Honors Stellar Astronomy 1401
Fall 2008

Instructor: **Ron Wilhelm**

Office: **Science Building Room 9**

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Class: **9:00 - 9:50 AM. MWF in AD 248**
8:00 - 10:50 PM M (Lab) at Skyview or SC-112

Office Hours: **MWF 10:00 – 11:00 AM**
T & Th 10:00 - 11:00 AM

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

You must also purchase a journal for this course.

The Course:

This stellar astronomy course is likely to be quite different then 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 December, 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 access 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 analysis of results and basic properties of areas covered by research topics. Graded journal entries, quizzes and homework 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 progress reports discussed during class time will assess the development and evolution of each thesis topic and assess the critical analysis and formation of concept bridges. Final thesis defense, in the form of a written paper and 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.

Journals

All lecture and lab topics will be written in your course journals. These journals will be periodically graded throughout the term. Your grade on journal entries will be based on both quantity and quality of the entry. Missing entries will be give zero points and entries deemed as partial or of sub-standard quality will not receive full credit.

Your journal will be an important interface between you and me for this course. You will be given reading assignments and specific discussion topics each week, in advance of the discussion the following week. You will be expected to prepare notes for the coming class period, take notes in class over the discussion, and make reflective entries after the classroom discussion. This will also be true for labs.

Near the middle of the term you will be expected to pick a topic for research. You will need to acquire background information and you will be working on data analysis. This will also be kept in your course journal and serve as a source of reference when working on your final thesis reports.

Finally, all quizzes and exams will be open journal. In other words, you may use your journals as a reference source. It is therefore to your advantage to keep a well organized and well documented journal.

Quizzes & Homework Questions

We will have a quiz each Friday, consisting of one or two essay questions which will test your overall understanding of the material covered in lecture and/or lab. You will also receive several homework questions each week which are to be handed in with the quiz. The quizzes will normally cover similar topics as the homework. 50% of this grade will be based on the quiz answers and 50% on the homework answers. The two lowest, overall quiz/homework scores during the term will be dropped. I will NOT split the quiz and homework grades in considering which to drop, just the lowest two overall grades for a given week. If you must miss a quiz, a makeup quiz will only be given for well documented reasons. If you do not have documented reasons for missing a quiz, that quiz can become one of your dropped grades.

Exams

We will have two exams during the term. The first will be an essay exam covering the

developed physical principles from the first half of the course. The exam will cover material discussed in class, reading material and technical aspects learned in lab. The second exam will come near the end of the term and cover aspects of the various research topics which are being conducted by members of the class. This second exam will cover general concepts and also be personalized to ask specific questions about your specific thesis topic.

Final Thesis Report

Instead of a final exam for the course, each group working on a thesis will present a short presentation during the final exam time. This presentation will be graded on the ability to use data and background information to build a coherent argument for your project thesis. Through your research, you may find that your thesis is supported or refuted. A refuted outcome will not affect your final grade. Your grade will be based on your ability to interpret data, make sound arguments, and come to a meaningful conclusion. A scholarly written paper will also be due at the time of the presentation. This paper will begin with your thesis, and include background information which you have acquired throughout the term, data analysis and interpretation, and a fully supported conclusion.

Journal Entries (includes labs):	25%
Weekly Quizzes:	25%
Exams (15% each)	30%
Final Thesis Project	20%

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

The choice is yours....

You take the blue pill and the story ends. You wake in your bed and you believe whatever you want to believe. You take the red pill and you stay in Wonderland and I show you how deep the rabbit-hole goes.

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 (AcessTECH). 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:

Week of class	Topics	Text Readings
Aug 25th	Introduction, Critical thinking, Stars	Chapter 1 & 15
Sept 1st	Universal Laws of motion, gravity	Chap 4
Sept 8th	Birth place of stars.	Chp 16
Sept 15th	Energy, Temperature, Heat Equilibrium	Chap 4, 14
Sept 22th	More advanced categorization of Stars	Chap 5, 15
Sept 29th	The H-R Diagram	Chap 15
Oct 6th	What happens when equilibrium is lost? Exam 1 Friday October 10th	Chap 16, 17
Oct 13th	Galaxies	Chap 20
Oct 20th	Our Galaxy and galaxy evolution (final decision on thesis topic due)	Chap 19.21
Oct 27th	Dark Matter, Dark energy and cosmology	Chap 22, 23
Nov 3rd	Relativity and how it all fits together	S2, S3
Nov 10th	Discussion of what we have learned Wild things like UFOs	Chap 24
Nov 17th	More student led discussions, turkey	
Nov 24th	2nd Exam Monday November 24th	
Dec 3rd	Final discussions, Last class	
Dec 9th	Class final, Thesis presentations (4:30 – 7:00 PM)	