Astronomy 301: Unique number 48480
Introduction to Astronomy
Instructor: John Scalo

Classroom and time: Welch Hall 3.502, T Th 11:00-12:30.
Professor: John Scalo Office: R.L. Moore 15.318
Phone: 471-6446 (office), or **478-2748** (home) email: scalo@astro.as.utexas.edu
Office hours: M2:15-3:15, T2:15-3:15, or after any class, or by phone (see below). On the day before each exam we will try to open up more office hours. If you don't have a class after ours, we can talk outside the classroom (in the foyer) after class. For short questions there is usually no need for you to walk all the way to my office. I also welcome phone calls at home—it is an extremely efficient way for us to communicate while a particular question or problem is on your mind. I usually cannot give adequate answers to questions by email, so I'd appreciate it if you only send email if you have non-subject matter comments that do not require a reply; especially welcome are any suggestions or criticisms as the semester progresses (e.g. "You tend to mumble" or "I can't read your handwriting on the board" etc.).

Teaching Assistant: Benny Tsz Ho Tsang Office: R. L. Moore 16.318
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Office hours: M2-3:30, W2-3:30.

Materials: The only items you need to purchase are the textbook and some #2 pencils (for each exam). I will assume you have convenient access to the internet, and that you check your email regularly.

Course web site: **All materials will be available via Blackboard or sent to you by email.**

***Textbook web site*: www.masteringastronomy.com (course "name" is MASCALO76939)**

Textbook: Chaisson, E. and McMillan, S. *Astronomy Today (**with Access Code**), 7th Edition, **Vol. 2, Stars and Galaxies w/Mastering Astronomy***. ISBN: 9780321718655.

It is crucial that you purchase the **seventh** edition, and that you buy **volume 2 of the two-volume version**, which comes bundled with an online access code (called "Mastering Astronomy" by the publishers). To compensate for the steep price of the one-volume textbook, I am using only the second volume of the two-volume version, but this will require that students study for one of the exams using the textbook web site—so you **do** need the "Mastering Astronomy" access. (Details later.) Basically, you purchase an expensive text, but only have to buy half of it, however for ¾ the price.

The Co-op carries the correct (new) textbook, and I suggest you purchase it as quickly as possible. Since it is a new book, you can return this book for full value if you decide to drop the course. The price listed last year was $90, or about $80 after annual Co-op Rebate. Amazon shows it at $75 + shipping, and no rental.

I have found it impossible to purchase a used version online or anywhere else without incurring serious expense, receiving the wrong edition, or missing part of the course materials. You can find a used 7th edition online for low price, but it will not have the access code, so you'll have to purchase an access code online (at the Pearson web site), which costs about $50. Do not trust sellers who list a used 7th edition as having the access code—as far as I know that is impossible. Also, the earlier edition (6th) will be seriously misaligned with the current edition (wrong subsection and page numbers, etc.), and will likewise not have an access code. Finally, you should not buy the Astronomy Today 7th edition one-volume version, which is much more expensive than our v.2 of the two-volume version, *unless* you buy a used copy and are willing to be missing the interactive review questions at the textbook web site.

Once you have the book, a first assignment is that you take time to look through it, to see the layout, level of math, and generally get familiar with what this course is about, before we begin with specific material. Trust me: It will be beneficial to "get the feel" of the book before diving into details.

The course in a nutshell: This course is meant as a *descriptive* introduction to a wide range of topics in astronomy for students who are not science or math majors. The emphasis is on description of astronomical phenomena, how astronomical observations are performed and interpreted, and theories for the evolution of various astronomical objects. We will cover a broad range of phenomena, including our solar system, the search for extrasolar planets, the Sun and other stars, the Milky Way and other galaxies, and the universe at the largest scales. *I strongly urge you to flip through your textbook at your earliest convenience to get a good overview of the subject matter.*

The pattern of lectures and exams is usually 4 (or 5) in-class lecture periods, then an exam (5 exams). I will send you a review sheet 2-3 days before each exam. *There is no comprehensive final, but there will be an optional comprehensive final for extra credit (replaces lowest score) given on the day that is scheduled for the final exam.*

Course Prerequisites: **None**. Math usage is very minimal, but you will have to be able to deal with some very small and large numbers, and be able to understand some graphs. The emphasis is on understanding the ideas and concepts, rather than solving problems. The most useful asset to bring to this class would be an interest in astronomy, even if it is developed during the semester.
Note: This course does not count toward degree requirements for students in College of Natural Sciences, and is designed for students *not* majoring in a science or engineering field. CNS students should enroll in AST307.

Grading: **100% of your grade is based on 5 exams.** Details of these are given below on the readings/lecture schedule. Homework *will* be assigned, but it is "due" on the days of exams, and you don't turn in anything. Instead, the multiple-choice equivalent of the homework questions will appear on the exam; some of these are the online review questions at the textbook web site, or at the end of each chapter. Your lowest exam score will only get half-weight compared to the rest of your scores. **There is no comprehensive final.** You will be offered an optional comprehensive final as extra credit—it will replace your lowest exam score (but not a zero—you must take all exams).

Final letter grades. With 5 exams, and counting the lowest one with ½ weight, there are 450 points possible. Your final percentage average will be the sum of your exam scores, after dividing the lowest by a factor of 2, divided by 450. Final grades in our class will be assigned on the following basis. (Numbers refer to your final percentage average over the five exams, lowest score given half weight; see below.)
A = 87-100,
B = 77-86.9
C = 67-76.9
D = 57-66.9
F = below 57.0

Final percentages will not be "rounded up." 86.87 is a B, not an A.

Plus/minus grades will not be assigned.

Just under the cutoff? The optional comprehensive final is a way to *possibly* increase your final grade by ½ to 1 letter grade, so should be seriously considered if you end up 1-4 percentage points under the next highest grade cutoff. If at the end of the semester you are just under the cutoff for a grade, by any amount, do *not* ask me to lower the cutoff--this is unfair to all concerned. At the end of the semester I review all student scores carefully before deciding on final grades, and usually end up being generous about borderline cases, when they are truly borderline and no other students are unfairly affected.

Departmental policies: Please download and read the "Memo to Undergraduate Astronomy Students regarding Astronomy Courses" at Blackboard (in Course Documents, "First Day Handout"), or at http://www.as.utexas.edu/astronomy/education/memo.html.

Special requests: Students with disabilities may request appropriate accommodations for the exams or more general accommodations from the Division of Diversity and Community Engagement, Services for Students with Disabilities, 471-6259, http://www.utexas.edu/diversity/ddce/ssd/

If you have *any other* special request of *any* sort (excluding those not allowed, like lowering the grade cutoff), please put the request in writing, preferably by email, or call me on the phone. Please state clearly and explicitly your request and why it is reasonable. Include a phone number so that I can contact you about your request. Obviously (I hope) this procedure does not apply to minor requests such as "Could you stop twitching so much during your lectures?" Such requests or comments are useful and welcome. Any suggestions for improvement of the class as we proceed will be greatly appreciated—an email is usually the easiest way. Don't wait until the end of the semester to complain!

Attendance: You will not be graded explicitly on your attendance except insofar as it affects your exam scores. The exams are weighted toward the lecture material, as well as the textbook readings. I usually give examples of exam questions (some of which appear on the exam) during class, and try to clarify some of the denser material in the text, so attendance turns out to be highly beneficial. Some statistical studies I've done in the past indicate an average difference of nearly a full letter grade between students who attend regularly and those that don't. In semesters for which I counted attendance, it was very rare for a student who didn't have about 80-90% attendance to receive an A. Of course, you may be one of the occasional exceptions who can acquire everything you need from the textbook, in which case you are welcome to avoid all the lectures you like.

Dropping the course (see *General Information*, ch.4, for details of required approvals, and authoritative documentation of the dates given here). I list a few important dates here.
Tuesday, Sept. 3 is the last day of the official add/drop period; after this you need approval of the department chair and usually the student's dean. The 12th class day, Friday, Sept 13, is the last day to add or drop courses and receive a refund. Tuesday Nov. 5 is the last day to Q drop without urgent and substantiated *nonacademic* reasons (e.g. extended health-related problems or family emergencies).

Incompletes: An incomplete (X) will only be considered for students who cannot complete the required course work for reasons other than lack of diligence (illness or other imperative nonacademic reasons), but only if the student has a passing grade on the work completed.

Cheating: Academic dishonesty will result in failure of the course and a report to the Dean of Students, who will decide on further action. Also, bring your UT ID card with you to exams and be prepared to show this card if asked.

Student observing opportunities (schedule is tentative; see http://outreach.as.utexas.edu/public/viewing.html for official schedule and updates). Students interested in observing the night sky through small telescopes have several opportunities. 1. The Painter Hall Observatory (24th E. of Guadalupe) has UT Student/Staff Night on Fridays and Public Night is on Saturdays. These sessions are free and open to all ages; no reservations are required. 2. The Astronomy Department sponsors weekly "Star Parties" on the 18th floor observing deck of R.L. Moore Hall 30 minutes after sunset on Wednesdays. This is free and open to the public. Call 471-5007 for a list of all Astronomy Department public events, since the schedule may have changed. The list of events is preceded by a description of the current night sky. Call 232-4265 for weather cancellation information.

Exams, homework

Exam description. The exams will consist entirely of multiple-choice questions, usually 35-45 of them. I will prepare you for the nature of the exam questions by occasionally giving sample questions during lectures, by pointing out the types of information that I expect you to understand or remember, and giving examples on review sheets. There are also useful questions at the end of most textbook chapters—I will tell you which are relevant. There is a good multiple choice interactive self-testing part of the *textbook* (Mastering Astronomy) web site that I urge you to use, since the exam questions will be of that form, and some will be taken from this source. I will suggest which questions to try as we finish each chapter. You need an access code, which accompanies every new textbook, in order to use this feature of the textbook (click on "Study Area" button in the upper right part of the Mastering Astronomy web page).

Special circumstances. In case of medical or other non-academic emergencies or situations, contact me (*and* the TA) as early as possible—it should be possible for you to take an exam a day or so early or late in these cases (but not for academic reasons). For observance of religious holy days that interferes with an exam day, you must notify me of your pending absence at least fourteen days prior to the date of the exam. You will be given an opportunity to take the exam on an alternate day. For students with other special concerns, such as athletes who need to be out of town on the day of an exam, or students who need special accommodation, please notify me as early as possible so that we can make alternative arrangements. UT rules specify the 12th class day as a deadline for these cases, but I realize that special circumstances may arise. We make an extra effort to be sure that no student is unfairly penalized for circumstances that could not be foreseen, so be sure to contact me *and* the TA in such cases, even if it is the day of an exam.

Students with disabilities may request appropriate academic accommodations for the exams or more general accommodations from the Division of Diversity and Community Engagement, Services for Students with Disabilities, 471-6259, http://www.utexas.edu/diversity/ddce/ssd/

Receiving your exam grades. We will return exam grades through the UT Blackboard system, usually within 24 hours, sometimes before the end of the work day. You will turn in your exam when you turn in your scantron answer sheet, but you can compare your answers with an exam marked with correct answers, located at the back of the classroom, a couple of days later. For this reason, you should record your answers (e.g. 15a, 16d,…) on a separate piece of paper before you turn in the exam. A few days after each exam, take time to carefully compare your answers with the correct answers—this is often good preparation for the next exam.

Homework: There *is* homework in this class, but you will not turn it in. Instead, you will see some of the homework questions appear on the exam, in multiple-choice form. I will send some homework questions by email, and discuss them briefly during lecture; others will be from the assigned review questions at the end of each chapter, or at the textbook online web site.

The reading and exam schedule is on the next page.

AST 301 Introduction to Astronomy (Scalo)
Course schedule of lectures, readings, and exams

Date	Main Topic(s)	Readings – to be completed before class	Comments
8/29 Th	Introduction	Get textbook Look through textbook	Read syllabus
9/3 T	Scale of universe, distance, angles. History: Geocentric, heliocentric, Copernicus, Kepler *et al.*	(App.1), 1.1, 1.3, 1.6 2.2, 2.3, 2.4, 2.5	Read MP, p.11
9/5 Th	Orbits: Kepler's, Newton's laws. Waves, spectrum of light	2.5, 2.6, 2.7, 2.8 3.1, 3.2, 3.3	MP p.44, MP p.52
9/10 T	Thermal radiation: Wien's, Stefan's laws	3.4 Ch. 3.5, 4.1, 4.2	3.4 long and important
9/12 Th	Doppler effect, spectral lines. Info from spectral lines	Ch. 4.3, 4.4, 4.5	4.3 long and important
9/17 T	Telescopes	Ch.5.2 through 5.7	Skip Sec. 5.1
9/19 Th	**EXAM 1**	**Review sheet, questions**	
9/24 T	Survey of solar system	Ch. 6	Read online.
9/26 Th	Formation of planets	Ch. 15	Read online.
10/1 T	Extrasolar planets	Ch. 15	Read online.
10/3 Th	Extrasolar planets	Ch. 15, outside reading	Update: Mostly Kepler Mission
10/8 T	**EXAM 2**	**Review sheet, questions**	
10/10 Th	Sun	Ch. 16	Skip 16.4, 16.5
10/15 T	Properties of stars	Ch. 17	17 important!
10/17 Th	Interstellar medium	Ch. 17, 18	Skip 18.2, 18.3
10/22 T	Formation of stars	Ch. 18	
10/24 Th	**EXAM 3**	Review sheet, questions	
10/29 T	The HR diagram; main sequence evol.	Ch. 19, 20	Skip 20.6
10/31 Th	Supernova explosions, nucleosynthesis	Ch. 21	
11/5 T	Neutron stars, gamma-ray bursts, black holes	Ch. 22	
11/7 Th	Milky Way galaxy. Other galaxies.	23 24	Skip 23.7 Skip 24.3-24.5
11/12 T	**EXAM 4**	Review sheet, questions	
11/14 Th	Dark matter Cosmology, large-scale structure	24.3, 25 25, 26	
11/19 T	Cosmology	26	
11/21 Th	Inflation, early universe	26, 27	Tough material
11/26	Cosmic background radiation		
11/28	**THANKSGIVING HOLIDAY**		
12/3	Cosmic background, Alternative models for universe	27	
12/5	**EXAM 5 Last class day**	Review sheet, questions	
12/12 W 2-5 pm	***OPTIONAL* COMPREHENIVE FINAL EXAM**	Covers all material from class; replaces lowest exam score.	

We will attempt to stick to this timetable, although slight adjustments may occur. *Your* job is to look over the textbook material before each lecture, and then review your lecture notes within a day *after* the lecture. I will explain in class and/or in emails if there is material for which you will not be responsible—most of it is marked above. Also, on occasion, I will ask that you read a popular-level article designed to update the material in the textbook—this is especially true for the Exam 2 material on "Extrasolar Planets."

Summary of exam dates (these are firm dates):

Exam 1. September 19, Thursday

Exam 2. October 8, Tuesday

Exam 3. October 24, Thursday

Exam 4. November 12, Tuesday

Exam 5. December 2, Thursday: Last class day.

No comprehensive final.

Optional Final: December 12, Wednesday, 2-5pm, usual classroom.

Brief Course Description

This course is meant as a *descriptive* introduction to a wide range of topics in astronomy for students who are *not* science or math majors. The emphasis is on *description* of astronomical phenomena, how astronomical *observations* are performed and interpreted, and *theories* for the evolution of various astronomical objects. Look at the list of topics in the syllabus and/or go through your textbook to get a feel for the range of astronomical objects we will discuss.

The mathematical level is very low in this course—I do not believe manipulation of formulas demonstrates understanding. *However* you will encounter a few important but simple formulas in the text, familiarity with which will be essential in later sections of the course, so please don't interpret this paragraph as suggesting that you should ignore the important equations!

You should get used to *seeing* very large and small numbers expressed in "scientific notation" (be sure to read Appendix 1 of the text, at the end of the book, or at the web site, on this; for example, "Our galaxy contains about 10^{11} stars."). **It will also be *very* helpful to develop a comfort with looking at graphs**.

That being said, *most of the emphasis in this class will be focused on a verbal-level presentation and understanding of the material at a conceptual level. This may be more difficult than you think!*

Suggestions for success:

Read ahead, in the textbook, before each lecture, even if it is merely to skim the relevant pages and look at the pictures. You are expected to keep up with the material. **I would like to assume that you have tried to look over the relevant text material *before* the corresponding lecture**. If you are coming to class "cold," without having skimmed the material in the text, you will find yourself at a disadvantage.

Ask me questions in class if something is not clear or if you are just curious about something. Or call me.

Look at or think or talk about the course material as often as possible, even if it means 15 minutes every day—*familiarity is remarkably important for understanding a subject conceptually.*

Attempt to talk about the material, to yourself or someone else, or an inanimate object if necessary. My experience is that students who can explain the material in everyday language do well on my exams. The subset of students who think they have studied hard and understood the material and nevertheless do much more poorly than expected on exams are almost always those who cannot articulate the material themselves.

The biggest single danger in this course, as in most courses, is to fall far enough behind, either through lack of reading or spotty attendance, that you cannot ever really understand the material being covered. A related danger is to study the material infrequently and irregularly (e.g. once per week). Subsequent chapters will almost certainly seem obscure, and the effect becomes seriously cumulative if you allow this state of affairs early in the semester, when we cover the most "physics-oriented" material that you will need throughout the rest of the book. I realize that all instructors probably say this about not falling behind, but it is one of the most important factors in controlling your success in most classes, and probably *the* most important factor in this one.