AST 248: General Information

Spring 2017

Lectures: MW 2:30-3:50 PM
Javits 110

Instructor: Prof. Frederick M. Walter (ESS 459; 632-8232; frederick.walter at stonybrook.edu)
Office Hours: most Mondays, Wednesday, and Fridays 9-10 AM, or by appointment

TA: YiYang Jia (YiYang.Jia at stonybrook.edu)
Office Hours: TBD
Sandhiya Kannan (Sandhiya.Kannan at stonybrook.edu)
Office Hours: TBD in ESS 440,

Updated 17 January 2017

Note: all this information is subject to change up until the first day of the semester.

Course Structure: Astronomy 248 is a course in Astrobiology. As such, it is a free-ranging examination of our universe as a habitat for life. We will cover aspects of physics and astronomy (the physical conditions in the universe; extrasolar planets), information theory (how do we recognize signals from alien intelligences?), biology (how does intelligent life evolve?), and chemistry (where does life come from in the first place?). We will answer the question "Where are they?" Among the goals of this course are to train the student in estimation and critical thinking.

This course consists of two weekly lectures. Attendance at lectures is strongly encouraged. Part of each lecture will be set aside for discussions of current topics of interest in the news.

Students are encouraged to use the world-wide-web to explore topics covered in this course, but the web must be explored with caution.
Prerequisites: One SBC SNW or one DEC category E course. You are expected to understand the concepts behind scientific reasoning. Your exact background (e.g., biology, chemistry, physics, astronomy) may help you in certain areas of the course. We will use some mathematical reasoning, using algebra, and will introduce physical principles as they are needed.

Expectations: This is a rigorous science course at the college level. Students are expected to do all assigned readings prior to lecture, and to participate in class. Students should expect to spend 6-9 hours per week outside of class reading the material and doing the homework. Astrobiology is a quantitative science; students in this course will be expected to be able to solve problems and answer quantitative questions. But this topic lies astride both the humanities and the sciences. We will delve into the humanistic side of science when appropriate.

Learning Objectives: Mastery of this course does not mean remembering facts. It means knowing how to think scientifically. A student who masters Astronomy will be able to think critically about data (observations), and synthesize disparate facts to reach a conclusion in almost any area where the data can be quantified. More specifics can be found here.

If passed, this course satisfies DEC H or SBC STAS requirements.

Required Books:

- Life in the Universe, by J. Bennett and S. Shostak (Pearson 2012). The fourth edition is current; earlier editions may be acceptable if you pay close attention in lecture.

The book is available through the campus bookstore. It can also be ordered on-line from various sources.

Suggested Books:

- Rare Earth, by Ward and Brownlee, is a popular level science book that is appropriate for this class.
- The Science of Aliens, by C. Pickover (Basic 1998), is a speculative romp through the possibilities of alien biology and psychology.
Grading:
Grades will be based on:

- **two midterm examinations**, each worth 20% of your grade. Midterms will be given in class, on Wednesday February 15 and Wednesday March 22. More details are given in the course syllabus.
- **a cumulative final examination**, worth 25% of your grade. The final will be on Tuesday May 9 from 5:30 to 8:00 PM. The room is TBD.
- **spot quizzes** in lecture. There will be about 12 weekly quizzes. The lowest two quiz grades will be dropped. The quizzes will account for 15% of your grade. Quizzes will be based on the assigned readings and the lecture material.
- **term paper**, on a topic listed in the guidelines. The paper will be due in class in Wednesday April 26. The term paper will account for 20% of your grade. The excruciating details are available here.

This tests will be graded on a curve. All students who do A work (90% or better) will receive A grades. However, from past experience typical grades will be lower. If the median grade is less than 80%, grades will be curved such that the median test grade is C+, and the top 10% of the students will get A grades. The raw and curved grades will be available on the web (details later).

Lectures:
The lecture hall will be nearly full. Students attending lectures are asked to exhibit common courtesy.

- If you arrive early, please take a seat near the center of the lecture hall. Otherwise late-coming students will be forced to crawl over you.
- Please do not arrive late. This is discourteous and disruptive. And you may miss spot quizzes given at the start of the lecture.
- Please do not leave early. This is discourteous and disruptive. And you may miss spot quizzes given at the end of the lecture.
- Please do not carry on conversations with your friends during lecture.
- Please turn off cell phones and pagers during lecture. If you must use the phone, please leave the room. We don't want to know about your emergencies.
- Students who are disruptive will be asked to leave.

Students are encouraged to ask questions at any time during the lectures.
The power point presentations are usually placed online, but lecture notes will not be available. You are responsible for taking notes. In fact, note-taking is encouraged, as it helps you sort and retain the material we discuss.

**Attendance Policy:**

Students who know in advance that they will miss a class or a test because of university-related activities (including athletics) or civic obligations (e.g., jury duty) should contact the instructor as soon as possible in advance of the date of absence. Students so-engaged, who inform the instructor in a timely manner, will not be penalized, and will be allowed to make up any work missed.

**Homework:** Homework problems from the textbook will be assigned weekly, but will neither be collected nor graded. I often ask these questions on the quizzes and tests.

**Testing Policy:**

Testing is an important way of assessing whether or not you are learning anything from this class. There will be two mid-term examinations and a final examination. The final examination will be designed to take about 1.5 hours to complete, and will be cumulative. All exams are closed-book. However, each student is allowed to bring one sheet of paper, no larger than 8 1/2 x 11 inches in size, containing whatever information the student deems useful.

During an examination:

- All books and other material, except the one crib sheet described above, must be placed under your seat.
- No one is allowed to wear a cap with a bill.
- Sunglasses are not allowed.
- Headphones are not allowed.
- No electronic devices are allowed, including calculators, cell phones, and pagers.
- For your protection, do not sit near your friends during exams. Try to avoid even the appearance of impropriety.
No electronic devices of any kind are allowed during examinations. Cell phones and pagers must be turned off. Students who disrupt the examination because of an audible phone or pager, or by answering a call, will be asked to leave and will have their exam confiscated. Students who have a legitimate need to be on-call during an examination should discuss this with the instructor in advance.

Students are responsible for coming to the tests prepared. The instructor does not supply pens, pencils or answers. Tests should be completed in pen (any color except red).

**Attendance policy for midterms and final:** Students will not be permitted to leave for the first 30 minutes (midterms) or the first hour (final). No students will be admitted after anyone leaves. Students should have a picture ID to present upon handing in their exams.

Students who leave the exam for whatever reason will not be allowed to return.

**Makeup policy:** Midterm and final examinations may be made up only with a valid medical excuse and a doctor's note attesting that the student could not take the exam, or for a sanctioned university event. Students seeking a makeup must contact the instructor as soon as possible.

There will be no makeups on quizzes (the lowest 2 are dropped); except as noted above.

Requests for extra credit assignments will not be entertained.

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**Academic Dishonesty:**

Students suspected of cheating in exams, of plagiarizing their writing assignments, or of any other form of academic dishonesty, will be assigned an F grade for the course and will be reported to the academic judiciary.

Students who suspect others of cheating are encouraged to report them. Reports will be kept confidential. Dishonest students make things that much harder for the majority of students, who are honest.
Americans with Disability Act: If you have a physical, psychological, medical, or learning disability that may impact on your ability to carry out assigned course work, the university urges that you contact the staff in the Disabled Student Services (DSS) office, Room 133 Humanities, 632-6748/TDD. DSS will review your concerns and determine, with you, what accommodations are necessary and appropriate. All information and documentation of disability is confidential.

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AST 248: Search for Life in the Universe
Syllabus
Spring 2017

last update: 17 January 2017

Instructor: Prof. Fred Walter (ESS 459; 632-8232; frederick.walter@stonybrook.edu)
Office Hours: MWF 9-10, or by appointment

TA: Sandhiya Kannan
Yiyang Jia

Lecture: Mondays and Wednesdays, 2:30-3:50 PM Room: Javits 110

Lecture Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topics</th>
<th>Reading</th>
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<tbody>
<tr>
<td>1</td>
<td>Jan 23</td>
<td>Introduction; The Drake Equation You Live Here; What is Science?</td>
<td>BS 1, 3, 12.1, Appendix C</td>
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<td>Jan 25</td>
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<td>2</td>
<td>Jan 30</td>
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<td>BS 2, 3, 10.1</td>
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<td>Feb 1</td>
<td>The Sun</td>
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<td>The Influence of the Sun on Earth</td>
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<td>Why the Sun Shines</td>
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<td>Feb 6</td>
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<td>BS 2, 3, 10.1, 11.1</td>
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<td>Feb 8</td>
<td>f_s</td>
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<td>The Stars: Other Suns</td>
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<td>The Lives of the Stars</td>
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<td>Feb 13</td>
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<td>BS 3</td>
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<td>Overview of the Solar System</td>
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<td>BS 1, 2, 3, 10.1, 11.1</td>
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<td>Midterm 1</td>
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<td>5</td>
<td>Feb 20</td>
<td>f_p, f_l</td>
<td>BS 4, 5, 10.1</td>
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<td>Feb 22</td>
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<td>The Habitability Zone</td>
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<td>What is Life?</td>
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<td>6</td>
<td>Feb 27</td>
<td>f_l</td>
<td>BS 4, 5</td>
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<td>Mar 1</td>
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<td>The Nature of Biological Evolution</td>
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<td>The History of The World</td>
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<td>7</td>
<td>Mar 6</td>
<td>f_l N_h</td>
<td>BS 4, 5, 6, 7, 8</td>
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<td>Mar 8</td>
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<td>Looking for Life in all the Wrong Places</td>
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<td>Mar 27 Mar 29</td>
<td>$f_l/N_h$</td>
<td>Europa and the Icy Moons; Titan Rare Earth</td>
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<td>10</td>
<td>Apr 3 Apr 5</td>
<td>$f_p/N_h$</td>
<td>Exoplanets What makes a Planet Habitable?</td>
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<td>Apr 10 Apr 12</td>
<td>$f_p/f_l$ L/T</td>
<td>The Galactic Context Lifetimes of Civilizations</td>
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<td>Apr 17 Apr 19</td>
<td>$f_l/f_c$</td>
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<td>13</td>
<td>Apr 24 Apr 26</td>
<td>$f_l/f_c$</td>
<td>The Fermi Paradox Spaceflight</td>
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<td>14</td>
<td>May 1 May 3</td>
<td>$N$</td>
<td>Consequences of Contact Summary</td>
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<td>May 9 5:30 PM</td>
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<td>Final Exam</td>
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*** note: this plan is subject to change ***

**Readings**

Readings from the textbook should be done BEFORE the lecture. That way the lecture can be used to clarify, and not just introduce, concepts.

BS refers to chapters in Bennett & Shostak's Life in the Universe.

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AST 248: Learning Objectives

A student who masters this course will understand how to think scientifically. A student who masters Astronomy will be able to think critically about data (observations), and synthesize disparate facts to reach a conclusion in almost any area where the data can be quantified.

Specifically, a student mastering this course will understand:

- the reasoning behind Drake's equation
- how to apply estimation techniques in general
- how the Sun and stars evolve
- the concept of habitable zones
- the changing Earth and the evolution of life thereupon
- the concept of the habitable zone
- the rationale behind and methods for searching for life elsewhere in the Solar System
- the rationale behind and methods for searching for life elsewhere in the Galaxy
- the Fermi paradox
AST 248: The Search for Life in the Universe

Spring 2017

Important Dates

Updated 19 December 2016

- **Wednesday February 15**: First Midterm.
- **Wednesday March 22**: Second Midterm.
- **Friday March 24**: Last day to withdraw or change to P/NC grading.
- **Wednesday April 26**: Term paper due.
- **Tuesday May 9**: Final Examination. 5:30 - 8:00 PM. Location: TBD You will need to show a picture ID to take the final examination.