**ASTR 105-01: Descriptive Astronomy**

VVO 110; Spring 2014; TTh: 10:30 am – 11:50 am
http://wesfiles.wesleyan.edu/courses/ASTR-105-sredfield/

**Instructor:** Seth Redfield  
email: sredfield@wesleyan.edu  
office: VVO 101  
office hours: W 1–2 pm, and by appt.  
office phone: 3669

**Teaching Assistant:** Nicole Arulanantham  
email: narulanantha@wesleyan.edu  
office: VVO Library  
office hours: T 3–5 pm

**Teaching Apprentice:** Dilovan Serindag  
email: dserindag@wesleyan.edu  
office: VVO Library  
office hours: M 7–8:30 pm

**Course Description:**
This is an introductory class that examines the principles of modern astronomy, summarizing our present knowledge about planets, stars, galaxies, and the universe. Two themes are central to the structure of this course: (1) Experiencing our place in the universe can be visceral as well as intellectual, and (2) Our knowledge of the cosmos is expanding rapidly, often in fits and starts coupled with the development of new techniques and technologies. With regard to theme (1), we will emphasize understanding astrophysical phenomena that we have the opportunity to experience at anytime (e.g., phases of the moon, apparent motion of the planets), and in addition, have several opportunities to look through the telescopes at Van Vleck Observatory (VVO) to observe a wide range of astrophysical objects in the night sky (e.g., planets, supernova remnants, distant galaxies). With regard to theme (2), the course will focus on the top astrophysical discoveries of the last several decades. These are subjects that you may have read about, and will continue to read about, in the popular media. In addition, these results are typically made possible using telescopes or expertise funded by our tax dollars. As responsible and scientifically literate citizens, we should understand the implications of this research as we set the priorities for federal funding.

Education research has shown that while lectures can be very useful, most students learn better when they are actively working with the material, rather than passively listening to a lecture. Therefore, there will be homework every week, frequent demonstrations, small group discussions, and assignments during class time.

**Textbook:**
The Cosmic Perspective (CP) 7th edition (although editions 5–6 are OK too) by Bennett, Donahue, Schneider, and Voit. Four copies (6–7th editions) are on reserve at Olin (first two chapters on E-Res; password: astr105). Be aware that they market portions of the book, so don’t be fooled into buying half the book.

**Grading:**
Homework: 30%; In Class Work: 20%; Exam 1: 10%; Exam 2: 10%; Final Exam: 20%; Paper: 10%
Your lowest homework and in class assignment grade will be dropped when calculating your final grade. Participation in two evening observing sessions are required to pass this class.

**Homework:**
There will be homework assigned every week. Homework is due at the beginning of class on Thursday. No homework will be accepted after the beginning of class under any circumstances.
In Class Work:
Every class will include a small group assignment. You are responsible for forming groups quickly, keeping
an eye on the clock, not disturbing other groups, and getting back into lecture mode without wasting time.
Be sure to bring a scientific calculator to every class.

Exams:
There will be three exams in this class, the first in-class on Thursday, February 26th, the second in-class on
Thursday, April 9th, and the final exam on Tuesday, May 12th from 2–5pm.

Attendance:
Attendance is expected. In class work is a substantial component of your grade, and the easiest to do well
on. If you miss a class, you will receive a zero for the in-class activity.

Paper:
A short paper (no more than 4 pages) will be due on Tuesday, April 21st. This paper can address any
topic in astrophysics (e.g., What is dark energy? How will we detect an Earth-mass planet around another
star?), and should identify a key astrophysical question, provide the necessary background, explain basic
concepts, and finally, place it into the greater context (i.e., Why is understanding and answering this question
important?). Not only will the paper be handed in to me as part of your grade, but it will also be evaluated
by a group of your classmates, acting as the “Decadal Survey” of the National Academy of Sciences, which
set the funding priorities for NASA and the National Science Foundation every ten years. Each group will
be given a set of papers to critique and prioritize, just as is done for the Decadal Survey, and to distribute
research grants and telescope observing time. It will be important in your paper to be clear, concise, and
provide a motivating context for your subject of interest, while keeping in mind that you will have two
audiences: (1) me and (2) a panel of your peers. A paragraph description (an abstract) of your paper topic
is due on March 31st. Additional information regarding the paper will be distributed in a few weeks.

Evening Observing:
We are lucky to have excellent historical and modern astronomical facilities here on campus at the Van
Vleck Observatory (VVO), and we will be taking full advantage of them. We have four evening observing
sessions scheduled using the telescopes here at VVO. In order to ensure that we do not get clouded-out, we
will set aside 4 weeks in which the observing will take place on the first clear night of the week. So, the
evening observing session will be held on the first clear evenings from among Monday, Tuesday, Wednesday,
or Thursday. The observing session weeks are currently scheduled for: 2–5 February from 9–11pm; 23–26
February from 9–11pm; 30 March–2 April from 9–11pm; and 20–24 April from 9–11pm. An email will be
sent out to the entire class around 4pm on the day of a potential observing session as to whether the session
will be occurring or not. You should expect to be at the observing session for at least an hour.

In order to pass this class, you must attend at least two of these sessions, and complete the corresponding
written assignment! These observing sessions are a lot of fun, especially if you’ve never looked through
a telescope before. Attending more than two evening sessions will count for extra credit, by replacing lower
grades on homework or in-class work. Objects we may observe include the Moon, Jupiter, the asteroid Juno,
Comet Lovejoy, the Orion nebula, star clusters, and nearby galaxies.

Students With Disabilities:
Wesleyan University is committed to ensuring that all qualified students with disabilities are afforded an
equal opportunity to participate in and benefit from its programs and services. To receive accommodations,
a student must have a documented disability as defined by Section 504 of the Rehabilitation Act of 1973
and the ADA Amendments Act of 2008, and provide documentation of the disability. Since accommodations
may require early planning and generally are not provided retroactively, please contact Disability Resources
as soon as possible. If you require accommodations in this class, please make an appointment with me as
soon as possible (before February 19th), so that appropriate arrangements can be made.
Course Outline

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Assignments</th>
<th>Reading</th>
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<tbody>
<tr>
<td>1/22</td>
<td>Overview and Our Universe</td>
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<td>1/27</td>
<td>Our Night Sky</td>
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<td>1/29</td>
<td>Planetary Motion</td>
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<td>2/2–5</td>
<td>Observing Night 1 (9–11pm; 1st clear night; check email @ 4pm)</td>
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<td>2/3</td>
<td>Gravity</td>
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<td>2/5</td>
<td>Light</td>
<td>HW 2 due</td>
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<td>2/10</td>
<td>Telescopes; Our Solar System</td>
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<td>2/12</td>
<td>Planet Formation</td>
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<td>2/17</td>
<td><strong>A Close Look At the Giant Planets</strong></td>
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<td>2/19</td>
<td>Asteroids, Comets, and Pluto</td>
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<td>2/23–26</td>
<td>Observing Night 2 (9–11pm; 1st clear night; check email @ 4pm)</td>
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<td>2/24</td>
<td><strong>Exoplanets: Planets Around Other Stars</strong></td>
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<td>2/26</td>
<td>Exam 1</td>
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<td>3/3</td>
<td>Our Star the Sun</td>
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<td>3/5</td>
<td>The Diversity of Stars</td>
<td>HW 5 due</td>
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<td>3/10</td>
<td>NO CLASS; SPRING BREAK</td>
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<td>3/12</td>
<td>NO CLASS; SPRING BREAK</td>
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<td>3/19</td>
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<td>3/24</td>
<td>Star Formation</td>
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<td>3/26</td>
<td><strong>The Closest Supernova in Modern Times</strong></td>
<td>HW 6 due</td>
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<td>3/30–4/2</td>
<td>Observing Night 3 (9–11pm; 1st clear night; check email @ 4pm)</td>
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<td>3/31</td>
<td><strong>Black Holes</strong></td>
<td>Paper abstract due</td>
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<td>4/2</td>
<td>Einstein Papers; Olin Special Collections</td>
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<td>4/7</td>
<td><strong>The Biggest Explosions: Gamma-Ray Bursts</strong></td>
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<td>4/9</td>
<td>Exam 2</td>
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<td>The Interstellar Medium and the Milky Way</td>
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<td>4/16</td>
<td><strong>Our Galactic Structure</strong></td>
<td>HW 8 due</td>
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<td>4/20–4/24</td>
<td>Observing Night 4 (9–11pm; 1st clear night; check email @ 4pm)</td>
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<td>4/21</td>
<td>Galactic Cannibalism; Dark Matter</td>
<td>Paper due</td>
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<td>4/23</td>
<td>Galaxy Clusters</td>
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<td>4/28</td>
<td>Dark Energy</td>
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<td>4/30</td>
<td><strong>The Big Bang, Inflation, and How it Will End</strong></td>
<td>HW 10 due</td>
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<td>5/5</td>
<td>Review or TBD</td>
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<td>5/12</td>
<td>Final Exam 2–5pm</td>
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Can’t Get Enough Astronomy?

2. Wednesday Night Public Observing (VVO 16") from 8–9pm (rain or shine).
3. Saturday Night VVO Public Observing (hosted by the Astronomical Society of Greater Hartford and sponsored by the Astronomy Department at Wesleyan University): 24 Jan 8–10pm; 21 Feb 7–10pm; 21 Mar 9–11pm, 25 Apr 9–11pm.
4. Wednesday Astronomy Colloquia, typically every 2 weeks, held in VVO 110 at 4:15pm (with coffee and donuts at 4). Look for posting at VVO, and I will make announcements in class.
5. Sturm Lecture, an annual event held in the spring, in which an outstanding astrophysicist is invited to give a public lecture. This year it will be Sara Seager from MIT. She is a leading researcher in exoplanets. Her public lecture will be the evening of Wednesday, April 29th.
6. The *Dawn* Spacecraft will arrive and orbit the dwarf planet Ceres (roughly the size of Texas) in March. It should send back some spectacular images of this strange world.
How to succeed in this class

1. Attend class and participate in the activities.

For discussion groups to work properly everyone has to speak up. If someone in your group is being too quiet, ask for their opinion. Try to think of as many possible answers as you can. Try to enumerate the advantages and disadvantages of each viewpoint. If everyone seems to agree on the answer, play devil’s advocate and try to poke holes in the answer.

2. Do the homework.

Start working early enough that if you have any questions, you can get help. Contact a friend and work together - two heads are better than one! If you’re confused, contact Nicole, Dilovan, or I - helping is our job!

3. Read the text.

Set aside a chunk of time every day for reading. Different people read at different speeds so set aside enough time to get through about a chapter of material. Don’t just try to read it straight through. Skim through it the first time, and then go back and read it more thoroughly. Having an idea of what the chapter is about as you are going through helps to actually learn the material, rather than just pulling your eyes from sentence to sentence.

What to do if you need help

1. Stop by.

Nicole, Dilovan, and I are here to help out. We’ll give you as much time as you need to help figure out the homework, explain a difficult concept, or discuss your ideas for your paper. If the scheduled office hours don’t work for you, send an email and make an appointment. We want to make this class fun and interesting, not confusing and overwhelming!

2. Send an e-mail.

During the day, I regularly check my email. If you have a question, send an e-mail and I’ll get back to you as fast as I can.

3. Call me.

I spend most of the day in my office, so I’m usually just a phone call away (x3669).