Astronomy 162: Introduction to Stellar
Galactic, and Extragalactic Astronomy

Meetings: Monday, Wednesday, Friday, 1:30-2:48, Denney Hall 352
Final exam: Wednesday, March 19, 11:30-1:18

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Textbook: *Foundations of Astronomy*, by Michael Seeds

Course objectives

I hope to convey some of the fundamental facts that astronomers have learned about stars, galaxies, and the universe, to describe a few of the outstanding scientific problems that are the focus of current astronomical research, and to illustrate ways in which scientific theories are developed and tested against observations. Among the questions that I hope you will be able to answer by the end of the course are the following: What is a star? What is a galaxy? What is dark matter? What is the Big Bang theory? What empirical evidence supports (or challenges) our explanation of the physical nature of stars, galaxies, and the cosmos? What is the relation between the physical laws that govern astronomical objects and the physical laws that govern phenomena on the Earth?

Prerequisites

Astronomy 161 (or an equivalent course) is a prerequisite, though I will do my best to make this course fairly self-contained. The only other prerequisite is math at the level of Math 075 or 076 (actually, well below this level would be sufficient). None of the math in this course will go beyond simple algebra, but there will be some equations in the lectures and in the assignments.

Lectures, lecture notes, and readings

To the perennial question "What is going to be on the test?" the answer is: anything that I cover in class is fair game. The course outline below lists required readings from the textbook. These will be useful for reference and for giving you a different point of view on material that I cover in lecture, but they are definitely the backup act rather than the main event. In this course, there is no substitute for coming to class.

I will deposit lecture notes at the COP-EZ center at 60 Bricker Hall (phone 2-2219), where you can purchase copies for yourself. If you purchase all of the lecture notes for the course, the total cost will be about 5 dollars. I will try to stay two weeks ahead with the deposited lecture notes, i.e. you can go to COP-EZ every two weeks and get the notes for the *next* two weeks of lectures. Notes for week 1 have been handed out; notes for weeks 2 and 3 should now be available at COP-EZ. I will also post the lecture notes on the World Wide Web (WWW) at http://www-astronomy.mps.ohio-state.edu/∼dhw/Intro/current.html, in postscript format.

The notes will usually correspond fairly closely to the text overheads that I show in class, but they will not include most of the images or figures that I show or have details of my explanations. Purchase of the notes is not required but it is *strongly recommended.* It is possible to take complete notes in class that cover everything that is in the deposited notes, but it is difficult to do that and listen at the same time. I think the easiest, most enjoyable, and most effective way to take the course will be to obtain the notes from COP-EZ or the WWW ahead of time, bring them to class, and add your own notes onto them based on what I say in lecture. The notes are a supplement for the lectures, not a substitute; you are responsible for what I cover in class whether it is in the notes or not.

Quizzes, exams, and grading:

Grades will be based on seven quizzes (30%), a short (2-4 page) essay assignment (10%), a midterm exam (25%), and a final exam (35%). The quizzes will have multiple choice answers, but they will be of two quite different types. Four of them will be 10-question quizzes that are intended to keep you up to date on the material; if you are doing the reading and coming to class, you should be able to manage with just a quick review of the lecture notes before each quiz. The other three quizzes will really be "problem sets"; I will give out a set of five problems one week ahead of time, and you are to work out the answers at home, and in class just fill in the quiz sheets based on your prepared answers. These problems will be relatively challenging. Quizzes will be on Fridays. The regular quizzes will take place during the first 10 minutes of class. The problem set quizzes will take place during the first 5 minutes of class, since you should already have your answers and just need to fill them in. The midterm exam will occupy the full class period.

For the essay assignment, you will search out some astronomy sites on the World Wide Web and write a short account of what you find. I will hand out an instruction sheet that tells how to activate your OSU student computer account and access the WWW in case you have not done this before. Guidelines for the assignment will be handed out at the midterm, and the essay will be due on Monday, March 3.

I will combine the quizzes into a single grade, dropping the lowest of the seven scores. (Important exception; I will *not* drop the score for the final problem set quiz.) If you miss a quiz for any reason, you get a zero on it. There will be a single make-up quiz on Friday, February 28. If necessary, you can arrange (with me or with the TA) to turn in a problem set early. I will use separate curves (something like a C+ median is typical in the astronomy department) for the combined quiz/essay score, the midterm, and the final, and average with the weights indicated above. If you must miss the midterm or the final because of severe illness, etc., let me know *in advance* (send e-mail or leave a phone message if you can't get hold of me), and I will arrange a makeup exam. The makeup exams will involve short-answer essay questions and/or an oral component in addition to multiple choice questions.

For the midterm and final, you may bring one sheet (two sides) of *handwritten* notes and a calculator (which you are unlikely to need). Other notes or books are not allowed. No notes or books are allowed for the regular quizzes; for the problem set quizzes you should bring your pre-marked answer sheets with you to class.

Course outline

All readings are from *Foundations of Astronomy* by Michael Seeds

Week 1: Measuring stellar properties
Reading: 6-1, 7 (all), 9-1, 9-2

Week 2: Stellar properties and the Hertzsprung-Russell (HR) diagram
Friday: Quiz
Reading: 9-3, 9-4, 10

Week 3: Stellar structure
Friday: Problem set quiz
Reading: 12-2, 12-3, (optional, 12-1, 12-4)

Week 4: The sun, main sequence stars, and red giants
Friday: Quiz
Reading: 13-1, 13-2, 13-3

Week 5: White dwarfs; review of stars
Friday: Midterm exam
Reading: 14-1

Week 6: Supernovae, neutron stars, and black holes
Friday: Quiz
Reading: 14-2, 15 (all), 13-4

Week 7: Galaxies
Friday: Problem set quiz
Reading: 16 (all), 17 (all)

Week 8: Space, time, and gravity
Friday: Make-up quiz
Reading: 5-3, (optional, 18)

Week 9: The big bang
Monday: Essay due
Friday: Quiz
Reading: 19 (all)

Week 10: Dark matter and other tales
Friday: Problem set quiz
Optional reading: 6 (all)

Midterm exam will be Friday, February 7, during regular class period

Final exam will be Wednesday, March 19, 11:30–1:18