

Astr 2100 Descriptive Astronomy
Fall 2017

Introduction

An introductory course in astronomy for non science majors, Astr 2100 gives an overview of the universe, starting from a description of the sky as seen from an Earth-bound perspective, and progresses through descriptions of the Solar System, the Stars, and the Galaxies. Mathematical content is limited (but not eliminated), the emphasis being on a conceptual description.

Course Organization

Instructor:	Dr Ian M. Littlewood
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email:	ilittlewood@csustan.edu
Class Times:	M W @ 3:30 pm in room N 104
Office Hours:	11 – 11:50 am M, W, F 2 – 3:30 and 5 - 6 M, W
Text:	"Astronomy: A Beginner's Guide to the Universe" by Chaisson (Pearson).

Homework Assignments

Homework assignments will be posted on the web as we cover the relevant material. Due dates will depend on the posting date, but will generally be two classes later. As they are posted I will announce them in class, but it is your responsibility to check for new assignments on a regular basis. Late submissions will be accepted until the answers are posted.

Some notes on turning in assignments:

- 1) The result of a numerical calculation should be rounded. I am not going to enforce strict rules, but a good rule of thumb is that 3 significant figures (defines as starting with the first non-zero digit) is acceptable. So for example
 - a) $65 / 23$ should be rounded to 2.83 not 2.826086957
 - b) $130,000 / 0.071$ should be rounded to 1830000 not 1830985.915492958
 - c) $0.0269 * 0.00418$ should be rounded to 0.000112 not 0.000112442
- 2) All open ended answers, including numerical answers require a supporting argument. This is important
 - a) to show you know what you are doing
 - b) to help you remember the logic behind the answer when preparing for the tests
 - c) to allow me to assign partial credit
- 3) Please don't try to print out the question sheet and then answer the questions on the same sheet. There simply won't be enough room. (The exception are any multiple choice answers)
- 4) Presentations should be professional.
 - a) Typed answers are better but handwritten answers are acceptable providing there are legible.
 - b) Torn sheets of paper are not
 - c) If you tear pages out of a spiral notebook please remove the ragged edge.

- 5) Email submissions are acceptable. Fax submissions also, but send an email notifying me at the same time.

Class material

The subject matter for this class does depend on the speed at which we cover material, but generally speaking has three main components:

1. Observational astronomy. What you can see in the night sky. How the night sky changes, during the night, from night to night, during different seasons, and longer term changes. The regular patterns which are seen. How to describe the position of any object in the sky
2. The Solar System. Concentration on the mechanics of the Solar System rather than individual planets. How observations lead to a model of Solar System which reveals information about the physics of motion.
3. Stellar astronomy. Properties of the stars, and how to measure them. Distance, luminosity, and mass.

Quantitative Reasoning

What is Quantitative Reasoning? Quantitative Reasoning (or Quantitative Literacy) is the use of numerical data and calculation to draw conclusions which answer fundamental questions. It is the recognition that data is important, and that without understanding the relevance of that data any conclusions that are drawn are necessarily incomplete, and often inaccurate. It could include mathematics, but much valuable insight can be derived using nothing more than arithmetic and the willingness to comprehend what the numbers are telling you. First and foremost it requires

- Logical thought, to decide how to use the data in a way that is rational, as opposed to guessing.
- The ability to put the numbers into context. The result of a calculation is not a number, but the meaning it conveys.

Both of these will be valuable skills in your careers.

One thing that Quantitative Reasoning isn't: One thing - it doesn't (necessarily) mean is advanced mathematics, and we shall not be using anything beyond basic algebra in this class.

Why is Quantitative Reasoning important? Historically quantitative reasoning was crucial to understanding the sky and how the universe works. It is quite straightforward to giving a qualitative picture of the universe, but it was the inability of the early astronomers to get the numbers right which lead to the development of more sophisticated models and our current understanding. Indeed it was the need to improve the quantitative picture of the universe which lead to the development of advanced mathematics such as calculus. Nevertheless we shall not need to resort to calculus in this class. By making appropriate approximations we can understand the logic with only algebra.

Exam Schedule

Note: Test are scheduled for the following dates. Make up tests will only be given for documented reasons outside of the student's control

Test 1	Wednesday September 27 th 2017
Test 2	Wednesday November 1 st 2017
Test 3	Wednesday December 6 th 2017
Cumulative Final	Friday, December 15 th 2017 @ 2:00 p.m. (2 hours)

Note: Cell phones are not allowed during tests. Important: you will need a calculator, and cannot rely on the

one on your phone. Make sure you bring a calculator with you. If you don't have one you can buy a reasonable scientific calculator for around \$10.

Grading

Final grades will be determined from a curve of the cumulative totals at the end of the semester. Grades will be assigned without +/- grading. Points will be assigned according to the following:

Homework Assignments	25%
Three semester exams	45%
Final Exam	30%
	100%

Course Objectives

As the semester progresses you should be able to:

- Describe our view of the night sky, and relate it to the structure of the universe
- Interpret the different scales of the universe
- Describe the motions and appearances of the different objects in the night sky, and explain the regularities in these motions
- Distinguish the major features of the Solar System objects.

Organization of material

The class can be divided into four main parts

1. Your view of the night sky. This is the *geocentric* view, from the point of view of anyone the Earth as if that person were stationary. (Chapter 0 and other resources)
2. The transition to the *heliocentric* view, in which the Sun is at the centre of the Solar System. (Chapter 2)
3. The details of the Solar System, and other solar systems. (Chapters 4 through 8)
4. The stars, their properties and life cycles. (Chapters 9 through 13)

Hints on doing well in this class

There are a few pointers that I can give based on past experience

1. It is better to understand than to memorize. Some parts of the class (particularly the mathematical ones) have so many possible questions you will not be able to memorize them all. But if you understand you can deduce the answer quite easily. Note that does also apply to some degree to the non-mathematical sections.
2. Looking at the sky you view looks almost random, a star here, a planet there, etc. In fact there is a great deal of regularity to the universe and how its components move, behave, and evolve. Try to look for the patterns in the sky in order to understand the regularities that do occur. That will hopefully get you to understand how astronomy affects your everyday life.

3. Try to participate. You will learn much more by attempting to answer in-class questions than by being passive. It doesn't matter if you get the answer wrong (there is no penalty for a wrong answer to a discussion question), but it will still develop a sense of how to approach problems. And don't be afraid to ask questions yourself.

Appendix: Quantitative Reasoning @ Stan State

CSU Stanislaus has a working group on campus, working on improving quantitative literacy. The working group has identified the following critical areas:

- Approximation / estimation
- Mathematical models
- Tables and graphs
- Algebra
- Geometry
- Statistics

Definition of terms

First two definitions:

- qualitative applies to descriptions, research methods, etc which do not refer to numerical data. Information can be gathered by interviews and observation. It could include concepts (for example natural selection), and explanations of how a machine works.
- quantitative applies to descriptions, research methods, etc which rely numerical data and its interpretation, and/or calculation and interpretation of the result.

Further details can be found at <http://csustan.csustan.edu/qr/>. Of course, no one course will be able to cover of these critical areas, and the ones it does cover will not be covered equally. Our course will contain components of approximation, tables and graphs, and basic algebra. Again, complex mathematical calculations are not required, for the most part arithmetic is sufficient.