



**Department of Astronomy**

4055 McPherson Lab  
140 West 18th Avenue  
Columbus, OH 43210-1173

Phone (614) 292-1773  
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<http://www.astronomy.ohio-state.edu>

31 Dec. 2007

Dean David Andereck  
MAPS  
425 Stillman Hall  
1947 College Road  
Campus

Dear Dave:

We have received a letter of concurrence from the Department of Chemistry for our proposed Astronomy 141 course, but we have not yet received a response to our request from the School of Earth Sciences or the College of Biological Sciences. However, since the deadline for New Course proposals for Autumn is approaching rapidly, we wish to submit the proposal with the understanding that we will forward to you the responses from Earth Sciences and Biology as soon as we receive them.

Yours truly,

A handwritten signature in cursive script, appearing to read "G. Newsom".

Gerald H. Newsom  
Professor Emeritus

**OHIO STATE NEW COURSE REQUEST**

College: MAPS

Academic unit: Astronomy

Book 3 Listing: Astronomy  
(e.g., Portuguese)

Proposed Course No: 141 Full Title of Course: Life in the Universe

Proposed Effective Qtr/Yr: SU  AU  WI  SP  YEAR: 2008 (See OAA Academic Organization and Curriculum Handbook for Deadlines)

**A. Course Offerings Bulletin Information.** Follow instructions in the OAA Academic Organization and Curriculum Handbook.

*Is this a course with decimal subdivisions?* If so, use one New Course Request form for the generic information that will apply to all subdivisions. Use separate forms for each new decimal subdivision, including on each form only the information that is unique to that subdivision.

18-Character Transcript Abbreviation: Life in Universe Level U  G  P  Credit Hours: 05

Description (not to exceed 25 words): Potential for life elsewhere in the universe, based on discovery of extra-solar planets and nature of life on Earth; search strategies for such life

Quarter offered (check): SU  AU  WI  SP  \*Distribution of class time/contact hours: Sch, or 3 1.5 hr. cl  
Quarter and contact/class time hours information should be omitted from Book 3 publication: (check here)

Prerequisite (s): \_\_\_\_\_

Exclusion or limiting clause: \_\_\_\_\_

Repeatable to a maximum of \_\_\_ credit hours.

Cross-listed with: \_\_\_\_\_

Grade Option (Please check): Letter  S/U  Progress

If this course is Progress graded, what course is the last one in the series? \_\_\_\_\_

Honors Statement: Yes  No  GEC: Yes  No  Admission Condition  
Off-Campus: Yes  No  EM: Yes  No  Course: Yes  No   
Embedded Honors Statement: Yes  No   
Service Learning Course\*: Yes  No

\*To learn more about this option, please visit <http://artsandsciences.osu.edu/currofc/>

Other General Course Information: \_\_\_\_\_

(e.g. "Taught in English." "Credit does not count toward BSBA degree.")

Subject Code 400201 Subsidy Level (V, G, T, B, M, D, or P) G  
(If you have questions please email Jed Dickhaut @ dickhaut.1@osu.edu)

Will course be taught in distance learning format: Yes  No

**B. General Information:**

1. Provide the rationale for proposing this course:

Recent discovery of many extra-solar planets has focused intense interdisciplinary interest in the possibility of life elsewhere in the universe. This course builds on that interest to illustrate how natural science is practiced.

2. List Major/Minor affected by the creation of this new course. Attach revisions of all affected programs.

This course is (check one) Required  Elective  Other (Explain) : GEC Natural Science

\* If the course offered is less than quarter, term, or semester, please also complete the Flexibly Scheduled/Off Campus/Workshop Request form.

3. Indicate the nature of the program adjustments, new funding, and/or withdrawals that make possible the implementation of this new course.

Fewer sections of the 161-162 sequence will be offered in the future; a new faculty member has been added to the department.

The course is being offered as a 294 course in 2008.

4. Is the approval of this request contingent upon the approval of other course requests or curricular requests?

Yes  No  List:

5. If this course is part of a sequence, list the number of the other course(s) in the sequence: \_\_\_\_\_

6. Expected section size: 140 Proposed number of sections per year: 3

7. Do you want prerequisites enforced electronically? (See OAA Curriculum Manual for what can be enforced.) Yes

8. This course has been discussed with and has the concurrence of the following academic units needing this course or with academic units having directly related interests (List units and attach letters and/or forms): Not Applicable

9. Attach a course syllabus that includes a topical outline of the course, student learning outcomes and/or course objectives, off-campus field experience, methods of evaluation, and other items as stated in the OAA Curriculum Handbook.

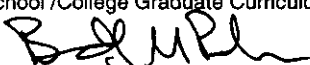
**APPROVAL SIGNATURES** (As needed. All signatures on lines in ALL CAPS ( e.g. ACADEMIC UNIT) must be completed

Academic Unit Undergraduate Studies Committee Chair (Undergraduate course) Printed Name Date

Academic Unit Graduate Studies Committee Chair(Undergraduate/Graduate course) Printed Name Date

School /College Undergrad Curriculum Committee (Undergraduate/Graduate course) Printed Name Date

School /College Graduate Curriculum Committee (Undergraduate/Graduate course) Printed Name Date

 Printed Name Date  
Bradley M Peterson 12/31/07  
ACADEMIC UNIT CHAIR /SCHOOL DIRECTOR Printed Name Date

COLLEGE DEAN Printed Name Date

Graduate School (If Appropriate) Printed Name Date

ASC Curriculum Committee Chair (If Appropriate) Printed Name Date

University Honors Center (If Appropriate) Printed Name Date

Office of International Education (study tour only) Printed Name Date

ACADEMIC AFFAIRS Printed Name Date



Department of Chemistry

**Christopher M. Hadad**

(614) 292-1204 (voice)  
(614) 247-2374 (fax)

hadad.1@osu.edu

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[www.chemistry.ohio-state.edu](http://www.chemistry.ohio-state.edu)

December 19, 2007

Professor Bradley M. Peterson  
Chair, Department of Astronomy  
Ohio State University  
CAMPUS

Dear Brad,

My staff and I have looked over your proposed Astronomy 141 course as a GEC elective.

I have no reservations whatsoever about your proposed course – everything in your package of information seems perfect. This course, having been taught already in different iterations, appears to be of interest with students at OSU. My only suggestion is whether this course could be offered at distance as well as on-ground.

I hope that this succinct letter will function as concurrence from Chemistry for your Astronomy 141 course.

Please let me know if you need any further information.

Sincerely,

A handwritten signature in black ink, appearing to read "Chris Hadad", written in a cursive style.

Christopher M. Hadad  
Professor of Chemistry and Vice Chair for Undergraduate Studies

**The Ohio State University  
General Education Curriculum (GEC)  
Request for Course Approval Summary Sheet**

1. Academic Unit(s) Submitting Request

Astronomy

2. Book 3/Registrar's Listing and Number (e.g., Arabic 367, English 110, Natural Resources 222)

Astronomy 141

3. GEC areas(s) for which course is to be considered (e.g., Category 4. Social Science, Section A. Individuals and Groups; and Category 6. Diversity Experiences, Section B. International Issues, Non-Western or Global Course)

Category 3: Natural Science, Physical Science course (BA)

4. Attach:

- A statement as to how this course meets the general principles of the GEC Model Curriculum and the specific goals of the category(ies) for which it is being proposed;
- An assessment plan for the course; and
- The syllabus, which should include the category(ies) that it satisfies and objectives which state how this course meets the goals/objectives of the specific GEC category(ies).

5. Proposed Effective Date Autumn Quarter 2008

6. If your unit has faculty members on any of the regional campuses, have they been consulted? N/A

7. Select the appropriate descriptor for this GEC request:


Existing course with no changes to the *Course Offerings Bulletin* information. Required documentation is this GEC summary sheet and the course syllabus.

Existing course with changes to the *Course Offerings Bulletin* information. Required documentation is this GEC summary sheet, the course change request, and the course syllabus.

New course. Required documentation is this summary sheet, the new course request, and the course syllabus.

For ASC units, after approval by the academic unit, the documentation should be forwarded to the ASC Curriculum Office for consideration by the appropriate college curriculum committee and the Arts and Sciences Committee on Curriculum and Instruction (CCI). For other units, the course should be approved by the unit, college curriculum committee, and college office, if applicable, before forwarding to the ASC Curriculum Office. E-mail the syllabi and supporting documentation to [ascurofc@osu.edu](mailto:ascurofc@osu.edu).

9. Approval Signatures

  
Academic Unit

6/3/07  
Date

College Office/College Curriculum Committee

Date

Colleges of the Arts and Sciences Committee on Curriculum and Instruction

Date

Office of Academic Affairs

Date

## ASTRONOMY 141 Life in the Universe

How this course meets the GEC goals for Category 3, Natural Science (BA)

Astronomy 141 is proposed as a GEC Physical Science course in the Natural Science category. The general goal for courses in the natural sciences is to foster an understanding of the principles, theories, and the methods of modern science; the relationship between science and technology, and the effects of science and technology on the environment.

The more specific goals of Astronomy 141 are:

- A comprehensive overview of scientific basis of the study of life in the universe, as supported by its three primary pillars: (1) the implications of our understanding of the emergence and nature of life on the Earth for the diversity and ubiquity of life elsewhere, (2) the potential for life on other bodies in our solar system and the physical causes behind the habitability of the Earth, and (3) the search for habitable worlds and life throughout the Galaxy.
- Understanding of the history of modern science, and the foundations of the science of astrobiology and searches for life.
- Exploration of the complex relationships between science, society, and the search for life in the universe, and an exploration of the potential implications of the discovery of life elsewhere in the Universe.

### **Course Objectives**

These goals will be met through the following more detailed learning objectives:

- Familiarity with the basic principles, theories and methods of the disciplines of astronomy, chemistry, biology, geology, and earth and planetary sciences as they pertain to the understanding of the nature, evolution, and emergence of life on the Earth and elsewhere.
- Understanding the basic conditions necessary for life to develop and flourish, and a general familiarity with the nature and diversity of life on the Earth. Understanding of the concept of habitability and the consequences of physical changes to environments for survivability of life.
- Learning about important events in the history of science and astronomy. Understanding how these events, when combined with the development of enabling technologies such as the telescope, space probes, and gene sequencing, have set the scientific and philosophical stage for the rigorous, scientific study of life in the universe.
- Exploration of the long-term future of life on the Earth and in the universe, and in particular the philosophical question of how internal economic, political and societal forces as well as external factors can impact the sustainability of civilizations, which in turn informs our search for life in the universe.
- Exploration of the potential moral and philosophical implications of the discovery of extraterrestrial life.

## ASTRONOMY 141

### Life in the Universe

#### Assessment Plan

Astronomy 141 is proposed as a GEC Physical Science course in the Natural Science category. It is based in large part on a 3 cr Group Studies course that was piloted in Spring Quarter 2007 and a 5 cr Group Studies course offered in Winter 2008.

We will use two main assessment tools for this course:

- (1) Questions tailored to test the students' grasp of concepts directly linked to the GEC goals for Natural Science courses will be embedded in the final exam. Students' responses to these particular questions will be scrutinized to see which goals were inadequately met, as evidenced by a lower percentage of correct answers. These areas will receive greater emphasis and class time the next time the course is offered.
- (2) An exit survey, similar to that administered at the end of existing GEC courses such as Astron 161–162 will be administered to as many students as possible at the conclusion of the course. Students will be asked whether they strongly agree, agree, disagree, strong disagree, or neither agree nor disagree with statements such as “this course helped me understand the basic facts, principles, theories, and methods of modern science.” In addition to asking students whether or not the course met the Natural Science GEC goals, the exit survey will also solicit narrative evaluations. The exit survey will be used to identify those GEC goals that the students perceive as not being met; this in turn will help the instructor modify the content and presentation of the course material to better achieve these goals the next time the course is taught.

The general goal for courses in the natural sciences is to foster an understanding of the principles, theories, and the methods of modern science; the relationship between science and technology, and the effects of science and technology on the environment. The more specific goals of Astronomy 141 are:

- Understanding current theories of star and planet formation and evolution and how these constrain the possibilities for the development of life in different environments.
- Understanding the principles of life as we know it and the interface among the disciplines of astronomy, chemistry, biology, geology, and earth and planetary sciences.
- Understanding the conditions necessary for life to develop and flourish, and understanding the consequences of physical changes to environments for life (e.g., global warming).
- Understanding the history of human views of life in the Universe.
- Understanding the enabling technologies, from the first telescopes through modern space probes and sophisticated techniques for planet finding, that have played key roles in the evolution of our understanding of the possibility of life elsewhere in the Universe.
- Understanding the potential societal and philosophical implications of discovery of life elsewhere in the Universe.

**Astronomy 294 – Life in the Universe**  
Winter Quarter 2008  
Syllabus

**Professor:** Scott Gaudi, Office: 4057 McPherson Lab (614-292-1914), E-Mail: [gaudi.1@osu.edu](mailto:gaudi.1@osu.edu)

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

**Course Web Page:** <http://www.astronomy.ohio-state.edu/~gaudi/AST294/index.html>

### **Course Description**

The general theme of Astronomy 294 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.

### **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 4-8: 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 9-16: The solar system: formation and overview, requirements for habitability, the deserts of Mars, 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 17-22: 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 23-24: 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 Fridays:

- Homework 1: Friday, January 18
- Homework 2: Friday, February 1
- Homework 3: Friday, February 8
- Homework 4: Monday, February 22

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 Fridays:

- In-Class Quiz 1: Friday, January 25
- In-Class Quiz 2: Friday, February 15
- In-Class Quiz 3: Friday, February 29

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 by the Wednesday after the missed quiz.

### **Final Exam**

The Final Exam will be on Wed., March 12, 1:30-3:18 p.m. 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

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 Spring Quarter 2007 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 5 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 TBD. 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 astrobology 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](http://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.