

Astronomy 301: Unique number 48210
Introduction to Astronomy. Instructor: John Scalco

Classroom and time: Welch Hall 3.502, MWF 9-10.

Course web site: <http://www.as.utexas.edu/astronomy/education/spring11/scalo/301.html>

Professor: John Scalco

Office: R.L. Moore 15.204 Phone: 471-6446 (office), or **478-2748** (home)

email: scalco@astro.as.utexas.edu

Office hours: M, F 10:30-12, or after any class, or by phone any time 9am-9pm (see below)

My schedule is probably more open than yours, so if those times interfere with classes or work, just tell me a time that would be convenient if you need to talk to me about course material. If you don't have a 10am class, we can also 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 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: Julie Krugler Hollek

Office: R. L. Moore 17.307 Phone: 471-8414

email: julie@astro.as.utexas.edu

Office hours: T1:30-3:30, Th 1-5; usually review sessions 4:30-5:30 on day before exam, room to be announced)

If office hours require revision, we will send out a group email as well as announce it repeatedly in class.

Textbook: Chaisson, E. and McMillan, S. *Astronomy Today*, 7th Edition **Vol. II, Stars and Galaxies**.

It is crucial that you purchase the **seventh** edition, and that you buy **volume II 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 $\frac{3}{4}$ the price.

The Co-op unfortunately ordered the one-volume version of the 7th edition, and I am waiting for the vol.II version to come in. *For now, buy the one-volume version; when the correct version arrives, you can return this book for full value and buy the vol. II version (with access code)*. If you buy one of the *used* full one-volume 7th editions in the Co-op (no access code), it will be significantly less expensive, but you'll have to purchase an access code online, which basically compensates. So either way, I'd return it and get vol. II when it arrives (with access code for 7th edition).

However you decide to proceed, you need to have a textbook immediately, by Friday latest, or risk falling significantly behind.

If you attempt to purchase online, note that the only inexpensive version you'll find is the 6th edition. My notes and assignments and review sheets etc. will be keyed to the page numbers and organization of the 6th edition, as will the end-of-chapter suggestions. You can get by these slight changes pretty easily.

What you can't get around is that there are useful interactive multiple choice questions only available through the Mastering Astronomy access code, so you'll have to purchase this separately, and *for the 7th edition*. I believe the publishers have taken the 6th edition Mastering Astronomy site offline, so if you purchase a 6th editions "with access code," it is useless, and the seller probably knows it. I suggest that if you buy online, buy the vol. II 6th edition or the full (1 volume) 6th edition, and purchase a 7th edition access code separately, assuming that will be possible. The 7th edition of Astronomy Today one volume version I \$145.80 at the Co-op new (no access code, probably \$30 online), or \$109.35 used (no access code). Volume II of the 7th edition will be \$82.30 at the Co-op. As far as I know, there are no used versions available anywhere.

At that site, or at any site listed in BestBookBuys.com, I see no way to be sure you would be purchasing the second volume of the 2-volume edition we are using, or that it has the access code to the ebook and other online materials will work on the 7th edition.

If you want to take a chance with an online purchase, I suggest you immediately buy the new version from the Co-op and return once your online version arrives and you verify that it has the access code. I am using the same textbook for this course in the Fall 2011, so you will be able to sell the textbook to the Co-op at the end of the semester for a sadly small fraction of its value, if you can part with it.

→**It is important that you have the textbook no later than Friday Jan.21**, and 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.

Course web page. <http://www.as.utexas.edu/astrometry/education/spring11/scalo/301.html>

Make sure you keep this handy. I may try to set up a link through Blackboard, but I will *not* be keeping lecture slide materials at Blackboard. You could also navigate to the course website through the Astronomy Department web site, <http://www.as.utexas.edu/astrometry/education/courses.html> by just clicking on AST 301 Scalo. The course website will contain the syllabus; an *outline* of most class lectures (usually as pdf files that are copies of my powerpoint slides, plus any additional notes I think are necessary); you can also get copies of handouts, review sheets, or any other items that I ordinarily will distribute through Blackboard email (*not* as permanent files at Blackboard). I urge you to keep the url in a handy place.

Course Prerequisites: None. Math usage is very minimal. The emphasis on understanding the ideas and concepts usually makes this course more difficult for most students—it will be difficult to get a high grade, or even a C, through memorization and certainly not by using any formulas or numbers.

Grading: 90% of your grade is based on exams, 10% on pop-quizzes (see below). “Homework” is not turned in but contributes to exam scores (see below for explanation).

Exams: 90% of your grade will be based on 7 exams (about one every two weeks, beginning with Exam 1, Wed. Feb 2). All exams will be weighted equally *except* that your lowest exam score will only receive a weight of 1/2 compared to the others. So you have to take all the exams, but if you have an off day (or week, etc.) it won't hurt your final grade too much. The topics and dates of the exams are listed on the last page. In case there are any errors or emergency changes, they will be announced heavily in class and at the class website, but outside of these, the exam dates are firm.

There will be no comprehensive final.

The exams will consist entirely of multiple-choice questions. 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 is a good multiple choice interactive self-testing part of the text web site that I urge you to use (you need an access code), 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.

In case of medical or other non-academic emergencies or situations, contact me as early as possible—it may be possible for you to take an exam a day or so early or late in these cases (but not for academic reasons).

We will try to return exam grades through the UT Blackboard system within one or two days of the day of the exam. You will turn in your exams, but 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. 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 it won't be turned in. Instead the homework consists of a subset of the questions at the end of each chapter and especially on the interactive multiple-choice self-testing

part of the text web site. The purposes of the homework are to give you a way of testing your understanding of the material, to provide a guide to the most important concepts, and to force you to keep up with the material. Although the homework will not be turned in, they are “graded” in the sense that some of them appear on exams; you will probably find that your exam grades suffer significantly if you do not attempt to work through these assignments. I may distribute the homework questions through Blackboard instead of the course web site; you will receive email announcements if this is the case.

Quizzes: I will give a series of short (~ 2-3 min) quizzes that will consist of simple questions covering the material you should have read before class, and/or that was covered in the previous lecture. These quizzes will be coarsely graded as 3 (exceptionally clear answer), 2 (adequate answer), 1 (you answered, but incorrect), or 0 (not turned in). Quizzes are intended to force you to keep up with the reading (difference between a 1 and 2), and because many students prefer not to have their entire grade determined by long and (more difficult) exams. In this way, a student can be steadily earning credit through other means. Expect about 5-10 of these through the semester, perhaps more frequent during the last half of the semester. You will just turn in a piece of your own paper with your name and answer. **Ten percent of your grade will be based on these quizzes.** For the four semesters that I have used quizzes in this way I found that they did make a significant difference for about 10-15% of students, either in a positive or negative sense. The quiz scores raised the final letter grade for about five percent of the class. Many of these were borderline cases whose consistently good quiz scores pushed them over to the next highest grade. More common were students who apparently rarely attended class, so had a string of zeros, and received grades lower than they would have based on exams alone. *Remember that this is 10 percent of your grade, approximately one letter grade, so you cannot afford to miss more than a few of them before having a (slightly) negative effect.*

Final letter grades: Final grades are assigned on the basis of A=87-100, B=77-86.9, C=67-76.9, D=55-66.9, F<55. Final percentages will not be “rounded up.” For example, if you end up with a 76.8, you will receive a C. The university gives instructors the choice of using “plus and minus” grades. I find these confusing and subjective, with just as many “minuses” as “pluses,” so I will not be using them. Last semester about half the class received grades of A or B, but a disappointingly large fraction received Ds.

Just under the cutoff? If at the end of the semester you are just under the cutoff for a grade (by, say, one, or two, or 0.3, percentage points), whether you are just under a D, say, or an A, do *not* ask me to lower the cutoff--this is unfair to all concerned. Cutoffs will *not* be lowered to accommodate your individual score. Scores at the end of the semester are *not* rounded up, so, for example, an 86.7 will get you a B.

Departmental policies: Please download and read the “Memo to Undergraduate Astronomy Students regarding Astronomy Courses” at <http://www.as.utexas.edu/astronomy/education/courses.html> if you did not receive it in class.

Special requests: The University of Austin provides upon request appropriate academic accommodations for qualified students with disabilities. For more information, contact the Office of the Dean of Students at 471-6259, 471-6441 TTY.

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.

Attendance: **1.** The exams are weighted toward the lecture material, as well as the textbook readings, and the “notes” that I will make available to you are only outlines or abstracts of my lectures, so attendance is beneficial. **2.** Frequent absences will affect your earned points on pop quizzes (10% of grade).

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.* Besides preparing you for the lecture, it will prepare you for the pop quizzes. *Bring a printout of the pdf outline of lectures to class, and take notes to include the additional material from lectures.* You will find it difficult to do well on the exams if you only study the textbook and pdf outline. *Most importantly, 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.* Finally, 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 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.

Dropping the course (see *General Information*, ch.4, for details of required approvals, and authoritative documentation of the dates given here).

Friday, Jan. 20, 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, Wed., Feb 2, is the last day to add or drop courses and receive a refund. The 20th class day, Mon Feb 21, is the last day to drop without a possible academic penalty. After the end of the 4th week of class, and until the deadline for dropping courses (Mon March 28), a student wishing to drop a course will get the forms from the Dean’s office and ask the instructor to complete a drop form that assigns a Q (ONLY if average grade is D or better) or an F. After that date, students are **only** allowed to drop for urgent and substantial *nonacademic* reasons (e.g. extended health-related problems or family emergencies). For non-academic reasons, a written appeal must be presented in the Student Division of the Dean’s Office.

The College of Natural Sciences does not in general honor the “one free drop” policy of some other colleges (e.g. Liberal Arts), so do not ask me for a Q drop after Oct 20 for academic reasons (e.g. because your grade is lower than you’d like), no matter what a counselor in your college may have told you. You need a substantiated non-academic reason. The only possible exceptions are first-semester freshmen who are allowed to drop a single College of Natural Sciences course—in that case there is a special form that I would need to see.

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. Depending on the size of this class relative to the number of seats, you will be asked to sit at least one seat apart during exams. 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 has UT Student/Staff Night on Fridays from 9:30 to 10:30. Public Night is on Saturdays, 8:30 to 10:30. 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 (7pm, probably 6pm) on Wednesdays this Spring. This is free and open to the public. Call 471-5007 for a list of all Astronomy Department public events, since this schedule may have changed.

Course Description—Review this in detail as soon as possible after first class lecture hour.

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 in this course is on description of astronomical phenomena, how astronomical observations are performed and interpreted, and theories for the evolution of various astronomical objects. The mathematical level, it is nearly zero in this course—I do not believe manipulation of formulas demonstrates understanding, so I try to equalize the background differences by using very little math in lectures, and almost (not quite) none on the exams. *However* you will encounter a few important but simple formulas in the text whose understanding will be helpful, even crucial, throughout later sections of the course, so please don't interpret this paragraph as suggesting that you should ignore the important equations!

You should also get used to *seeing* very large and very 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 is to develop a comfort with looking at graphs**, if you're not comfortable already. *Comfort with scientific notation and graphs will greatly enhance the ease with which you comprehend concepts later in the course, and so I urge you to spend some time on these matters early in the course. However most of the emphasis in this class will be focused on a verbal-level presentation and understanding of the material.*

The lectures will generally emphasize the most important and/or difficult topics covered in the text and attempt to clarify their connections. The lectures will not cover *every* topic covered in the text that you are responsible for, so don't assume that if it's not covered in lecture, it won't be on the exam; I will tell you in lecture (and on review sheets before each exam) which parts of the text you can skip or are of minor interest. There are a (very) few topics to which I will add material not covered in the text, the more important role of the lectures is clarification of concepts and discussing the same material as in the book from different points of view, so that you do not get deluded by terminology. So you may find it a distinct advantage to attend classes regularly, especially since some of the exam questions will be taken directly from lecture material, and I am in the habit of asking questions during class that later magically appear on exams.

My expectation is only that you keep up with the material, that you do **not** fall behind. In particular, **I will assume that you have tried to look over the relevant text material *before* the corresponding lecture**, so that the lecture can serve as a concentrated review and clarification. If you are coming to class “cold,” without having skimmed the material in the text, you will find yourself at a large disadvantage. The pop quizzes that will be given at the beginning of some classes are meant to encourage you to follow this path.

The textbook: I have used this textbook many times, and have stayed with it partly because its writing is clear (as far as science writing can be clear), and because of its visual materials. As soon as possible, please spend an hour leafing through the whole textbook so that you have a feel for the kinds of topics we will cover, and the level of detail that you will encounter. Also, to repeat, we are using vol.2 of the 2-volume 7th edition, with a 7th edition access code that will allow you to read chapters 7 and 14 online (as well as access interactive multiple choice sample questions).

The textbook website contains a *lot* of material, including links to recent developments, between figures and topics in the text and animations, to external sites; lists of glossary terms, learning objectives; and other stuff. I will *not* hold you directly responsible for any of this material that is not in the textbook (with an exception below). The website material can be perused at your discretion. Some students do report their understanding of the material strongly enhanced by, say, looking at pictures and animations, so I encourage you to dabble around at the web site as we cover each new topic.

We *will* use the multiple choice self-testing module at that site. (choose “Multiple Choice 1” and “Multiple Choice 2”) A separate handout will be passed out listing specific suggested study guide questions for the first few exams. These comprise your “homework,” some of which will appear on each exam. A few additional “homework” questions may be assigned for each exam—none of these are turned in. If they’re on the exam, you’ll get them correct.

Basic Outline of Textbook Reading Covered on Exams (subject to possible slight modification, e.g. if we don’t quite finish covering a particular chapter, we may postpone that material to a later exam—I will notify you in class and by email if there are changes, and well in advance of the exams)

Because of the large number of topics included in “astronomy” and the finite length of the semester, I have decided to omit several chapters that consist of detailed discussions of objects in our solar system (chapters 7 through 14), and to not discuss the history of astronomy, except in ways that I will make clear in class. We will also omit Ch.28 (extraterrestrial intelligence); take AST 309L (which is frequently taught) for a full-semester treatment of this subject. (It is one of my research areas, but I am not teaching it again until 2011/12 earliest.)

The most crucial part of the course, but unfortunately for most students, the most dry and difficult, are the first few chapters. Much of your later success in understanding the material will depend on how comfortable you are with these basic physical concepts. So probably *the most important advice for this course is to NOT get behind in the reading and self-testing for the first part of the course, especially chapters 3 and 4 on the topic of light*. In fact, this is the time when you should study most consistently. If you master this background material, later chapters will seem much less obscure.

Reading and exam schedule is on the next page.

AST 301: Reading and Exam Schedule

Here is a list of the reading assignments and dates for each of the seven exams (given during the normal class period and classroom—**bring a #2 pencil**). I suggest you copy this to a separate sheet and keep it handy. However because we only have about five lectures per exam, and there may be unforeseen circumstances, you should consider this list somewhat tentative; if the reading schedule is changed slightly, it will be announced prominently in class and by class email. Note: The exams are all on Wednesdays except for the last exam (Friday). Suggested end-of-chapter questions and on-line interactive questions will be supplied via email before each exam.

Exam 1. Chapters **1** (basics), **2** (gravity, orbits,...), **3** (radiation, except we will postpone sec. 3.5 on the Doppler effect until exam 2). Also see Appendices 1 and 2 at the end of the textbook. *Chapter 3 is especially important for later chapters.*

In Ch. 1 you will only be tested on sections 1.1, 1.3, and 1.6; these are on our place in the universe, angular measure, and distances. In Ch. 2 you should read sec. 2.2, 2.3, but really we will be concentrating only on sections 2.5 through 2.8, especially Kepler's and Newton's laws and how we can learn about astronomical objects using them. We will cover all of Ch. 3 except 3.5.

Date: **Wednesday, Feb 2**

Exam 2. Sec. 3.5 (Doppler effect); Chapters **4** (spectroscopy) and **5** (telescopes). Chapter 4 is especially important for later chapters, and usually difficult for students.

Date: **Wednesday, Feb 16**

Exam 3. Chapters **6** (survey of the solar system-omit 6.6), **15** (formation of planetary systems, observation of exoplanets).

[This material is available *only* online at the textbook website, not in your textbook (unless you have the large one-volume version of the textbook). Note that we are skipping chaps.7-14 covering details of the solar system.]

Date: **Wednesday, March 2**

[*Spring Break occupies March 14-18*]

Exam 4. Chapters **16** (Sun), **17** (properties of stars), **18** (the interstellar gas and dust). [We need to cover 16, 17, and beginning of 18 before Spring Break, leaving one lecture after break to complete and review. At this point it is uncertain whether ch.19 will be on exam 4 or exam 5—see below.]

Date: **Wednesday, March 23**

Exam 5. Chapters **19, 20 (not 20.6), 21, 22** (stellar formation, evolution and death). Ch. 19 may have to be covered on exam 4, depending on our rate of progress.

Date of exam: **Wednesday, April 6**

Exam 6. Chapters **23** (Milky Way galaxy, not 23.7), **24** (other galaxies, not 24.4, 24.5), **25** (galaxies and dark matter)

Date: **Wednesday, April 20**

Exam 7. Chapters **26** (cosmology) and **27** (the early universe).

Date: **Friday, May 6** (last class day)

I will explain in class and/or in emails/handouts if there is material for which you will not be responsible. This occurs mainly for chapters 1 and 2 (see above); we will read nearly all of the remaining chapters listed above.

Ask me questions about anything that is unclear, or not covered, in this syllabus.