ASTRON 4 Course Outline as of Fall 2000

CATALOG INFORMATION

Dept and Nbr: ASTRON 4 Title: ASTRON/SOLAR SYSTEM
Full Title: Astronomy of the Solar System
Last Reviewed: 4/10/2023

Units		Course Hours per Week		Nbr of Weeks	Course Hours Total	
Maximum	3.00	Lecture Scheduled	3.00	17.5	Lecture Scheduled	52.50
Minimum	3.00	Lab Scheduled	0	6	Lab Scheduled	0
		Contact DHR	0		Contact DHR	0
		Contact Total	3.00		Contact Total	52.50
		Non-contact DHR	0		Non-contact DHR	0

Total Out of Class Hours: 105.00 Total Student Learning Hours: 157.50

Title 5 Category:	AA Degree Applicable
Grading:	Grade or P/NP
Repeatability:	00 - Two Repeats if Grade was D, F, NC, or NP
Also Listed As:	
Formerly:	

Catalog Description:
A descriptive, non-mathematical introduction to the solar system. Particular emphasis to the sun, moon, and planets. Covers planetary satellite systems, planetary ring systems, asteroids, meteorites, comets, meteor showers, planetary motion, Greek astronomy, the Copernican revolution, and the origin of the solar system.

Prerequisites/Corequisites:

Recommended Preparation:
Eligibility for ENGL 100 or ESL 100.

Limits on Enrollment:

Schedule of Classes Information:
Description: A descriptive, non-mathematical introduction to the solar system. Particular emphasis to the sun, moon, and planets. Covers planetary satellite systems, planetary ring systems, asteroids, meteorites, comets, meteor showers, planetary motion, Greek astronomy, the Copernican revolution, and the origin of the solar system. (Grade or P/NP)
Prerequisites/Corequisites:

Recommended: Eligibility for ENGL 100 or ESL 100.
Limits on Enrollment:
Transfer Credit: CSU;UC.
Repeatability: Two Repeats if Grade was D, F, NC, or NP

ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:

AS Degree:	**Area**			Effective:	Inactive:
	C	Natural Sciences		Fall 1981	
CSU GE:	**Transfer Area**			Effective:	Inactive:
	B1	Physical Science		Fall 1981	
IGETC:	**Transfer Area**			Effective:	Inactive:
	5A	Physical Sciences		Fall 1981	
CSU Transfer:	Transferable	Effective:	Fall 1991	Inactive:	
UC Transfer:	Transferable	Effective:	Fall 1991	Inactive:	

CID:

Certificate/Major Applicable:
Not Certificate/Major Applicable

COURSE CONTENT

Outcomes and Objectives:
After completing the course, the student should be able to:
1. Define the astronomical unit and state each planet's distance from the sun in astronomical units.
2. Describe planetary rotation, revolution, and retrograde motion.
3. Apply the definitions of density, volume, and mass to describe the characteristics of Jovian and Terrestrial planets.
4. Describe the location and general physical properties of comets, asteroids, planets, and stars.
5. State the major contributions to astronomy made by Aristarchus, Erathosthenes, Eudoxus, and Ptolemy.
6. Demonstrate how the Ptolemaic model of the solar system accounts for the retrograde motion of the planets.
7. Calculate a planet's mass by using Kepler's 3rd law.
8. Calculate your weight on any planet by using Newton's law of gravity.
9. Describe the difference between the quantum and wave models of light.
10. Calculate a telescope's magnification and light gathering power.
11. Write an essay detailing how a planet's dark line spectrum allows astronomers to determine the chemical composition of its atmosphere.
12. Explain how to choose the optimum binocular for astronomical viewing
13. Describe the difference between the evolutionary and catastrophic model of the origin of the solar system.
14. Define condensation and accretion in the context of planetary formation.
15. Describe the Kant and LaPlace nebular hypothesis.
16. Construct and label a diagram which describes the anatomy of a comet.

17. Write an essay describing the relationship between comets and meteor showers.
18. Construct and label a diagram which explains why meteor showers are best observed after midnight.
19. State the date of the five best meteor showers and how many meteors can be seen per hour for each shower.
20. Write an essay documenting the basis for classifying asteroids into 4 families.
21. List the major climatic effects that would occur after a major asteroid impact on earth.
22. Explain the compositional differences between iron, stone, stony-iron, and carbonaceous chondrite meteorites.
23. Describe the visual appearance and location of the sun's chromosphere, prominences, and corona.
24. Memorize the three step reaction series in the proton-proton cycle of nuclear fusion.
25. Describe how the sun's interior structure produces a granulated appearance on the sun's photosphere.
26. Draw and label a "butterfly" diagram to describe the solar sunspot cycle.
27. Construct a diagram that correctly explains why the moon goes through a cycle of phases.
28. Construct a diagram which reveals the physical circumstances that produce both lunar and solar eclipses.
29. Explain how the moon's gravity produces two tidal bulges of earth, one facing the moon, and one facing away from the moon.
30. Describe the three major "geologic" ages in lunar history.
31. Write an essay that contrasts and compares moonrocks with earthrocks.
32. Recall four different Apollo experiments conducted on the lunar surface and what information astronomers have gained from them.
33. Review the steps in how the earth's atmosphere evolved from a reducing atmosphere to an oxidation atmosphere.
34. Describe the greenhouse effect and how it accounts for the difference in climate between Venus and the earth.
35. Explain how plate tectonics forms ocean ridges, ocean trenches, island arcs, and mountain ranges.
36. Explain how the physical characteristics of water make it an ideal medium for the chemical reactions of carbon chemistry and life.
37. Contrast the difference between craters on the moon and craters on Mercury.
38. Construct a diagram that explains why Venus and Mercury go through a complete cycle of phases as seen from earth based telescopes.
39. Describe the major surface features found on Venus that were revealed by the Magellan and Pioneer Venus spacecraft.
40. Explain how a slight difference in distance from the sun accounts for the radically different atmospheric compositions of Venus and earth.
41. Refute Percival Lowell's arguments for the existence of intelligent life on Mars.
42. Write an essay describing the 3 Viking spacecraft experiments designed to detect life on the surface of Mars.
43. Explain how geologists account for the enormous size of Martian volcanoes.

44. Review the evidence collected that shows Mars once had shallow seas and rivers of water.
45. Write an essay describing why astronomers feel Io and Titan may have surface conditions that are favorable for the development of life.
46. State Roche's limit and how it accounts for the existence of planetary ring systems.
47. Describe and contrast the major surface features found on the Galilean satellites of Jupiter.
48. Draw a diagram which reveals the interior structure of Jupiter and Saturn.
49. Write an essay which documents the role of Gauss, Adams, Leverrier, and Galle in discovering the planet Neptune.
50. Write an essay which documents the astronomical contributions made by Caroline and William Herschel.
51. Describe the similarities in the interior structure, magnetospheres, and atmospheres of Neptune and Uranus.
52. Write an essay which documents the contributions made by Percival Lowell and Clyde Tombaugh in discovering the planet Pluto.
53. Explain why many astronomers now feel Pluto should be considered a planet.

Topics and Scope:

I. Overview of the solar system
   A. Distance scales
   B. Jovian planets
   C. Terrestrial planets
   D. Planetary motions
   E. Planetary volumes and densities
II. History of astronomy
   A. Greek models of the cosmos
   B. Heliocentric solar systems
   C. The Copernican revolution
   D. Newtonian laws of motion
   E. Newtonian gravitation
III. Light and telescopes
   A. The electromagnetic spectrum
   B. Telescope optical designs
   C. Telescope powers
   D. Binoculars
   E. Dark line spectra
IV. Origin of the solar system
   A. Catastrophic models
   B. Evolutionary models
   C. Nebular hypothesis
   D. Condensation-accretion model
   E. Evidence for condensation and accretion
V. Comets and meteor showers
   A. Anatomy of a comet
   B. Cometary orbits
   C. Great comets in history
   D. Comet-meteor relationships

E. Observing meteor showers

VI. Asteroids and meteorites
- A. Asteroid families
- B. Impact cratering
- C. Impacts and dinosaur extinction
- D. Meteorite classification
- E. Meteorite finds and falls

VII. The sun
- A. Solar interior
- B. Nuclear fusion
- C. Photosphere and sunspots
- D. Solar atmosphere
- E. Sun and earth seasons

VIII. Earth-moon relationships
- A. Tides
- B. Eclipses
- C. Lunar phases
- D. Lunar and solar calendars
- E. Dynamics of the moon's orbit

IX. The moon
- A. Surface features
- B. Interior structure
- C. "Geologic" history
- D. Apollo program
- E. Moonrocks

X. Earth
- A. Origin of the earth's atmosphere
- B. Plate tectonics
- C. Erosional landforms
- D. Water-life relationships
- E. Gaia hypothesis

XI. Mercury and Venus
- A. Phases of Mercury and Venus
- B. Atmosphere of Venus
- C. Surface features of Venus
- D. Surface features of Mercury
- E. Carbon dioxide and the greenhouse effect

XII. Mars
- A. Canals and historical observations
- B. Mariner spacecraft
- C. Viking landers
- D. Surface features
- E. Evidence for water and life

XIII. Jupiter and Saturn
- A. Galilean satellites
- B. Titan
- C. Planetary ring systems
- D. Minor satellites
- E. Jupiter's interior structure and composition

IX. Uranus, Neptune, and Pluto
- A. Discoveries of each of these three worlds
- B. Interior structure of each of these three worlds

C. Miranda
D. Triton
E. Charon

Assignment:

1. Specific reading and study assignments from the textbook (averaging about one chapter per week, roughly twenty to thirty pages).
2. Handout journal articles with study questions (four per semester, with short answer and essay questions to be turned in for a grade).
3. Textbook essay question of the week (a weekly paragraph written for a grade that is taken from the textbook's end of chapter essay question list).

Methods of Evaluation/Basis of Grade:

Writing: Assessment tools that demonstrate writing skills and/or require students to select, organize and explain ideas in writing.

Written homework, Reading reports	Writing 30 - 40%

Problem Solving: Assessment tools, other than exams, that demonstrate competence in computational or non-computational problem solving skills.

Homework problems, Exams	Problem solving 20 - 30%

Skill Demonstrations: All skill-based and physical demonstrations used for assessment purposes including skill performance exams.

None	Skill Demonstrations 0 - 0%

Exams: All forms of formal testing, other than skill performance exams.

Multiple choice, Completion	Exams 30 - 40%

Other: Includes any assessment tools that do not logically fit into the above categories.

None	Other Category 0 - 0%

Representative Textbooks and Materials:
ASTRONOMY TODAY: Chaisson and McMillan, Prentice Hall, 1999.
UNIVERSE: Kaufmann and Freedman, W.H. Freeman & Company, 1998.
MOONS AND PLANETS: Hartmann, Wadsworth, 1999.
IN QUEST OF THE UNIVERSE: Kuhn, Jones and Bartlett Publishers, 1998.