Alien Worlds  
Astronomy 105  
Fall 2013

Andrew West  
Assistant Professor, Department of Astronomy  
Email: aawest@bu.edu  
Office: CAS 422A  
Phone: 617-358-5879

Course Description and Goals: Astronomy 105 (AS105) focuses on the search (and study of) extraterrestrial worlds that may harbor life. We will embark on a detailed examination of our solar system, the history of NASA exploration, and the discovery of more than 900 confirmed planets orbiting other stars. This course will examine alien worlds we can touch, alien worlds on which we can land (or have landed), alien worlds that are studied from a great distance, and examine the question of how common life is in the Universe. Students will use telescopes to observe the worlds of our solar system, examine alien worlds as portrayed in cinema, learn the tools needed to interpret astronomical observations, and be exposed to the myriad discoveries coming from current studies of extrasolar planets, including recent results that indicate planets around other stars appear to be common.

Class Times:

CAS AS105 A1: Lecture: Tue, Thu: 2:00-3:20 (Tsai Center)

Head Teaching Fellow (TF):

Sadia Hoq  
Email: shoq@bu.edu  
Office: CAS 524

As the head TF, Sadia should be your first point of contact when it comes to general or logistical questions about AS105. Specific questions should still be directed to Professor West. Sadia can also be used as a secondary resource - her office hours are open to all students.

Teaching Fellows:

Paul Dalba  
Email: pdalba@bu.edu  
Office: CAS 524  
Phone: 617-353-6554

Brandon Harrison  
Email: zephyr@bu.edu  
Office: CAS 524  
Phone: 617-353-6554

Phillip Phipps  
Email: phhipps@bu.edu  
Office: CAS 524  
Phone: 617-353-6554
Office Hours:
West: Mon: 2PM-3PM (CAS 422A); Tues: 11AM-12PM (CAS 422A); Thur: 9AM-10AM (PCH/ERC)
Hoq: Mon: 11AM-12PM (CAS 524); Wed: 3PM-4PM (CAS 524); or by appointment
Dalba: Tue: 3:30 PM-4:30 PM (CAS 524); Fri: 11AM-12PM (CAS 524); or by appointment
Harrison: Tue: 1PM-2PM (CAS 524); Thur: 1PM-2PM (CAS 524); or by appointment
Phipps: Thur: 11AM-12PM (CAS 524); Fri: 11AM-12PM (CAS 524); or by appointment

Note on office hours and questions: Please make use of office hours (both mine and the TF’s). They are designed to set up a personal setting where you can feel comfortable asking questions that may not seem appropriate in class. I have found that students who make use of my office hours tend to be much more successful in my class.

The best way to get information is to ask questions. No instructor is perfect, myself included. If I do a poor job in explaining some concept, please raise your hand and ask me to rephrase.

Discussion Sections: You are required to register for one of the discussion sections, which are listed as separate sections (see below) but are part of the same course. Your grade will be a combination of the coursework and activities completed in these sections. Discussion sections will be with one of the TFs in either Room 521 or B04 of the CAS building. Attending discussion is strongly encouraged because there will be some assignments that can only be completed during sections – if you miss it without prior arrangement, you cannot make it up.

CAS AS105 A2: Mon (CAS 521) – 1:00-2:00 (Harrison)
CAS AS105 A3: Tue (CAS 521) – 1:00-2:00 (Dalba)
CAS AS105 A4: Mon (CAS 521) – 2:00-3:00 (Harrison)
CAS AS105 A5: Wed (CAS 521) – 1:00-2:00 (Harrison)
CAS AS105 A6: Tue (CAS B04) – 11:00-12:00 (Phipps)
CAS AS105 A7: Wed (CAS 521) – 4:00-5:00 (Hoq)
CAS AS105 A8: Fri (CAS B04) – 2:00-3:00 (Dalba)
CAS AS105 A9: Thu (CAS 521) – 11:00-12:00 (Harrison)
CAS AS105 B1: Mon (CAS B04) – 1:00-2:00 (Phipps)
CAS AS105 B2: Wed (CAS B04) – 1:00-2:00 (Phipps)
CAS AS105 B3: Thu (CAS B04) – 1:00-2:00 (Phipps)
CAS AS105 B4: Mon (CAS 521) – 11:00-12:00 (Dalba)
CAS AS105 B5: Wed (CAS 521) – 11:00-12:00 (Hoq)
CAS AS105 B6: Thu (CAS B04) – 11:00-12:00 (Dalba)

(Text)books:
1) “Mirror Earth: The Search for our Planet’s Twin”, 2012, Michael D. Lemonick

Web site: My plan is to have most of the course information available through the BU Blackboard Learn site (http://learn.bu.edu). You will be able to log into the course site by logging into blackboard with your BU username and Kerberos password.
**Background:** Astronomy 105 has no prior course requirements. It is designed with the expectation that you have had high school algebra and an understanding of basic science. Basic mathematical equations should not freak you out. If you have already taken AS101 at BU, then you cannot get Natural Science General Education credit for AS105. For those interested in more mathematical/scientific rigor, you should consider taking AS202 (please let me know if you would like more information).

**Current Science and Scientists:** This class is not designed to prepare you to be an astronomer; rather one of the goals is to give you enough background to understand basic astronomical concepts, understand how science works and learn about the role that scientists play in shaping our understanding of Alien Worlds. Throughout the semester I will bring in popular articles to class that we will discuss and introduce you to scientists who will help shape our attitudes toward astronomy and science.

**Facebook and Twitter:** AS105 has both a Facebook group (alienworlds) and a Twitter handle (@BUalienworlds). Students are encouraged to join the Facebook group and follow the Twitter account as well as make posts to the Facebook page or Tweet to #alienworlds. Posts should be limited to news related to AS105 content and/or questions about science/astronomy - questions about logistics should be directed to the Head TF via email.

**Daily Traditions:**

*Music:* Most days as you are coming into class I will play a song that has something to do with what we are talking about in class that day or something related to astronomy.

*Questions:* We will always start each day with an opportunity for you to ask questions. Although you should always ask questions at any point during class, I will always reserve the first few minutes for any questions that may have come up overnight. Some of the time you will be asked to share your questions with a partner before asking me.

*Questions of the Day:* All of my lectures begin with a set of questions. These are an outline of what I hope you learn that day. By the end of the day you should be able to answer each question with at least a couple of sentences.

*Astronomy Picture of the Day:* I would like the AS105 students to become familiar with the “Astronomy Picture of the Day” (APOD) website (http://apod.nasa.gov/apod/), which posts beautiful astronomical images with descriptions from professional astronomers. Most days we will take a few minutes in class to look at the APOD, chat about what we are seeing, discuss how it relates to AS105, and hopefully inspire students to continue looking at APOD on the days when AS105 does not meet.

*Minute Papers:* Once a week, at the end of class, you will write for 2-3 minutes about the important points of the lecture/class. In the past, students have used the minute paper to summarize the class, ask probing questions, give feedback to the instructor, and/or discuss ways in which class relates to other topics. You will turn these into your Teaching Fellow (make sure you write your name, section and TF’s name on your minute paper) and your TF will read, comment and answer any questions that come up. Every week I will read the minute papers from four different AS105 sections so that by the end of the course, all of you will have received at least a few responses from me. The minute papers will count towards the participation portion of your grade but will not be graded on content. Instead, it will serve as an evaluation for both your ability to pay attention in lecture and my effectiveness as an instructor. In a given week, you will not know which day the minute paper will be assigned.
**Exams:**
There will be 4 exams in this class:

Quiz 1 - Online or Take Home, Due October 7  
Quiz 2 - Tuesday, October 22  
Quiz 3 - Thursday, November 21  
Final - Monday, December 16, 3-5 PM, Tsai Center

**Observing Alien Worlds:**

No astronomy class would be complete without the opportunity to view the night sky, look through telescopes, and apply some of what you have learned in this course to direct observations. Boston University has a small observatory on the roof of CAS that we will be using as part of this course.

Observing will be held using telescopes on the roof of CAS. You can access the roof via stairs on the fifth floor (door next to room 522). Take the stairs to the sixth floor, then just keep climbing until you get to the roof.

Observing sessions will be during the week from 8:30-9:30 PM on Mondays, Tuesdays, and Thursdays when it is clear. To check if it is clear, you can look in the sky and/or call 617-353-2630 (after 6:30), and select option 1 for the Astro 100-level “night lab” message. TFs will lead the observing sessions and I will come to some of them as well (and will let you know when I am going). The nights will not happen when it is cloudy so make sure you do this early! Make sure you go to the observing nights early in the semester (just thought I would say it again). As part of your grade (and enjoyment), you will need to attend 1 clear night and fill in the worksheet that I will provide via Blackboard. However, you are welcome to go as many times as you like.

**Other Important Dates**

- Museum of Science Planetarium — 6:30 PM, September 30, October 1 and October 2 (Monday, Tuesday, and Wednesday respectively - choose one)
- Monday Schedule — Tuesday, October 15 — No class
- Parents to class — Thursday, October 17
- Final Exam — Monday, December 16, 3-5 PM

**Grading:**

Participation/Minute Papers: 5%  
Night Observing: 5%  
Planetarium: 5%  
Homework and Class Assignments 30%  
Quizzes 30% (10% each)  
Final 25%
Homework and Late Policy: All homework assignments will be due before 5PM on the date specified on the assignment. Homework should be placed in the “homework box” labeled “AS105” in room CAS 514 (unless otherwise noted). No late homework will be accepted. However, since we realize that unforeseen circumstances occur, each student will get one, penalty-free, late homework assignment during the semester (but it must be turned in within one week of the original due date). If you choose to use your free late homework, please write “late” on the top of your homework assignment. No work can be turned in after the last day of classes (12/11).

No exams can be made up without prior-to-class arrangement. I realize that sometimes life is out of our control so if a problem occurs, come and talk to me (earlier rather than later).

Laptop Policy: My personal feeling is that laptops, tablets and/or other electronic devices are distracting and likely result in more time on email, Facebook, etc. than paying attention in class. However, as college students you are all adults and can make that decision for yourself. Therefore, my policy is that electronic note taking is acceptable except for the 3rd week of class (9/17 and 9/19), when I would like our class to conduct an “electronic-free” experiment and then let you (electronic note takers) decide which format you like better. Remember to bring paper on which to take notes during that week.

Cell Phone Policy: Cell phones MUST be turned off at all times. In the event of a cell phone interruption, I reserve the right to answer your phone and thoroughly embarrass you in front of the entire class.

Collaboration: Science often requires us to work together. In doing homework and writing up assignments it is okay and even encouraged that you work together. It is very important that each person turns in his or her own work. Copying will not be awarded any credit. BU has a zero-tolerance policy when it comes to cheating. If you have any questions about the fine line between collaborating and cheating, please come and see me or the head TF.

Flipping the Classroom: A few times during the semester, we will do something called “flipping the classroom”, where you will prep for class beforehand by watching a short video or doing a quick worksheet and then we will use class time to discuss the material in more detail and give you plenty of opportunities to ask questions. This format has been shown to increase student learning but will only work if you prepare for class – I’m excited to give it a try!

Attendance: CAS policy states, “Students are expected to attend each class session unless they have a valid reason for being absent. Students may be required at any time to account for undue irregularity in attendance, either by personal explanation to their faculty adviser or dean or by written statement from a parent or another authority. Any student who has been excessively absent from a course may be required to withdraw from that course without credit. Students who expect to be absent from class for more than five days should notify their dean promptly.”

Academic Conduct: It is your responsibility to know and understand the provisions of the University Academic Conduct Code, which is available online (http://www.bu.edu/academics/).
## Course Outline

<table>
<thead>
<tr>
<th>Week</th>
<th>Tuesday</th>
<th>Thursday</th>
<th>Homework</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (9/3-9/5)</td>
<td>Introduction: Alien Worlds</td>
<td>Vocabulary; size, time and other scales</td>
<td>HW 1 (Due 9/13)</td>
<td>Asimov: Prologue - Ch. 6</td>
</tr>
<tr>
<td>2 (9/10-9/12)</td>
<td>Tools for determining planet properties</td>
<td>Laws of motion, orbits and gravity</td>
<td>HW 2 (Due 9/25)</td>
<td>Asimov: Ch. 7-13</td>
</tr>
<tr>
<td>3 (9/17-9/19)</td>
<td>States of matter, light</td>
<td>Transiting planets</td>
<td>No new homework</td>
<td>Asimov: Ch. 14-20</td>
</tr>
<tr>
<td>4 (9/24-9/26)</td>
<td>Apollo</td>
<td>Planet/Moon Formation</td>
<td>HW 3 (Due 10/2)</td>
<td>Asimov: Ch. 21-27</td>
</tr>
<tr>
<td>5 (10/1-10/3)</td>
<td>Solar System Formation</td>
<td>Terrestrial Atmospheres</td>
<td>Quiz 1 (Due 10/7)</td>
<td>No Reading</td>
</tr>
<tr>
<td>6 (10/8-10/10)</td>
<td>What is a planet?, Pluto?</td>
<td>Exoplanets: RV Method</td>
<td>HW 4 (Due 10/15)</td>
<td>Asimov: Ch. 28-33</td>
</tr>
<tr>
<td>7 (10/15-10/17)</td>
<td>Monday Schedule</td>
<td>Earth Impacts</td>
<td>No new homework</td>
<td>Asimov: Ch. 34-End</td>
</tr>
<tr>
<td>8 (10/22-10/24)</td>
<td>Quiz 2</td>
<td>Exoplanets: atmospheres/imaging</td>
<td>HW 5 (Due 11/5)</td>
<td>Lemonick: Ch. 1-3</td>
</tr>
<tr>
<td>9 (10/29-10/31)</td>
<td>Sun and Stars</td>
<td>Stellar evolution</td>
<td>No New Homework</td>
<td>Lemonick: Ch 4-6</td>
</tr>
<tr>
<td>10 (11/5-11/7)</td>
<td>A. West Research</td>
<td>Drake Equation and Life</td>
<td>HW 6 (Due 11/15)</td>
<td>Lemonick: Ch. 7-9</td>
</tr>
<tr>
<td>11 (11/12-11/14))</td>
<td>Terrestrial Satellites</td>
<td>Life in our Solar System?</td>
<td>No new homework</td>
<td>Lemonick: Ch. 10-12</td>
</tr>
<tr>
<td>12 (11/19-11/21)</td>
<td>Rare Earth Factors</td>
<td>Quiz 3</td>
<td>No Homework</td>
<td>No Reading</td>
</tr>
<tr>
<td>13 (11/26-11/28)</td>
<td>Astronomy in Film</td>
<td>Thanksgiving</td>
<td>HW 7 (Due 12/11)</td>
<td>Lemonick: Ch. 13-15</td>
</tr>
<tr>
<td>14 (12/3-12/5)</td>
<td>Putting it all together</td>
<td>Students Choose</td>
<td>No Homework</td>
<td>Lemonick: Ch. 16-18</td>
</tr>
<tr>
<td>15 (12/10-12/12)</td>
<td>Wrap-up, evaluations</td>
<td>Study Period</td>
<td>No Homework</td>
<td>No Reading</td>
</tr>
</tbody>
</table>
I have read this syllabus and understand the requirements and policies for Astronomy 105.

Printed Name:

Signed Name:

Date:

Section:

T.F.: 