ASTR121: Introductory Astrophysics — The Stars and Beyond

Spring 2004

Lectures:	Tuesday, Thursday 11:00 AM–12:15 PM, CSS 2428
Discussion Section:	Friday 1:00–1:50 PM, CSS 2428
Lab section 0101:	Monday, 11:00 AM–1:00 PM, CSS 1109
Lab section 0201:	Monday, 2:00 PM–4:00 PM, CSS 1109
Homepage:	`http://www.astro.umd.edu/~miller/ASTR121`
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Office Hours:	After class most days, or by appointment
Teaching Assistant:	Laura Brenneman
Office:	CSS 0222
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Office Hours:	Friday 2-3 PM and by appointment
Required Text:	Freedman & Kaufmann, ***Universe***, 6th Edition (2002)

Introduction

This course presents a broad introduction to the science of astronomy. It is designed to be a two-semester sequence with the first semester (ASTR120) concentrating on our Solar System and the second semester (ASTR121) concentrating on our Galaxy and the Universe. The intent of the course is to give the student a solid background in the primary physical concepts relevant to astronomy, and a broad exposure to the astronomical universe. **This course is for science majors, or those with a strong interest in science.**

In addition to learning about our Universe, a primary goal of this class is to develop your scientific thinking and problem-solving abilities. **Equations and numerical calculations will be a component of this class.** A working knowledge of algebra, geometry, and trigonometry is *essential* for this class, and although calculus is not mandatory it will help with the understanding of some concepts.

Course Structure

This course consists of two lectures and one discussion period each week. The lectures will contain the bulk of the course material and provide a forum for general questions. It is intended that the lectures parallel the text. Thus, for a better understanding of the lecture material, it is important you READ THE TEXT (preferably BEFORE the lecture). However, some material in the lectures may not be in the text. You are responsible for all material presented in class, discussion periods, labs, and the homework, even if it is not in the text. On occasion, I will give short in-class quizzes. When these happen, they will always be at the beginning of class, and you will get some points for giving an effort even if you get the answers wrong.

The discussion periods serve a variety of roles. Primarily, they provide an opportunity to think about and apply the lecture material. They also are a forum for question-and-answer sessions, problem-solving practice sessions, and group discussions of issues brought up in the lectures. You are **expected** to attend discussion section. Most of the time there will be graded work to be done in the discussion period, which will count towards your overall grade in this course. You will need a *valid* excuse to make up any work missed in discussion section (see below).

The labs will involve hands-on problem-solving, often using the Web, and are intended to be fun and useful practice for the type of research you really will be doing if you pursue a career in astronomy.

Be Prepared

Students are expected to bring a pen or pencil, paper, and a calculator to every class and discussion. You should also bring your textbook to the discussion sections. Remember, in-class quizzes can occur at any time...

Night Lab

We will be going to the Campus Observatory to look at the night sky and to use optical telescopes. This night session will require your presence on campus one night during the semester. Since we cannot predict the weather, we may have several unsuccessful attempts at night observing. Realistically, it often takes 2–3 scheduling attempts before we get a clear night. Given the size of the class, there will be two night labs, with roughly one half of the class assigned to attend one or the other night lab. We will announce later in the term the available dates, and you will be given an opportunity to select your preference. You must have a *valid* written excuse if you miss your chosen night lab in order to make up the work.

Grading

Your final grade will be based on class work (including discussion section worksheets), homework, the night lab, two mid-term exams, and the final exam. These factors will be combined in the following percentages to determine your class grade:

Homework	20%
Lab section	10%
Discussion section	10%
Night lab	5%
In-class quizzes	5%
First midterm exam	15%
Second midterm exam	15%
Final exam	20%

This is designed so that no single assignment contains too much of the grade, meaning that a "bad day" won't ruin your chances. The total number of points available will be 1000, e.g., there will be 8 homeworks that consist of five 5-point questions each, for a total of 200, or 20% of the total. There may occasionally be extra credit (e.g., in discussion sections or the exams), but **there will *not* be any make-up assignments**. If you miss an assignment, you miss out on the points associated with that assignment. If you know that you will be absent for an exam, you must tell me in advance and give me written documentation of the reason (see below for valid reasons).

I will guarantee that you will receive *no worse* than the following letter grades for a given percentage of the total available points:

A	90–100%
B	80–89%
C	70–79%
D	60–69%
F	$< 60\%$

Note that the optional $+/-$ grading scale will NOT be used in this course, except that I might give an A+ to reward a truly exceptional performance.

If the average class grade is low, I may increase your letter grade compared to this table, but will not decrease it.

The mid-term exams are scheduled for the dates given on the accompanying class schedule. The exams will occur during the regular class lecture hour in the same room as the lectures. The final exam will be cumulative, drawing on all material covered by the lecture, discussion, lab sections, and night lab, but will be weighted somewhat more heavily towards material covered after the second midterm. The final will be given at the time, and in the room, listed in the University Schedule of Classes (also see bottom of accompanying class schedule).

Homework will be assigned most weeks and is to be turned in at the beginning of class on the Thursday that it is due (see the accompanying page that lists the homeworks). Homework turned in more than 15 minutes after the beginning of class on the due date will be considered late. Late homework may be turned in at the beginning of class the following Tuesday after the due date, at a penalty of a 30% reduction in score. On that Tuesday, we will return graded homework and hand out solution sets; no homework is accepted after that. It is expected that each homework assignment will take 2–3 hours to complete if you are attending lecture and are up to date on your reading of the text. Homework must be neat, readable, and stapled if necessary, with all work shown, justification given for answers as required, and with the units in all quantitative questions clearly indicated. Marks will be deducted for failing to adhere to these requirements. At times in discussion sections, written work will be given to be completed during the section, which will be graded, and should also be neat, etc. Some of these exercises may involve the use of equipment; others may involve problem solving in groups.

Finally, please note the grading structure of this class makes it mathematically impossible to get an 'A' grade for the course without doing reasonably well on the homework, discussion section, and night lab. Typically students who do not do homework do not get better than a 'C' course grade and often get a 'D' grade or worse; don't count on being the exception.

Missed Exams and Assignments

The University recognizes only a few excuses for missing exams, including religious holidays, University-approved travel, and illness (cf. Schedule of Classes). Traffic, for example, is not a valid excuse: to adjust for possible problems, you should plan to get to campus well in advance of an exam. None of the exams are scheduled on a major recognized religious holiday. Except in the case of emergencies, you will know beforehand if you will miss a scheduled exam or lab. You need to provide *written documentation* of the excuse BEFORE the exam. If you do, a make-up exam will be given at a mutually agreed upon time. To be fair to your classmates, we will have the make-up exam before the regular exam. In the case of emergencies, you must contact me *promptly* following the missed exam with a *valid written* excuse in order to be able to take a make-up exam. Make-up exams may be written or oral, at my discretion. If you do not have a valid written excuse, you will NOT be allowed to make up the exam.

Similar principles apply to other aspects of the course that involve credit, such as homework, labs, or the discussion section. Notify in advance, and give written documentation. If you do this, we'll allow you to make up work for full credit.

If you miss the final exam, a *valid written* excuse must be provided within ONE DAY after the missed final exam. In addition, you must arrange with me a time for a make-up exam within two days after the exam date listed in the University course schedule. This is fixed because course grades are due 48 hours after the final exam has been held.

For the night labs, it may not be possible for everyone to attend on their assigned night. If that is the case for you, please be sure that we are aware *in advance* that you will be unable to attend. We will make arrangements for you to make up the work.

The Honor System

The academic community at the University works on the basis of a Code of Academic Integrity (cf. http://www.testudo.umd.edu/soc/dishonesty.html). Acts of academic dishonesty include cheating, fabrication, facilitating academic dishonesty, and plagiarism. Specifically, activities such as cheating on exams or labs, copying homework, knowingly permitting your homework to be copied, and submitting forged excuses for absences from exams are violations of this code. All cases of suspected academic dishonesty can be turned over to the Student Honor Council to investigate and resolve. The normal sanction for academic dishonesty is a course grade of 'XF', denoting failure due to academic dishonesty. The Code of Academic Integrity is reprinted in full in the Undergraduate Catalog. **We are serious about this.** To set an example: the course structure is based on what Prof. Derek Richardson did in the last two years, with some modifications.

Recently the University Senate and Student Government Association approved an Honor Pledge.[1] The University of Maryland Honor Pledge reads:

"I pledge on my honor that I have not given or received any unauthorized assistance on this assignment/examination."

Although not compulsory, you are encouraged to write and/or sign this pledge on the front cover of all papers, projects, or other academic assignments submitted for evaluation in this course.

There are some potential gray areas that naturally arise in this class. For homework, you are permitted to work with other students in the class. This includes discussion of the problem and solution in a cooperative, mutually contributing fashion. However, you should write out your answer in your own words. You should NOT, under any circumstances, simply copy someone else's homework and call that "working together". You should NOT seek out or use "solution sets" from previous students. You may seek help on homework problems from the TA or myself. For the night lab and lab sections, it is expected that you will work with your partner or partners, but the written work that you turn in should be in your own words and you should have worked through any equations, and plugged in the numbers yourself. Failure to abide by these rules could result in the case being brought before the Student Honor Council.

Note in particular: you should not simply copy material from any source, *including the course textbook or a website*. For example, even one full sentence that is identical to a source (even with one or two words substituted) is a problem. Your best bet is to not look at the source when writing your own description. If for some reason an exact phrase is necessary, attribute it and put it in quotes. For example, according to William Shakespeare in Richard III, "Now is the winter of our discontent made glorious summer by this sun of York".

If you have questions regarding what is appropriate and what is not, please talk to me or to your TAs.

Students with Special Needs

Students with a documented disability who wish to discuss academic accommodations should contact me as soon as possible.

If you are experiencing difficulties in keeping up with the academic demands of this course, contact the Learning Assistance Service, 2201 Shoemaker Building, 301-314-7693. Their educational counselors can help with time management, reading, note-taking, and exam preparation skills.

If your writing skills could use improvement, check with the campus Writing Center.

[1] `http://www.inform.umd.edu/honorpledge/`

ASTR121 Course Outline

No.	Date		Lecture	Chapter
1	Jan.	27	Introduction, Distances	19
2		29	Stellar Motions and Magnitudes	19
3	Feb.	3	Stellar Spectra	19
4		5	Binary Systems and Mass Measurement	19
5		10	Properties of Stars/The H-R Diagram	19
6		12	The Interstellar Medium	20
7		17	Stellar Clusters and Star Formation	20,21
8		19	Stellar Evolution I	21
9		24	Stellar Evolution II	21
		26	**Mid-term Exam**	—
10	Mar.	2	Stellar Remnants: White Dwarfs	22
11		4	Neutron Stars and Pulsars	23
12		9	General Relativity	24
13		11	Black Holes	24
14		16	Structure of Our Galaxy	25
15		18	Motions Within Our Galaxy	25
		23	Spring Break	—
		25	Spring Break	—
16		30	Galactic Center/Stellar Populations	25
17	Apr.	1	Properties of Other Galaxies I	26
18		6	Properties of Other Galaxies II	26
19		8	Hubble's Law, Clusters of Galaxies	26
20		13	Superclusters and Active Galaxies	26,27
		15	**Mid-term Exam**	—
21		20	Quasars, Lensing, and More	26,27
22		22	Evolution of Galaxies	28
23		27	Cosmology	28
24		29	The Expanding Universe	29
25	May	4	The Early Universe	29
26		6	The Fate of the Universe	28
27		11	Life in the Universe	30

Final Exam: Thursday, May 13, 2004, 8:00–10:00 AM, CSS 2428

ASTR121 Homework Assignments

No.	**Due Date**	Problems (**Chapter**: Prob)
1	Feb. 5	**Ch 19**: 17, 25, 29, 30, 31
2	12	**Ch 19**: 23, 38, 44, 48, 54
3	19	**Ch 20**: 20, 24, 29, 32, 33
4	Mar. 11	**Ch 21**: 31; **Ch 22**: 10; **Ch 23**: 25; **Ch 24**: 12, 23
5	18	**Ch 24**: 26, 29; **Ch 25**: 21, 27, 31
6	Apr. 8	**Ch 25**: 35; **Ch 26**: 15, 19, 23, 28
7	22	**Ch 26**: 25, 26; **Ch 27**: 13, 23, 26
8	May 6	**Ch 28**: 21, 29; **Ch 29**: 17, 22, 23