Crafton Hills College

Astronomy 150

Spring 2016 Syllabus

Instructor Information

Instructor: Dr. Trevor P. Gamble
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Motto: *"Learning > Busy work"*

Course Description

Astronomy 150: Introduction to the ideas, concepts, and theories of astronomy including celestial motion, properties and evolutions of the solar system, stars, galaxies, and cosmology.

Prerequisite

- None

Recommended Prerequisite

- Physics 100 (Introduction to Physics)

Textbook & Course Materials

Required Text

- Astronomy: A Beginner's Guide to the Universe, 7th edition, by Eric Chaisson & Steve McMilian.
- An account at *MasteringAstronomy.com* (Course ID is GambleAstronomy2016).

Recommended Media for Entertainment

- Carl Sagen. Type his name into YouTube and enjoy!

- Neil Degrasse Tyson. Same story. YouTube the man.

Course Structure

• **Homework:** You will be given one assignment per week. This is to be submitted online at *MasteringAstronomy.com*. I recommend you find a few people to explore and solve the problems with. Homework will typically be assigned on Monday and due the following Tuesday. Late homework will be penalized 25% per day after the Tuesday deadline. Research projects may be assigned in place of MasteringAstronomy in select weeks.

• **Chapter Exams**: There will be three chapter exams. The final chapter exam will be part of the cumulative final. Each chapter exam will be worth 100 points. The points will (typically) be split evenly per chapter (25 points each). Please refer to the schedule for exam dates and chapters covered. You may use a calculator during the exam. The exams will be closed book and closed notes. The exam questions will be based on the lectures and homework assignments.

• **Comprehensive Exam:** This exam will be comprised of questions pulled from the chapter exams OR questions/subjects given in a study guide (they may be reworded and the numerical values may be modified). The final exam will be 12 questions long. You will be graded on your best 10 responses. Two questions must be left blank.

Your final grade will be marked "F" if you do not take this last exam.

• **Participation:** Class participation and attendance is mandatory. If you miss more than two days of lectures, you may be dropped from the course. Contact me if an emergency arises before lecture. *I cannot excuse absences after the fact.* Class participation will come in the form of demonstrations, games, and student responses to questions posed during the lectures.

• **Extra Credit:** Extra credit will be available through periodic homework assignments (typically a short fun project), as well as through participation during lecture. Homework extra credit will count for ~6% of your grade. Lecture extra credit will count for ~2% of your overall grade.

Fall 2015 Syllabus

Schedule

(I follow the Important Events exactly. Topics . . . not so much)

Lecture	Date	Topic	Important Events
1	1/20	Introduction - Chapter 0	
2	1/25	Chapter 1 – Chapter 2	
3	1/28	Chapter 2 – Chapter 4	
4	2/1	Chapter 4 – Chapter 5	
5	2/3	Chapter 5 – Chapter 6	
6	2/8	Chapter 7 – Chapter 8	
7	2/10	-	Exam – Chapters 0-3
8	2/15	-	President's Day (No Class)
9	2/17	Chapter 8 – Chapter 9	
10	2/22	Chapter 9 – Chapter 10	
11	2/24	-	Exam – Chapters 4-8
12	2/29	Chapter 11 – 13	
13	3/2	Chapter 13	
14	3/7	Chapter 14 – Chapter 15	
15	3/9	-	Exam – Chapters 9-13
16	3/14	Chapter 16 – Chapter 17	
17	3/16	Chapter 18	
18	3/21	Review	Comprehensive Exam

Grading Policy:

Percent of Grade	Description
50%	Chapter Exams
15%	Comprehensive Exam
15%	Homework
20%	Class Participation

Letter Grade Assignment

Grades will be determined as follows:

Letter Grade	Percentage	Performance
A	90-100%	Excellent Work
B	80-89.9%	Very Good Work
C	70-79.9%	Mostly Good Work
D	60-69.9%	Below Average Work
F	0-59.9%	Needs Serious Improvement

Course Objectives

1. Discuss the size and scale of the Earth, the Moon, the Sun, the solar system, the Galaxy and the Universe.
2. Describe and predict the motions of the stars, the Sun, the Moon, and the planets as seen from Earth.
3. Explain the cause of day and night, the seasons, and lunar phases.
4. Describe the electromagnetic spectrum and the theories on electromagnetic radiation.
5. Distinguish between continuous, emission and absorption spectra, and explain the cause of each.
6. Explain the purpose of a telescope as well as the relative advantages and disadvantages of the basic types of telescopes.
7. Explain why some observations must be done from space.
8. Discuss historical events in astronomy and how we have come to our current understanding of planetary objects.
9. Explain how retrograde motion can occur in the geocentric and heliocentric models, and provide arguments in favor of the geocentric model.
10. Describe Kepler's laws of planetary motion and discuss how they apply to the planets and binary star systems.

11. Use the size of the terrestrial planets to explain the differing levels of tectonics of these planets, and explain the role of plate tectonics in shaping the Earth.
12. Use the properties of the Moon as evidence to support the best theory of the Moon's formation.
13. Explain how the Moon causes tides in our oceans.
14. Discuss the evidence for liquid water in Mars' past and the roles this might have played in Mars' history.
15. Describe the properties of Venus' atmosphere, and explain the role of greenhouse gasses on Venus and Earth.
16. Explain the role of rotation and convection in creating the atmospheric circulation of the Jovian planets.
17. Use the role of tidal forces and shepherding moons to explain the various rings of the Jovian planets.
18. Describe the differences between the Galilean moons and be able to explain the role of tidal forces to create the tectonics seen on Io, Europa and Ganymede.
19. Describe the unique characteristics of Uranus and Neptune.
20. Explain the characteristics of asteroids, comets and Kuiper belt objects as a result of their location in the solar system and how they are related to planetary formation.
21. Describe the accretion theory of planetary formation, and use the condensation sequence to explain the bulk properties of the planets and the differences between the terrestrial and Jovian planets.
22. Discuss the properties of extra-solar planets, and describe the methods of their detection.
23. Discuss the characteristics of the Sun, including solar structure and the solar cycle.
24. Explain how we determine various properties of stars, including their mass, diameter, luminosity, and distance.
25. Describe the how stars are classified using their spectral classification and the Hertzsprung-Russell diagram.
26. Describe the energy source of the Sun and stars and explain why this energy can only be generated in the stellar cores.
27. Explain how the competing effects of fusion and gravity change the nature of a star during its lifetime.
28. Describe the interstellar medium and processes that lead to star formation.
29. Describe the death of stars and explain why different mass stars die in different ways.
30. Describe the properties of white dwarfs and neutron stars.
31. Discuss the evidence for the existence of black holes.
32. Describe the size, scale and structure of the Milky Way.
33. Describe the basic structure of galaxies and the methods of classifying galaxies.
34. Explain why collisions between galaxies are common while collisions between stars are not.
35. Discuss the nature of Active Galactic Nuclei and the evidence that black holes play a role in these objects.
36. Describe the evidence we have about the universe and its history and explain how this limits the possible theories about cosmology.
37. Discuss the properties of living organisms on Earth and contrast them to non-living matter.

38. Describe the Drake equation and calculate the likelihood of extraterrestrial life within the Galaxy.

Astronomy 150 Student Learning Outcomes

1. Explain the causes of the Earth's Seasons.
2. Explain the cause and effect of the Doppler Effect.
3. Compare and contrast the properties of reflecting and refracting telescopes.
4. Explain the Roche limit and how it applies to planetary rings.
5. Explain how the Sun generates energy.
6. Explain the Chandrasekhar limit and how it applies to white dwarfs.
7. Explain what a Quasars is and its role in galactic evolution.
8. Compare and contrast the open, closed, and critical Universes in Cosmology

Commit to Integrity

As a student in this course (and at this College) you are expected to maintain high degrees of professionalism, commitment to active learning and participation in this class. Please place your cellular phones on silent mode during class. Refer to the student handbook for the college policies regarding academic dishonesty.

I wish to recognize this syllabus was partially developed from previous syllabi of Crafton Hills colleague Dr. Matthew C. Adams.