Science 121 — Astronomy
Fall 10

Instructor: Jeff Wilkerson
Office: Valders 272G
Office Phone: 1226
e_mail: wilkerje@luther.edu
Office Hours: Monday 11:30 – 1:00
Tuesday 8:30 – 9:30
Wednesday 2:30 – 3:30
Thursday 12;00 – 1:00
Friday 2:30 – 3:30

Course Details:

Lecture meets M, W, F at 1:30 in V206
Labs meet M 2:45-4:45 and T 11:00-1:00 and 1:30-3:30 V282

Our primary goals for the course are:

I. Identifying and understanding important ideas in astronomy as well as the tools, both theoretical and observational/experimental, used to develop the ideas.
II. Identifying the similarities that connect each of the topics we study, as well as the processes, people and work that make each area of astronomical study unique.
III. Identifying items from I and II that might help us understand the nature of the scientific enterprise (i.e., what makes science science).
IV. Gaining a better understanding of what it takes to carry out a scientific study of the universe.

We will attempt to make progress toward our goals via four primary routes:

I. *Lecture/Discussion.* Given the size of the class, the primary format of class will be lecture but you are encouraged to ask questions and initiate discussion at any point. Readings are intended to fill out the material presented in class. They are important for helping come to terms with complex concepts but what is essential will come from class. You are not expected to have mastery of something in the reading that is not c=discussed in class or developed in homework or lab.
II. *Homework assignments.* Many homework assignments will be in the form of short answer questions, usually requiring only three or four sentences to answer the question and to support your answer. Sometimes there will be problems that will require a numerical answer. Think of these as you would a short answer question. You need to show your work to support your answer and you should provide a sentence or two of support as well. In order to help us reach all of our goals many of the homework questions will require you to interact with and think deeply about the material in addition to learning factual information about the nature and history of the universe.
III. *Labs*. Labs are designed to reinforce key concepts from homework and lecture. But completing labs is also the primary way to better understand what it means to turn observations into a model of some aspect of the universe and to test an existing model with new observations. This activity forms the very heart of science. It is through this

type of work that all of the models of physical systems described in your textbook came into being.

IV. *Projects.* Projects will extend the laboratory concept. Here you will make observations of the sky or use archived data to build a model of the nature of some physical system. These are not so very different from the activities we are doing in lab but will be slightly more open-ended and more under your control, as they take place outside the confines of laboratory.

Homework will be due on Tuesdays and Fridays at 4:00 PM. There will be a box outside the physics offices in Valders designated as our homework drop box. You may (and should!) discuss the homework with other students but the work you turn in should be written up entirely on your own. **No late homework will be accepted** but I will drop the three lowest homework scores when tabulating grades. Attendance in lab is mandatory. Excused absences from lab can be made up within one week of the missed lab. All handouts, homework assignments and test solutions along with selected homework solutions and reference materials will be kept on the course KATIE site. Your course text is *Discovering the Universe* by Kaufmann and Comins, eighth edition. The text for the lab is *Contemporary Activities in Astronomy* by Hoff and Wilkerson, fourth edition. Your grade will be determined as follows:

4 1-hour exams 12.75% each	**50%**
Lab	**15%**
Homework	**15%**
3 Projects (1 group, 2 individual)	**20%**

Approximate Class Schedule

The hour exams are scheduled for:

Friday September 24
Friday October 15
Monday November 15
Wednesday December 15 3:30 to 5:30

Each hour exam will cover only material that is new since the previous exam. The final will be similar to the other three exams, covering only new material. The exams will be no notes, no books.

Project due dates:

Project 1: Measuring the Duration of the Sidereal Day – October 4
Project 2: Measuring the Orbit of the Moon – November 8
Project 3: Cluster Reddening – December 8

The outline of the course will be:

Section I **Introduction to Astronomy** *Reading: Chapters 1 and 2*

What makes astronomy a science?
When did it become a science?
The motions of stars and planets (The celestial sphere)

Exam 1 will cover section 1

Section II **The Planets** *Reading: Chapters 5, 6, 7, 8 and 9*

Inner planets vs. outer planets
What do we know about the planets?
How did we learn what we know?

Section III **The Tools of Astronomy** *Reading: Chapters 3 and 4*

Telescopes
Spectroscopy
Astronomy at other wavelengths

Exam 2 will cover sections 2 and 3

Section IV **Stars** *Reading: Essentials 3, Chapters 11 and 10*

The nature of stars
The sun as a star
Range of stellar types

Section V **Stellar Evolution** *Reading: Chapters 12, 13 and 14*

How long do stars live?
How do stars change as they live?
What happens when stars die?

Exam 3 will cover sections 4 and 5

Section VI **The Milky Way Galaxy** *Reading: Chapter 15*

How big is it?
What does it contain?

Section VII **The Universe** *Reading: Chapters 16, 17 and 18*

How old is it?
How big is it?
What is its history?
How do we know?

The final exam will cover sections 6 and 7