

Astronomy 141 – Life in the Universe
Autumn Quarter 2008
Syllabus

Lectures: MWF, 9:30am - 10:48am, 0120 Baker Systems Engineering (BE 0120)

Professor: Scott Gaudi

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Office Hours: Tues, Wed, Thurs 11:30am-12:30pm, or by appointment

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Recommended Textbook: *Life in the Universe* (2nd Edition), by Jeffrey Bennett and Seth Shostak.

Course Web Page:

<http://www.astronomy.ohio-state.edu/~gaudi/AST141/index.html>

Course Description

The general theme of Astronomy 141 is the study of life in the universe, or alternatively, astrobiology. The topics that will be covered in the course exist at the interfaces of astronomy, chemistry, biology, geology, and the earth and planetary sciences. Students will learn about scientists' ongoing quest for answers to some of the most fundamental human questions: How did life originate on Earth? Is there life on other planets? Are we alone in the universe? What is the long-term future of life in the universe?

In particular, we will divide our time approximately equally between three topics: (1) the emergence and nature of life on the Earth, (2) the potential for life on other planets in the solar system, and (3) the search for habitable worlds and life throughout the Galaxy. The course will begin with an introduction to modern science and astronomy, and end with a brief digression on the long-term future of life on our planet, and in the universe in general.

Note that this is a 5 credit course, and is a General Education Curriculum (GEC) Physical Science course in the Natural Science category. The goals for GEC Astronomy courses include:

- Understanding the theories and methods of modern astrophysics.
- Investigating the relationship between science and technology.
- Exploring the effects of science and technology on the environment.

Learning Objectives for this course are:

- To investigate the basic facts, principles, theories and methods of modern science as practiced in astrophysics.
- To learn important events in the history of astrophysics, particularly the discovery of the size and age of the Universe and our place within it.
- To explain the role of modern technology in the investigation of astrophysical phenomena.
- To consider human impacts on planet Earth, including topics such as energy balance and effects of human activity.

Course Outline (3 days a week, 5 credit hours)

Unit 1: Introduction to Science and Astronomy

Lectures 1-3: Overview and goals; history of modern science; basic physical concepts.

Unit 2: Life on the Earth

Lectures 4-9: Nature of life on the Earth; the geological history of the Earth; the rise of life on the Earth; the Earth's global environment and its impact on biology.

Unit 3: Life in the Solar System

Lectures 10-18: The solar system: formation and overview; requirements for habitability; the deserts of Mars and the search for life on Mars; life on the moons of Jupiter; life elsewhere in the Solar System; the evolution of the habitability of Venus; the "Goldilocks" effect and the comparative habitability of Earth, Mars and Venus.

Unit 4: Life in the Universe

Lectures 19-26: Stars: masses, luminosities, temperatures, habitable zones, lifetimes, and other considerations for habitability; our local solar neighborhood: nearby stars, stellar populations, and the Galaxy; the search for extrasolar planets; the search for life on extrasolar planets; the search for extraterrestrial intelligence and the Drake equation; interstellar travel and colonization, the Fermi Paradox and the rare earth hypothesis.

Unit 5: Death in the Universe

Lecture 27-28: The long-term fate of life on the Earth; the long-term fate of life in the Universe.

Homework Assignments

There will be four (4) homework assignments during the quarter, each consisting of set of short answer or multiple-choice questions. The questions are open-book, open-notes, open-discussion. Homework will be due on the following dates:

- Homework 1: Monday, October 6
- Homework 2: Monday, October 27
- Homework 3: Monday, November 17
- Homework 4: Monday, November 24

Collectively the homework will count for 15% of your grade. The questions on the homework will generally be more challenging than those on the quizzes. They are designed to get you thinking about the course topics in an active way. I strongly encourage you to form study groups to discuss the questions, though you must decide on the final answers yourself.

Homework is due in class on the due date and no late homework will be accepted, except for legitimate, documented emergencies.

In-Class Quizzes

There will be three (3) in-class quizzes, scheduled for the following dates:

In-Class Quiz 1: Wednesday, October 15

In-Class Quiz 2: Friday, November 7

In-Class Quiz 3: Monday, December 1

Each of your quiz grades will count for 15% of your grade. The quizzes will cover the material in the lectures and readings since the previous quiz. All of the quizzes are **closed-book, closed-notes multiple-choice** tests. You only need to bring a #2 pencil for the quiz.

Please mark your calendars with the quiz dates. The quizzes will be held at the normal class time and you will have the entire class period to complete the quiz. **Makeup quizzes are only offered by advance arrangement with the professor.** Exceptions are for legitimate, documented emergencies and require no advance notice. If you will be away on an official University-sponsored activity (e.g., sports teams, band, etc.), you must bring me a letter from your coach, director, etc. **in advance** of the quiz. Quizzes must be made up within a week after the missed quiz.

Final Exam

The Final Exam will be on **Tuesday, December 9 at 9:30am - 11:18am** in the classroom (0120 Baker Systems Engineering). Attendance at the Final Exam is mandatory. You only need to bring a #2 pencil for the final.

The final will be **comprehensive**, covering all lectures, and has the same multiple-choice format as the in-class quizzes, only it will be twice as long. It is worth **40%** of your grade.

No makeup final will be offered.

If you miss the final exam, you will be given an incomplete (I) with an alternative grade equal to getting a zero on the final, and have to make it up during Winter Quarter 2009 to avoid the alternative grade.

In keeping with official University policy, early finals will not be available for those persons who wish to depart early for the break. Please plan ahead and make your travel plans accordingly.

Grading Policy

- The 4 homework assignments will collectively account for 15% of your grade.
- Together, in-class quizzes count for 45% of your grade (15% each).
- The final exam will be cumulative, covering all material from the class. It accounts for 40% of your grade, and must be taken by all students.
- All grading, homework and exams, is done on a standard C+ curve. This means the median grade in the class will approximately correspond to a C+.

Lectures and Attendance

Lectures will be MWF, 9:30am - 10:48am, in 0120 Baker Systems Engineering. The daily lectures are your primary resource for this course. We will not cover all of the topics in the book and I will supplement the book with additional material that is not covered in the book. Outlines of each lecture will be available via the class website. These outlines are intended to be useful aids for studying and following along in class. I recommend that you print out the outlines, bring them to class, and take notes in the margins. Remember, these are only outlines of what I cover each day in class, not comprehensive transcripts of the lectures. In particular, I will show many images and animations during class that will not be available on the class website.

Related Readings in Life in the Universe

Because introductory astrobiology textbooks designed for non-majors are rarely organized exactly the same as our courses, we will not strictly follow the order of topics in the book. You can expect to jump around some as the course progresses. As such, instead of specific reading assignments, each section of the course will have reading suggestions listed on the class website. However, not all topics in this course are covered by the book, and similarly not all topics covered in the book will be discussed in class. You are only responsible for the contents of my lectures.

Students with Disabilities

Any student who feels that he or she may need an accommodation based on the impact of a disability should contact Professor Gaudi to discuss their specific needs. We will rely on the Office of Disability Services at OSU to verify the need for accommodation and to help develop the appropriate strategies. Students with disabilities who have not previously contacted ODS are encouraged to do so by visiting the ODS website (www.ods.ohio-state.edu) and requesting an appointment.

Academic Misconduct

All OSU professors are required to report suspected cases of academic misconduct to the Committee on Academic Misconduct. See the University's Code of Student Conduct for details. The most common forms of misconduct in classes such as this one is copying from another student's exam. All cases will be investigated following University guidelines.

Classroom Etiquette

To help establish and maintain a courteous, distraction-free learning environment in our classroom, I ask that all students please observe the following basic rules of behavior during lectures and exams:

Use of cell phones and pagers is prohibited.

This includes using cell phones for instant messaging, email, web, pictures, etc. When in class, all cell phones and pagers must be turned off (i.e., not in a standby or "silent ring" mode).

Use of laptops and networked devices is prohibited.

Surfing the web, instant messaging, reading email, or typing notes on a keyboard during class is

very distracting to those around you. When in class, all laptop computers and networked devices (e.g., PDAs) must be turned off and put away. The only exceptions are approved devices for enhancing sound or vision for the hearing/vision impaired.

Please do not start packing up until class is completely over.

Nothing is more rude or distracting than the noise of notebooks closing and jackets and backpacks rustling while the professor is trying to finish up. I'll be very clear when we're done, and I work very hard to stay on time, so please wait until I get to the end.

If you come late or have to leave early, please sit near the back of the room.

This will make your late arrival or early departure less disruptive for your fellow students.

No conversing during lectures.

Please respect your fellow students and do not carry on conversations during class. Your cooperation in observing these rules is greatly appreciated.