

Stellar Astronomy 1401 Spring 2009

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Office Hours: MWF 10:00 - 11:00 PM
T & Th 11:30 - 12:30 AM
Or drop in when you're around

Instructor: Richard Wigmans
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Office Hours: T & Th 1:30 – 3:00 PM

Textbook: *Stars, Galaxies, and Cosmology: The Cosmic Perspective, 5th Edition, Bennett, Donahue, Schneider, and Voit*

Class: 12:00 - 12:50 AM. MWF in Chemistry Rm 107

Lab: In SC-121

The Course:

This stellar astronomy course is likely to be quite different than what you are expecting. In most introductory science courses a professor will spend a great deal of time telling you what scientists do, and what scientists have found. In this class we will spend a great deal of time making you scientists.

We will begin the term investigating some physics concepts, and then properties of stars, star forming regions, galaxies and the universe. You will learn the night sky, how to use a telescope, how to make observations, and how to analyze data. You will be asked to read about topics on your own, explain your findings, and present quantitative scientific results. You will spend a minimal amount of time sitting at your desks passively listen to lecture and a maximal amount of time in discussion of topics.

When I first started teaching a student once approached me near the end of the term and said it was unfair that I expected them to know so much when they were not studying to become astronomers. She had a valid point because I was only lecturing to them and not actually training them. This term I am training you to be astronomers. You may retire from this profession in May, but for the next three months you are astronomers in training.

Expected Learning Outcome (What you should know by the end of the course)

- 1) You should have a basic understanding of the astronomical objects, such as stars, nebula, galaxies, and large scale structure.
- 2) Virtually all measurements in astronomy are made through the analysis of electromagnetic radiation ("light"). You will learn properties of light, the atoms that generate the light and physical conditions which affect the properties of light.
- 3) We will develop an understanding of the observables that are used in the determination of physical properties of astronomical objects. This understanding will be developed by integrating the knowledge of atoms and light from Objective #2 with the observed data received at observatories around the world.
- 4) We will use the physical properties determined for a wide range of objects in order to determine formation and evolutionary processes at work across a large range of ages, distances and environments.
- 5) You will choose a topic of interest, develop a research thesis and investigate your thesis using observed data from available astronomical archives. You will use qualitative and quantitative measurements to investigate your thesis and draw conclusions from the data about the soundness of your thesis.
- 6) In the process of your final thesis project you will learn skills with database access, graphical interpretation and manipulation, and a deeper understanding of current published research within your area of expertise. You will also learn about other topics through discourse by fellow students and learn critical thinking skills and the ability to construct concept bridges across all areas of astronomy through the interpretation of others work.

Methods of Accessing the Expected Learning Outcomes

We will have weekly quizzes which will assess your level of understanding of basic concepts, facts, discussed topics and reading material. Exam 1 will test basic understanding of astronomical objects, physical principles of light and atoms, and the connection to astronomical observations. Exam 2 will test the ability to interpret data, uncertainties, critical thinking about results which will cover stellar and galactic astronomy as well as cosmology. Quizzes and exams will be used to assess gains in understanding over the extent of the course and to assess understanding of individual topics covered in our daily discussions. Periodic in class discussion will be used to assess the development and evolution of each topic and assess the critical analysis and formation of concept bridges. Final project defense, in the form of a presentation will assess the ability to interpret data and draw meaningful conclusion.

Grading

This course has a lecture and lab component. We will not, however, be making a distinction between the lecture and the lab. The two will be integrated into the overall learning experience. Labs will concentrate on the more technical side of data acquisition and analysis while lecture will be concerned with the conceptual side of astronomy.

Classroom Discussions

We will frequently discuss conceptual ideas in class. Discussion is an important way for me to observe first hand what you have been learning. Along with verbal discussions we will occasionally work through concepts together in class. This work will be collected and represent extra credit of up to 5% for the course.

Quizzes & Homework Questions

There will be weekly homework assignments which will be handed out on Wednesday in lecture. This homework will NOT be graded. Instead, in the week following the assignment, one or several of the homework problems will be selected for a short (10 minute) quiz. This quiz will take place at the end of the Friday lectures.

Exams

We will have two exams during the term. The first is tentatively scheduled for Friday, February 21st and the second for Monday, April 20th. Each of the tests will cover a well defined number of topics (book chapters). Details concerning the material to be studied will be given in class prior to the tests.

Final Exam (optional)

The final exam will be comprehensive and cover all the topics that we have discussed in class. This final is optional and can be used to replace the grade of ONE of the previous two exams. The final will be held on Tuesday, May 5th at 1:30 PM.

Weekly Labs:	25%
Weekly Quizzes	25%
Exams and Final (25% each)	50% (grade based on 2 out of three grades)
Classroom Participation	5% Possible extra credit

The grade scale will be a typical, 90-100 (A), 80-89(B), 70-79(C), 60-69(D), below this, an F.

Any student who, because of a disabling condition, may require some special arrangements to meet the course requirements should contact the instructor as soon as possible so that necessary accommodations can be made. Proper documentation must be presented from the Student Disability Services (AccessTECH). For the complete description of this policy see Texas Tech Operating Policy 34.22 online.

Any student absent for a religious holiday should make the intention known prior to the absence and shall make up missed exams in accordance with Texas Tech Operating Policy 34.19

Students will foster a spirit of academic integrity, and they will not present work as their own that was not honestly performed by them. For a complete description of this policy see Texas Tech Operating Policy 34.12

Tentative Course Outline:

<u>Week of class</u>	<u>Topics</u>	<u>Text Readings</u>
Jan 5 th	Critical thinking, Scaling of Universe	Chapter 1,2
Jan 12 th	Matter and energy; gravity	Chp 4
Jan 19 th	Properties of light, quantum mechanics	Chap 5,6
Jan 26 th	More spectroscopy and photometry	Chap 5,6
Feb 2 nd	The Sun and other stars	Chap 14, 15
Feb 9 th	More stars, stellar evolution	Chap 15, 16
Feb 16 th	finish stellar evolution, Relativity	Chap 17, S3
Exam 1	<u>Friday, February 21st</u>	
Feb 23 rd	Relativity & Black holes	Chap S4, 18
Mar 9 nd	Galaxies	Chap 19, 20
Mar 16 th	More galaxies, galaxy clusters, evolution	Chap 20, 21
Mar 23 rd	<u>SPRING BREAK</u>	
Mar 30 th	Dark Matter, cosmology, fate of universe	Chap 22, 23
Apr 6 th	Cosmology, Fate of the Universe	Chap 23
Apr 13 th	Life in the Universe	Chap 24
Apr 20 th	Catch-up and review	
Exam 2	<u>Monday, April 20th</u>	
Apr 27 th	Final discussions, Last class	

Final Exam May 5 (1:30 - 4:00 P.M.)