ASTR 101: PRINCIPLES OF ASTRONOMY

Fall 2015
Schedule # 20293 (Sec 4)
COURSE INFORMATION

Class Days: Tuesday, Thursday
Class Times: 12:30-1:45 pm
Class Location: WC-201

Instructor: Gur Windmiller
Contact Information: windmill@rohan.sdsu.edu
Office Hours Days: Tuesday, Wednesday
Office Hours Times (and by appointment):
T 2-3:30pm, W 1:30-3pm, or by appointment
Office Hours Location: PA 128

Course Overview

From the University’s 2015-2016 General Catalogue (pg. 152): “ASTR 101. Principles of Astronomy (3) [GE] Discover the universe: planets, stars, galaxies, and our place in the cosmos; the Big Bang; how stars shine; comets, meteors, nebulae, the Milky Way; black holes and other exotic objects”

This course is a general introduction to modern Astronomy. We will view Astronomy in the context of being part of the interconnected structure of the Natural Sciences. At the heart of this net is the objective, logical, system of the Scientific Method. After discussing the method itself, along with some general background material, the course will survey an array of Astronomical topics. We will generally follow an increasing scale of the Physical phenomena that we observe and aim to explain: from what we can perceive directly in the sky, through our own Earth, Moon, Solar system, the Sun, other stars, the Milky Way and other galaxies, all the way out to the scale, history and fate of the entire expanding Universe. Throughout all of these, we will rely on and emphasize one central idea: on all levels and on any scale, the rationality embodied by the Scientific Method remains the only way (and the driving force) of exploring the workings of the Universe. In examining the specifics of this science we will also demonstrate that what we can rationally explain in our everyday lives applies everywhere else in the world, because the basics of physical reality are always the same everywhere.

STUDENT LEARNING OUTCOMES

Upon completing this course you should be able to:
• Demonstrate the basic working and logic of the scientific method
• Explain how the method applies to what we can observe without intermediacy
• Describe in some detail the nature of cyclical Astronomical events such as the daily motions on the sky, Moon phases, Retrograde Motion, and how they are all tied through a specific scientific model (Geocentric vs. Heliocentric)
• Describe the basic idea behind some fundamental laws of nature (e.g. Newton, Kepler, gravity, momentum)
• Discuss how energy/light is used in Astronomy, what are some of its fundamental properties, and how they pertain to every-day life.
• Make informed comparisons of the nature/structure of the planets in our Solar System.
• Explain the qualitative basics of how the Sun, or any star, produces energy.
• State how stars compare with one another and discuss how they evolve. Be able to read and explain the HR diagram.
• Answer the questions: What is a White Dwarf, Neutron Star, Black Hole?
• Describe how the stars are organized into galaxies and compare basic galactic properties.
• Say something meaningful regarding what Science has determined about the structure of the Universe, where it came from and where it is headed.

Enrollment Information

PREREQUISITES

There are no formal college level prerequisites; the only real prerequisite is interest. Some mathematical skills will be very useful, for example:

• The use of the metric system
• The use of scientific notation ($d = 5 \times 10^{23}$ meters)
• Simple relations ($F = \frac{1}{r^2}$)
The use of Mathematics will be kept to a minimum, although occasionally, a quantitative understanding will be important. We will review the mathematical concepts as we go along.

The last day to add/drop this course is 9/4. If you have any specific questions please come talk to me before the deadline.

**Course Materials**

**TEXTBOOK**


**OTHER REQUIRED MATERIAL**

Scantron forms (the narrow red ones); Some use of online material

**Course Structure and Conduct**

The course is a combination of the lectures, reading, and other assignments. The lectures are the focus of the course. The reading (primarily in the course textbook) and the lectures are complimentary: the lectures make the thread through the reading material, outlining the topics and the emphases; the reading material covers everything in more detail, further illustration and a somewhat different organization.

Although most of what you’ll need to read will be mentioned in the lecture on or blackboard, it is ultimately your responsibility to keep up with the reading material, especially that of the textbook. One way or another, reading is part of an introductory Science course.

The part of the homework that is graded will count for 15% of the final grade, but to succeed in this course you’ll need to complete all of the assignments given. Beyond always keeping up with reading the textbook, some of the homework will consist of other, specific reading assignments; some of the homework will be the practice/use of online resources as discussed in the lecture, and some will be questions given out by the instructor. All such questions will be published on blackboard and submitted printed on paper. The questions on the quizzes and on the exam will test your knowledge and understanding of the material based on everything - the lecture, the reading, and the homework.

Online material will be provided by the instructor either in the lecture, or on the class website (blackboard). The online material will be used in accordance with discussion and demonstration in the lecture. It will usually consist of either specific reading material, or applicable exercises. Online material can typically be accessed through any browser. If a computer/browser is not available to you, the SDSU Love library makes Internet use available to any student.

If you follow the lectures closely, read all of the required material, use the online resources as directed, think about what you’ve heard, read, and exercised, and you still don’t have a good handle on something (or anything), there is plenty of help available to you (see below). But please don’t hesitate to talk to me about it as early in the semester as possible.

**Course Assessment and Grading**

The official requirements for receiving a grade are:

- Quizzes worth 60% of the grade, given at the end of lectures when finishing a chapter or a subject spanning several chapters.

- Homework assignments worth 15% of the grade

- Final Exam worth 25% of the grade (must be taken to pass the course)
  Final Exam time: 12/17 (Th) at 10:30 am
All exams/quizzes will be closed book, and will include multiple-choice questions and possibly a short-answer or essay/short-essay component. Each quiz/exam may also include some additional, more difficult, extra-credit questions.

There will be no make-up for any of the quizzes.

As per University regulations, the time of the final exam cannot be changed under any circumstances (page 468 on the 2015-2016 General Catalog; see http://arweb.sdsu.edu/es/registrar/finalexams/15_fall.html) Make sure you can take the final exam before you start the course.

Please review the definitions of letter grades and the SDSU policies regarding grades on pages 466-468 of the 2015-2016 General Catalog.

Your achievements throughout the course will be graded numerically (as percentages) and may be put on a curve for the final course letter grade. Here is what last year’s curve looked like:

A  90%-100%
A-  85%-89%
B+  80%-84%
B   75%-79%
B-  70%-74%
C+  65%-69%
C   60%-64%
C-  50%-59%
D   40%-49%
F   0%-39%

The curve for this course, if used, may be different.

On top of the calculated letter value, grades may be raised by up to one mark (e.g. from C- to C) based on such subjective criteria as my sense of your overall enthusiasm for the course, which can be demonstrated by effort and dedication. In other words – if your percentage grade is borderline, how much you put into it and try can make a difference upward.

If you are taking the course with the “credit/no-credit” option, you need a C or above to earn the credit (see page 467 of the 2015-2016 General Catalog). An incomplete grade (“I”) for the course will only be given in cases involving serious medical or legal issues. The entire responsibility for arranging to make up the lost work lies with the student.

Other Course Policies

HELP AND TUTORING

We encourage students who need extra help to seek it. In addition to my office hours, feel free to email me (the only reasonable way to get a hold of me; please try not to call my office) with any question or concern, or to set up an appointment. I’ll make every effort to be available to you, as much as needed, given schedule constraints. Graduate student teaching assistants will run a “help room” in PA 215 with hours generally between 12:00 and 17:00 M-Th (the exact schedule will be posted outside the help room).

Statement for Students with Disabilities: If you are a student with a disability and believe you will need accommodations for this class, it is your responsibility to contact Student Disability Services at (619) 594-6473. To avoid any delay in the receipt of your accommodations, you should contact Student Disability Services as soon as possible. Please note that accommodations are not retroactive, and that I cannot provide accommodations based upon disability until I have received an accommodation letter from Student Disability Services. Your cooperation is appreciated.

BEHAVIOR AND ETIQUETTE

I’m assuming and expecting students will all maintain a professional, respectful atmosphere. Be nice to each other. If there’s any problem, come talk to me. Don’t needlessly create a disturbance/distraction during lecture. Please try not to be late, and not to leave right before the end of the lecture, as both are very distracting to everyone. If you have to leave early, try to do it more than 15 minutes before the ending time.
More officially about general disturbance: any form of behavior deemed to be inappropriate by the instructor will not be tolerated. A student will be advised once by the instructor that his/her behavior is inappropriate. The first time this inappropriate behavior is repeated, the matter will be turned over to the University’s Judicial Procedures Office for appropriate disciplinary action.

Cheating in any form, which includes plagiarism is a grave offense. Cheating will not be tolerated, and evidence of cheating by a student may result in an automatic “F” as that student’s grade. Any evidence of cheating will be promptly reported to the Judicial Procedures Office. You can review the policies regarding cheating and plagiarism on page 477 of the University’s 2015-2016 General Catalog:

SAFETY ISSUES

The CSU takes the issue of classroom and campus safety very seriously. The office of Business and Financial Affairs has set up a web site where SDSU staff, faculty, and students can find information about San Diego State University’s emergency preparedness plan and opportunities for training on many aspects of the classroom/workplace. See: http://bfa.sdsu.edu/emergency/.

If you have any concerns whatsoever, please come talk to me.

TENTATIVE OUTLINE

Week 1: Introduction to course, syllabus, introduction to Astronomy and the Scientific method; The sky, Celestial Sphere, cyclical events, seasons, Moon phases, eclipses (Chapter 1)

Week 2: Retrograde motion, Heliocentric vs. Geocentric, Kepler’s laws, Newton’s laws, Gravitation, motion and momentum (Chapters 1, 2)

Friday, 9/4: Last day to add/drop.

Week 3: Radiation: the nature of light, Optics and telescopes (Chapter 3)

Week 4: Radiation: spectra, black bodies (Chapter 3).

Week 5: Formation of the Solar System

Week 6: Earth’s atmosphere and interior, the nature and formation of the Moon, tides (Chapters 4, 5)

Week 7: Terrestrial Planets (Chapter 5)

Week 8: Jovian Planets (Chapter 6)

Week 9: The Sun, Solar atmosphere and interior, nuclear fusion (Chapter 8)

Week 10: Stellar properties and distances, the HR diagram (Chapter 9)

Week 11: Life of Stars: formation, main sequence, clusters (Chapter 10)

Week 12: Death of Stars: White Dwarfs, Neutron Stars, Black Holes (Chap 11)

Week 13: Galaxies - The Milky Way, other Galaxies, Quasars and AGN (Chapters 12, 13)

Week 14: Galaxies. Thanksgiving (Th 11/26).

Week 15: Cosmology: The expansion and fate of the Universe (Chapter 13) Review for Final Exam

Thursday, 12/10: Last Day of Classes.

Thursday, 12/17, 10:30 am: Final Exam.