GROSSMONT COLLEGE

Official Course Outline

ASTRONOMY 120 – EXPLORATION OF THE SOLAR SYSTEM

1. Course Number Course Title Semester Units Semester Hours

ASTR 120 Exploration of 3 3 hours lecture: 48-54 hours

the Solar System 96-108 outside-of-class hours 144-162 total hours

2. Prerequisites

None

Corequisite

None

Recommended Preparation

None

3. Catalog Description

This course investigates the origin of our Solar System and how its contents change with time. The course surveys and analyzes the physical properties of solar system contents, including the Sun, planets, moons, rings, comets, and asteroids. Methods of space exploration will be discussed as related to past, current, and future efforts. Topics include: origins of the chemical elements in our solar system, formation and evolution of the solar system; comparative planetology (geology and atmospheres), gravitational and thermal effects on solar system objects, space exploration, and recent developments in the search for extrasolar planets.

4. Course Objectives

The student will:

a. Comprehend the spatial and temporal scales of the solar system, galaxy, and universe, and will describe the dynamic range of these scales.

b. Evaluate the utility of the scientific method and the role of experiments and observations.

c. Describe the formation of the solar system: the Sun in terms of gravitational collapse, conservation of angular momentum, and conditions leading to the onset of nuclear fusion; the planets in terms of accretion and impacts.

d. Analyze the Sun in terms of energy generation, equilibrium, and evolution, and its effects on solar system bodies via gravity, electromagnetic radiation, and particles.

e. Summarize the methods used in space exploration: telescopic observations, use of Kepler's laws, and Newton's laws, spacecraft missions such as Pioneer, Apollo, Voyager, Mars rovers, Cassini, New Horizons, and new technologies for planned and future explorations.

f. Compare and contrast the terrestrial planets in terms of interiors, surfaces, atmospheres, effects of the Sun, using evidence from recent observations and missions.

g. Compare and contrast the Jovian planets in terms of interiors, surfaces, atmospheres, effects of the Sun, using evidence from recent observations and missions.

h. Explain the properties of planetary atmospheres in terms of composition, temperature, and gravity.

i. Study the origin and evolution of the natural satellites of the planets, including moons and ring systems, using recent observational evidence.

j. Distinguish between the origins and compositions of dwarf planets, comets, and asteroids, and appraise the various classification schemes used for solar system objects.

k. Evaluate the role of collisions in solar system history, and the likelihood and effects of possible future impacts on Earth.

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5. Instructional Facilities

Standard classroom with whiteboard, computer, projector and internet access

6. Special Materials Required of Student

a. Scientific calculator

b. Access to the internet outside the classroom

7. Course Content

a. Cosmic perspective: our location in the Universe in space and time

b. Nature of science, scientific method, pseudoscience

c. Newton’s Laws and gravity, Kepler’s Laws of Planetary Motion

d. States of matter, classical atom, nuclear reactions

e. Electromagnetic spectrum, and the photon model of light-matter interactions: absorption, emission and scattering

g. Formation and evolution of Sun and planets

h. Sun-planet interactions (thermal, particle, magnetic)

i. Space exploration techniques, results, future prospects

j. Comparative planetary geology: volcanism, tectonics, impact history

k. Comparative planetary atmospheres, escape velocity, greenhouse effect

l. Origins and evolution of moons and ring systems

m. Classification and origins of comets, asteroids, and dwarf planets

n. Current research in solar system science, including extrasolar planets

8. Method of Instruction

a. Lecture

b. Discussion

c. In-class and online tutorials

d. Student projects

9. Methods of Evaluating Student Performance

1. Examinations, quizzes, tests, and a final examination
2. Homework and projects used to teach and emphasize content.

10. Outside Class Assignments

a. Written and online homework

b. Student projects

c. Reports on relevant current events, public lectures, or science center exhibits

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11. Texts

a. Required Text(s):

* + 1. Bennett, Jeffrey et al. *Cosmic Perspective: Solar System.* 6th ed., San Francisco: Pearson 2008.
    2. Chaisson, Eric, & Steve McMillan. *Astronomy Today Volume 1: The Solar System with Mastering Astronomy.* 6th ed., San Francisco: Pearson 2008.
    3. Fix, John. Astronomy. *Journey to the Cosmic Frontier, Volume 1 (Solar System) with Starry Night Pro 5 DVD.* 5th ed., Burr Ridge IL: McGraw Hill 2008.
    4. Fraknoi, A. et. al*. Voyages to the Planets.* 3rd ed. Florence KY: Cengage 2004.
    5. Freedman, Roger, William Kaufmann. *Universe: Solar System (EBook)*, New York: W. H. Freeman 2008.
    6. Hartmann, William. *Moons and Planets. 5th ed.*, Florence, KY: Cengage 2005.
    7. Jones, Barrie. *Discovering the Solar System.* 2nd ed. Hoboken NJ: Wiley 2007.
    8. Schneider, Steven, Thomas Arny. *Pathways to Astronomy vol. 1: Solar System.* 2nd ed. New York NY: McGraw Hill 2006.
    9. Seeds, M. *The Solar System.* 7th ed., Florence KY: Cengage 2011.
  1. Supplementary texts and workbooks:
     1. Sellers et al. *Understanding Space: An Introduction to Astronautics.* 3rd ed. New York, NY: McGraw Hill, 2008.

Prather, Ed et al., *Lecture Tutorials in Introductory Astronomy*, 2nd ed. San Francisco: Pearson 2008.

Addendum: Student Learning Outcomes

Upon completion of this course, our students will be able to do the following:

1. Identify the important components of the solar system.
2. Recognize how the scientific method and astronomical observations are used to improve our understanding of the solar system.
3. Identify the fundamental forces and physical processes affecting the solar system.
4. Explain the relationships between the components of the Solar System.
5. Explain how the Solar System and its components change with time.

Date approved by the Governing Board: May 17, 2011