will be occasional extra-credit opportunities based on observing objects in our sky with telescopes on the roof of Gallalee Hall and/or in Moundville. Details of these observing assignments will be announced in class.

Policy on Missed Exams & Coursework

There are no makeup exams *unless* you have a good, documented excuse for missing an exam. Then a special exam or assignment will be required for make-up credit. If there is a scheduled excuse which conflicts with the exams (dates posted above), you must advise me of, and present written documentation of, the excuse before the scheduled exam. If there is an unscheduled emergency, you must provide me documentation, and schedule the make-up exam, within 1 week of the absence. No further delay will be allowed if a make-up is possible within 1 week.

There will be no makeup opportunities for class participation. However, the single lowest homework score, reading review, and class participation score will be dropped from each category at the end of the course.

Classroom Decorum

The Code of Student Conduct requires that students behave in a manner that is conducive to a teaching/learning environment. Students who engage in behavior that is disruptive or obstructive to the teaching/learning environment will be subject to disciplinary sanctions outlined by the Code of Student Conduct. Disruptive/obstructive behavior is not limited to but may include the following: physical abuse, verbal abuse, threats, stalking, intimidation, harassment, hazing, possession of controlled substances, possession of alcoholic beverages, use of cell phones and beepers in class, reading of newspapers, talking to fellow students during faculty or student presentations.

Disability Statement

If you are registered with the Office of Disability Services, please make an appointment with me as soon as possible to discuss any course accommodations that may be necessary. If you have a disability, but have not contacted the Office of Disability Services, please call 348-4285 or visit 133-B Martha Parham Hall East to register for services. Students who may need course adaptations because of a disability are welcome to make an appointment to see me during office hours. Students with disabilities must be registered with the Office of Disability Services, 133-B Martha Parham Hall East, before receiving academic adjustments.

Policy on Academic Misconduct

All students in attendance at the University of Alabama are expected to be honorable and to observe standards of conduct appropriate to a community of scholars. The University expects from its students a higher standard of conduct than the minimum required to avoid discipline. Academic misconduct includes all acts of dishonesty in any academically related matter and any knowing or intentional help or attempt to help, or conspiracy to help, another student.

[The Academic Misconduct Disciplinary Policy](#) will be followed in the event of academic misconduct.

Severe Weather Protocol

In the case of a tornado warning (tornado has been sighted or detected by radar; sirens activated), all university activities are automatically suspended, including all classes and laboratories. If you are in a building, please move immediately to the lowest level and toward the center of the building away from windows (interior classrooms, offices, or corridors) and remain there until the tornado warning has expired. Classes in session when the tornado warning is issued can resume immediately after the warning has expired at the discretion of the instructor. Classes that have not yet begun will resume 30 minutes after the tornado warning has expired provided at least half of the class period remains.

UA is a residential campus with many students living on or near campus. In general classes will remain in session until the National Weather Service issues safety warnings for the city of Tuscaloosa. Clearly, some students and faculty commute from adjacent counties. These counties may experience weather related problems not encountered in Tuscaloosa. Individuals should follow the advice of the National Weather Service for that area taking the necessary precautions to ensure personal safety. Whenever the National Weather Service and the Emergency Management Agency issue a warning, people in the path of the storm (tornado or severe thunderstorm) should take immediate life saving actions.

When West Alabama is under a severe weather advisory, conditions can change rapidly. It is imperative to get to where you can receive information from the [National Weather Service](#) and to follow the instructions provided. Personal safety should dictate the actions that faculty, staff and students take. The Office of Public Relations will disseminate the latest information regarding conditions on campus in the following ways:

- Weather advisory posted on the UA homepage
- Weather advisory sent out through Connect-ED--faculty, staff and students ([sign up at myBama](#))
- Weather advisory broadcast over WVUA at 90.7 FM
- Weather advisory broadcast over Alabama Public Radio (WUAL) at 91.5 FM
- Weather advisory broadcast over WVUA 7. WVUA 7 Storm Watch provides a free service you can subscribe to that allows you to receive weather warnings for Tuscaloosa via e-mail, pager or cell phone. Check <http://www.wvua7.com/stormwatch.html> for details.

Academic Honor Code

All students in attendance at The University of Alabama are expected to be honorable and to observe standards of conduct appropriate to a community of scholars. The University of Alabama expects from its students a higher standard of conduct than the minimum required to avoid discipline. At the beginning of the semester and on examinations and projects, **you are required to sign and return the following Academic Honor Pledge with your introductory questionnaire to the instructor:**

"I promise or affirm that I will not at any time be involved with cheating, plagiarism, fabrication, or misrepresentation while enrolled as a student at The University of Alabama. I have read the Academic Honor Code, which explains disciplinary procedure resulting from the aforementioned. I understand that violation of this code will result in penalties as severe as indefinite suspension from the University."

Print Name

Sign Name

Date

***Life in the Universe* Brief Introductory Questionnaire**

1. Why did you enroll in this class (*Life in the Universe*)?

2. What do you hope to learn most in *this class*?

3. What is your biggest worry or concern about *this class*?

4. What was the subject/topic of your most advanced science class? Math class? When did you take *these classes* (e.g. six years ago in high-school, last year in college):

Science:

Math:

5. Please give me your best 1-2 sentence answer, or guess, for the question “What is life?”

6. Have you ever seen a galaxy with: (answer something like: yes, no, maybe, I don't know)

your naked eye?

through binoculars?

through a telescope?

7. What is your favorite Science Fiction movie or TV show (if any)?