

Ast 309R - Galaxies, Quasars and Universe - Spring 2014
MWF 12-1 - #48695 / MWF 1-2 - #48700

Instructor: Dr Derek Wills, Professor of Astronomy (RLM 13.136, 471-1392, oo7@astro.as.utexas.edu).

TA: unknown as of 19/13

Textbook: "Your Cosmic Context" by Duncan and Tyler (Pearson).

Office hours: Our TA's office hours are [to be decided], mine are Tues and Thurs 1:15-2:45. If you can't come at these times, ask us for another appointment.

Grades: There are four in-class tests and an optional final, all of equal length - only the best four of these five are counted. The final exam (and ONLY the final exam) is: (a) comprehensive, and (b) an open-notes exam, when you can bring your OWN written or typed lecture notes (no laptops, commercial notes, textbooks, homeworks or other aids). The best 4 tests each count 20% of your course grade, and the other 20% comes from the homework assignments.

Tests: This class is lecture-based, so study your notes when preparing for tests rather than just trying to memorize material from the book. Make-up tests will not be given since you can miss one test and still count the other four for your course grade. I will hold a review session the evening before each test; attendance is voluntary but strongly recommended. The in-class test dates are Feb 7, Mar 5, Apr 7 and May 2. The final exam is 2-5 pm on May 9 (the date and time are set by UT). I do not tolerate dishonesty - I report cases to the Dean of Students, and recommend an F for the course. Please bring a photo ID to tests.

Homework: will be assigned at irregular times during the semester - probably a total of 8 or so sets. Our TA will hold a help session for each set of questions before the HW is due; again, attendance is voluntary but recommended, and to get the best value from these sessions you should try the questions by yourself first. We cannot accept any HW handed in after the due date.

Class etiquette: (1) I welcome questions and discussion during class; if you're confused about something, you probably aren't the only person who is! (2) Please sit in the front half of the class - the room is much larger than the enrollment, and I'm not going to use a microphone, (3) If you have a cell 'phone I don't want to see it - ever!

Mathematics: This is a science course, and you will have to do some mathematics, mainly on the review questions. The tests are mostly non-numerical, and all the techniques you need will be covered in class.

General comments: Keep up with the material as we go through the course. We'll follow the general order of the topics in the textbook, but quasars are not covered in enough detail there, so I'll recommend other sources when we get to them (the Wikipedia article on quasars is a good start). Class attendance is crucial - IF YOU DON'T PLAN ON COMING TO MANY CLASSES, DROP THIS COURSE WHILE YOU STILL CAN!! You will be tested more on your understanding of the material than on pure memorization.

Disabilities: UT Austin can provide academic accommodations for qualified students with disabilities (Services for Students with Disabilities, 471-6259).

Star parties: Every Wednesday evening the 16-inch telescope on the RLM roof is open for viewing, and on Friday and Saturday nights the 9-inch one on Painter Hall is open; staff and TAs conduct these free events.

Some interesting web sites:

Astronomy Picture of the Day: <http://antwrp.gsfc.nasa.gov/apod/astropix.html>

Space Station sightings: <http://www.heavens-above.com/PassSummary.aspx?satid=25544&lat=30.2692&lng=-97.7436&loc=austin+tx&alt=0&tz=CST>

Iridium satellites Austin predictions: <http://www.heavens-above.com/iridiumflares.aspx?lat=30.2692&lng=-97.7436&alt=0&loc=Austin&TZ=CST&Dur=7>

Iridium satellites (more info): <http://www.satobs.org/iridium.html>

EarthSky: <http://earthsky.org/>

StarDate: <http://stardate.org/>

Ast 309R - course description and syllabus

This class addresses some of the major problems facing astronomers these days, and by the end of the semester you should have a better understanding of these problems and of currently-proposed solutions. The field of extragalactic astronomy changes fast, and we don't have all the answers. There may well be important discoveries in this area during the semester and we'll try to address them as they occur.

The textbook we're using does not cover everything that the course does, but we'll try to follow its presentation of the main topics, in the order that the book does. We'll

start with some background revision (Chapters 2-4), then Chapter 5 summarizes some of the main topics that are then expanded on in subsequent chapters. Quasars (one of the topics in Ast 309R), are not treated in much detail in the book and we'll use other web-based material to discuss them toward the end of the course. Tests will only cover the material presented in class, not everything in the relevant chapters.

Chapter 1: General philosophy about science - you should read all of this chapter.

Chapter 2: Observing the sky - angles, motions of stars, telescopes. Galaxy types. Light waves (amplitude, wavelength, frequency), the EM spectrum. Spectroscopy - emission and absorption lines. The Doppler effect. Parallax observations of nearby stars. Radial and transverse motions.

Chapter 3: Atoms, photons, blackbody (thermal) radiation, stellar spectra and standard candles. Luminosity and apparent brightness. The distance ladder - from nearby objects to the farthest galaxies.

Chapter 4: Orbits, gravity, motions of stars and galaxies, galaxies' structure (disk, bulge, halo, spiral arms). Rotation curves as evidence for dark matter.

Chapter 5: Preview of the next few chapters - galaxy redshifts, Hubble's law. Galaxy distributions. The cosmic background radiation. Abundance of the elements, ages of objects, Olbers's paradox.

Chapter 6: Curved space, testing General Relativity, gravitational lenses. Black holes (small, medium and large). Quasars (we will use other material to discuss these in more detail later).

Chapter 7: Cosmic expansion, discovery of dark energy.

Chapter 8: The cosmic microwave background.

Chapter 9: Nuclear fusion, stellar evolution, neutrinos, formation of the elements.

Chapter 10: The Big-bang Universe.