

University of California, Santa Barbara  
Department of Physics at UCSB

**Astronomy 1 — Fall 2009**

Instructor: Prof. Robert Antonucci  
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Office Hours: My hours will be given to you in class and posted on the website. You can also make an appointment, or drop by any time. Please feel free to consult by email at any time; I check mine very frequently.

Class Times: MWF 10:00-10:50 PM, Broida 1610. Four credit hours.

Purpose of the Course: Earth is the tiniest dust mote in a Universe of essentially infinite size and variety and beauty and weirdness. By the end of the term you will have a pretty sophisticated and broad knowledge of the contents and nature of the Universe as we know them today. You will also know just how this information was gathered, and you will have an appreciation for the relatively primitive state of our knowledge.

Textbook: R.A. Freedman and W.J. Kaufmann, *Universe* (8<sup>th</sup> edition). On some topics more detail is given than we can absorb in one term. **See the schedule below for the detailed requirements.** Don't try to read everything in the book unless you have a lot of free time!

Observing Sessions: One night-time observing session will be held on the roof of Broida. You must attend (i.e., there will be something to turn in which will contribute to your grade).

Homework: Homework will be assigned each Friday, to be turned in to the labeled locked boxes at the back of the lecture room, the following Monday in lecture. The Teaching Assistants, Elijah Quetin and Brendan Keller will grade your homework. Their email addresses are [elquetin@physics.ucsb.edu](mailto:elquetin@physics.ucsb.edu) and [bpkeller@umail.ucsb.edu](mailto:bpkeller@umail.ucsb.edu). Save all of your graded homework assignments and tests, both for reference, and in case you think a grading error has been made.

You may work with others on your homework problems, but you must **write them up yourself**, using your own words. If you hand in a paper that is nearly identical to your friend's, you will both receive zero credit, since we won't know who did the work. After each homework assignment has been handed in, solutions will be posted on our website, [www.physics.ucsb.edu/~astro1/fall2009](http://www.physics.ucsb.edu/~astro1/fall2009). For this reason **late homework will NOT be accepted except** for emergencies. (In case of emergency, let me know before the due date, if possible.)

Grading: Your grade in Astronomy 1 will be determined as follows:

Midterm 30%, HW 30%, Final 40%. Your total for the course will be curved, with about half receiving an A or B.

Website: We will maintain an website for this class at [www.physics.ucsb.edu/~astro1/fall2009](http://www.physics.ucsb.edu/~astro1/fall2009). It will be a convenient source of class information, including homework solutions. It is also an excellent link to astronomy sites that provide the latest results and authoritative information on astronomical discoveries. This is a very important resource in the class, which should be consulted every day or two. After the first week, homework and other handouts will be posted and handed out.

Disclaimer: **This is a relatively rigorous science class**, which many students find quite challenging. It satisfies the University requirement for a **quantitative** science class. The main tools of astronomy, besides observation, are math and physics. We will learn and apply some basic physics in this class. There are no course prerequisites, but experience shows that virtually every student can do fine in the class, **with lots of work and help from the instructor**. I will be happy to help you as much as you want. If office hours are inconvenient you can call me for an appointment or try just stopping by or consulting by e-mail or telephone. Periodically during the quarter I'll post summary sheets on our website listing the most important points from the previous week or two of class. If you don't understand something on a summary sheet, please ask.

## Approximate Schedule

All reading assignments are from Freedman and Kaufmann's *Universe*, 8<sup>th</sup> edition. I recommend reading the assignments **before** the corresponding classes; otherwise you may find the quizzes and lectures difficult. Important note: read ALL of the sections called Cosmic Connections in the chapters that we cover.

<b>Date</b>	<b>Topic</b>	<b>Reading Assignment</b>
Friday, 9/25	Introducing the Universe I	
Monday, 9/28	Introducing the Universe II	Chap. 1, including the Boxes.
Wednesday, 9/30	The Sky, daily motions of the Sun and stars	Ch 2, Sec 1-3
Friday, 10/2	The Celestial Sphere and the seasons	Ch 2, Sec 4 and 5
Monday, 10/5	Appearance of the Moon; eclipses	Ch 3, Sec 1-5, Box 1
Wednesday, 10/7	Kepler's laws	Ch 4, Sec 2-5, Box 2
Friday, 10/9	Newton's Laws	Ch 4, Sec 6, Box 3
Monday, 10/12	Gravity	Ch 4, Sec 7, 8
Wednesday, 10/14	The nature of light; blackbody radiation	Ch 5, Sec 1-4, Box 1
Friday, 10/16	Spectroscopy	Ch 5, Sec 5, 6, Box 2
Monday, 10/19	Atoms and photons	Ch 5, Sec 7-9. Boxes 3-6
Wednesday, 10/21	Basic properties and formation of the solar system	Ch 7, Sec 1-4 and 8, Box 1; Ch 8, all sections, Box 1
Friday, 10/23	Terrestrial planets; Earth and the natural greenhouse effect	Ch 9, Sec 1,3
Monday, 10/26	Doomsday: global warming (Note: you will get most of the descriptive material on the planets from the book so I can take time to tell you why we're doomed.)	Ch 9, sect 5, 7 Ch 11, Sec 1, 5-8
Wednesday, 10/28	Ozone Depletion	Ch 9, sect 5, 7 Ch 11, Sec 1, 5-8

<b>Friday, 10/30</b>	<b>Midterm</b>	
Monday, 11/2	The Gas Giants and their icy rings and moons	Ch 12, Sec 1,3, 8-10; Ch 13, Sec 1-4 and 6
Wednesday, 11/4	The Sun	Ch 16, sec 1,2, and 5, Box 1
Friday, 11/6	Introducing the stars: distances, luminosities, and temperatures	Ch 17, Sec 1,2,4,6, and 7, Boxes 2 and 4
Monday, 11/9	The Main Sequence	Ch 18, Sec 1,2, and Box 1; also Ch 19, Sec 1, Boxes 1 and 2
<b>Wednesday, 11/11</b>	<b>Holiday</b>	
Friday, 11/13	Stellar evolution I	Ch 19, Sec 2-5
Monday, 11/16	Stellar evolution II	Ch 20, Sec 1, 3-6, and 9
Wednesday, 11/18	Stellar evolution III; Neutron stars	Ch 21, Sec 1, 2, and 10
Friday, 11/20	Einstein's theory of gravity	Ch 22, Sec 1 and 2
Monday, 11/23	Black Holes	Ch 22, Sec 3, 5, 6, and 8, Box 2
Wednesday, 11/25	Our Milky Way galaxy; comments on the search for extraterrestrial intelligence	Ch 23, Sec 1-4; Ch 28, sec 1, 2, and 4
<b>Friday, 11/27</b>	<b>Holiday</b>	
Monday, 11/30	Other galaxies; dark matter	Ch 24, Sec 1, 2, and 8
Wednesday, 12/2	Expansion of the Universe	Ch 24, Sec 5
Friday, 12/4	The Big Bang	Ch 26, Sec 1-4
<b>Tuesday, 12/8</b>	<b>Final Exam</b>	

**Astro 1:****How to Get an A in this Class**

1. **TEXTBOOKS:** Read the indicated sections of the textbooks carefully. Just **SKIMMING** the sections **BEFORE** class will help you understand the lectures. You can save the careful reading for after class if you prefer. Follow the reading advice on the syllabus closely.
2. **TURN IN EVERY HOMEWORK:** There are no extensions on the HW, unless you have a family emergency or illness. It really hurts your average to miss a HW and get a zero on it.
3. **GO TO SECTION, GET HELP:** Sections provide major help with homework. Outside of office hours, you can get help from the instructor by email, telephone, and individual appointments. Hints are just an email message away. Our TAs will also answer questions by email or during office hours.
4. **GO TO LECTURE:** Often in class I'll show you a multiple-choice qualitative question and ask you to vote on the answers. Then you will have a chance to discuss it with your neighbors and vote again. More than half of these questions will appear on the exams, so you'll go into the exams knowing many questions in advance.
5. **REVIEW THE HOMEWORK:** When I make up test questions, I use the HW for inspiration for many of them; that is, many are slight modifications (and usually simplifications since test time is tight) of HW questions. So if you go into the tests with a good understanding of all the HW questions, you'll have a huge advantage.
6. **TAKE PRACTICE TESTS:** We'll post practice tests on the website, and go over them in review sessions (depending on demand). When you take a practice test, give yourself the same time limit as for the actual test. If you are unsure of the reasoning on any problems from the previous year's test, please get help on it.