

**LAST REVIEW: 2010-2011**

*(i.e. 2003-2004)*

**NEXT REVIEW: 2015-16**

*(i.e. 2008-2009)*

**STATUS: A**

*(A, I, D)*

**COURSE TITLE: Astronomy of the Solar System**

**COMMON COURSE NUMBER: AST 1003**

**CREDIT HOURS: 3**

**CONTACT HOUR BREAKDOWN**

*(per 16 week term)*

**CLOCK HOURS:**

*(Voc. Course ONLY)*

Lecture: **48**

Lab:

Clinic:

Other:

**PREREQUISITE(S): MAT 0024**

**COREQUISITE(S): None**

**PRE/COREQUISITE(S):**

**COURSE DESCRIPTION** *(750 characters, maximum):*

AST 1003 is an astronomy course outlining the knowledge gained from space probes of the Sun, the Moon, Earth, and the planets and evaluating the Solar System formation theories. The students will use writing compositions, observations, and mathematical analysis to analyze the data obtained by observing these bodies.

General Education Requirements – Associate of Arts Degree (AA), meets Area(s):

4B

Area

General Education Requirements – Associate in Science Degree (AS), meets Area(s):

4B

Area

General Education Requirements – Associate in Applied Science Degree (AAS), meets Area(s):

Area

## **UNIT TITLES**

- 1. The History of Orbital Mechanics**
- 2. The Sun**
- 3. Our Home System**
- 4. The Planets**
- 5. Small Bodies and the Study of the Solar System**

\*\*\* Complete the following only if course is seeking general education status \*\*\*

**GENERAL EDUCATION Competencies and Skills \*:**

In the box to the right of the Competency/Skill, enter all specific **student learning outcome** unit numbers, as indicated in the course outline (i.e. 1.1, 2.7, 4.2, 4.0 and 5.12) that apply.

|  |  |
|--|--|
| <b>Course must include <u>all</u> of the following:</b>  |  |
| <b>1. Read with critical comprehension**</b>   | 1.2, 1.3, 2.1, 3.1, 4.1, 4.5                                       |
| <b>2. Write clearly and coherently**</b>   | 1.2, 1.3, 2.4,   |
| <b>3. Demonstrate literacy as appropriate within a given discipline**</b>  | E: 1.5<br>F:1.1, 1.4, 1.5, 1.6, 1.7, 1.8 , 2.0, 3.0, 4.0, 5.0, 6.0 |
| <b>4. Apply problem solving skills or methods to make informed decisions in a variety of contexts**</b>  | 1.3, 1.5, 1.6, 4.2, 5.5  |
| <b>Course must include at least <u>one</u> of the following:</b>   |  |
| <b>5. Differentiate between ethical and unethical behavior</b>   |  |
| <b>6. Demonstrate an understanding of the physical, biological, and social environments and how individual behaviors impact this complex system.</b> | 2.0, 3.0, 4.0, 5.0   |
| <b>7. Demonstrate an understanding of and appreciation for human diversities and commonalities.</b>  |  |
| <b>8. Speak and listen effectively.</b>  |  |

*\*General Education Competencies and Skills endorsed by 2010-2011 General Education Task Force*

**\*\*Required Competencies**

**1) Read with critical comprehension.**

The student will be introduced to the basic texts, concepts, vocabulary, and methods necessary for developing an understanding of the discipline and meeting the required benchmarks as stated in the course outline.

**2) Write clearly and coherently.**

The student will demonstrate an understanding and mastery of subject matter in a variety of ways, including writing. Writing activities may include both graded and ungraded essays, short answer quizzes, summaries, reactions, journals, and various other reports.

**3) Demonstrate and apply literacy across all the disciplines (indicate which ones apply).**

- a) **Information literacy** means understanding how to locate needed information, using the appropriate technology for the task, managing and evaluating the extracted information and using it effectively and ethically.
- b) **Technology literacy** is the ability to responsibly and effectively use appropriate technology to access, manage, integrate, or create information, and/or use technology to accomplish a given task.
- c) **Workplace literacy** is having the appropriate knowledge and skills to communicate and work with others effectively and perform job duties, whether it is through the use of computers and/or other technology.
- d) **Cultural literacy** is recognizing, understanding, and appreciating the similarities and differences between one’s own culture and the cultures of others through a study of the arts, customs, beliefs, values, and history that define a culture.
- e) **Quantitative literacy** is having the ability to formulate, solve and interpret mathematical/statistical operations and graphical/tabular representations to make informed decisions.

- f) **Scientific literacy** means understanding the methodology and application of the scientific process, the physical and biological worlds, and recognizing that scientific knowledge is continuously updated or revised as new information is discovered.
- g) **Environmental literacy** is creating a context within which environmental issues can be viewed, imparting knowledge to enhance one's ability to analyze the issues, make the connections between humans' decisions and actions and the challenges facing the environment, and instilling the desire to sustain the environment through ethical practices in both one's professional and personal lives.

**4. Apply problem-solving skills or methods to make informed decisions in a variety of contexts.**

The student will use acquired skills or methods to recognize, analyze, adapt, and apply critical thinking to solve problems and make informed decisions.

**EVALUATION:**

In the box to the right of the Methods of Assessment, enter all specific learning outcome numbers (i.e. 1.1, 2.7, 4.0, 4.2 and 5.12) that apply.

|  |  |
|--|--|
| 1. Portfolio                           |  |
| 2. Short essays                        |  |
| 3. Research Papers                     | 1.2, 2.1, 3.1, 4.1, 4.5, 5.6, 5.7, 5.8               |
| 4. Group projects                      |  |
| 5. Discussions (In class and online)   |  |
| 6. Multiple Choice tests               | 1.0, 2.0, 3.0, 4.0, 5.0                              |
| 7. Presentations                       |  |
| 8. Service Learning Projects           |  |
| 9. Quizzes (pop, announced, etc.)      | 1.0, 2.0, 3.0, 4.0, 5.0                              |
| 10. Take-home tests                    | 1.0, 2.0, 3.0, 4.0, 5.0                              |
| 11. Summaries, critiques, and analyses |  |
| 12. Reaction papers                    |  |
| 13. Surveys                            |  |
| 14. Performance                        |  |
| 15. Short answer tests                 | 1.1, 2.1, 3.1, 4.1, 4.5, 5.6, 5.7, 5.8               |
| 16. Classroom debates and colloquia    |  |
| 17. Blogs, wikis, web pages            |  |
| 18. Other (Please explain)             | Observations made at Observatory: 2.0, 3.0, 4.0, 5.0 |

## UNITS

### Unit 1 The History of Orbital Mechanics

#### General Outcome:

- 1.0 **The student shall:** be able to diagram the historical developments that led to the development of orbital mechanics and celestial mechanics programmed into the space probes that have visited the planets.

#### Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

#### Development of Orbital Mechanics

- 1.1 Identify and compare the geocentric and heliocentric theories of the Solar System and evaluate their importance in the development of orbital mechanics.
- 1.2 Read critically the principal readings from the major contributors including Copernicus, Kepler, Newton, Kopal, etc. and diagram their contributions' historical importance in a written composition.
- 1.3 Demonstrate the ability to select the relevant data from databases that will allow for analysis and evaluation of models in astronomy.

#### Observational Astronomy and Astronomical Coordinates

- 1.4 Construct our sky with the positions and motions of the stars, Sun, Moon, and Planets using the concepts of celestial equator, celestial poles, ecliptic, zodiac, meridian and zenith using the astronomical coordinate systems.
- 1.5 Calculate the different orbital properties of eccentricity, semi-major axis, inclination, etc.
- 1.6 Identify and compare the different designs of reflecting and refracting telescopes and justify their use on space probes.
- 1.7 Differentiate each of the regions of the electromagnetic spectrum, including gamma rays, x-rays, ultraviolet, visible, infrared, microwave, and radio waves.
- 1.8 Identify and differentiate the different programs of space probes; Voyager, Mariner, etc.

**Common Course Number:** AST 1003

### **Unit 3 The Sun**

#### **General Outcome:**

- 2.0 The student shall:** be able to construct a model of the Sun using size, composition, structure, mass, sunspots, rotation, age, temperature, and energy output.

#### **Specific Measurable Learning Outcomes:**

**Upon successful completion of this unit, the student shall be able to:**

- 2.1.** Identify the layers of the Sun: the corona, photosphere and core and surface features (sunspots, flares, and prominences), and construct a model of the Sun based on the databases from the GONG and SOHO missions.
- 2.2.** Assess the physical conditions (such as temperature, pressure and density) in the various regions of the sun and interpret how they contribute to energy production of the Sun.
- 2.3.** Compare and contrast the Sun with other stars in terms of spectral type and luminosity.
- 2.4.** Diagram the Sun's evolution and evaluate the modern projections for its future evolution.

**Common Course Number:** AST 1003

**Unit 3 Our Home System**

**General Outcome:**

- 3.0 The student shall:** be able to compare the theories related to the moon's origin and compare and contrast the major physical characteristics of the Earth and Moon. Also will examine the effect the Moon has on the Earth due to their alignment.

**Specific Measurable Learning Outcomes:**

**Upon successful completion of this unit, the student shall be able to:**

- 3.1.** Compare and contrast physical characteristics of the Earth and Moon including each body's interior, surface and atmosphere using the databases from the LCROSS, Prospector, Apollo Missions, LandSat, and Shuttle missions.
- 3.2.** Identify and compare the major theories of lunar origin using the data from the above missions and the theoretical simulations done at place like Southwest Research Institute.

**Common Course Number:** AST 1003

#### **Unit 4 The Planets**

**General Outcome:**

- 4.0 The student shall:** be able to compare the interiors, surfaces, possible atmospheres and physical characteristics of the Terrestrial and Jovian planets of our Solar System.

**Specific Measurable Learning Outcomes:**

**Upon successful completion of this unit, the student shall be able to:**

#### Terrestrial Planets

- 4.1** Identify the main Terrestrial Planets; Mercury, Venus, Earth, Moon, and Mars from the databases of the Pioneer, Explorer, Mariner, etc. missions.
- 4.2** Compare the relative importance of impact, volcanism and weathering in the formation of the surface topography of the Terrestrial worlds.
- 4.3** Contrast the interiors of these inner worlds.
- 4.4** Contrast the atmospheric characteristics and the evolution of the Terrestrial worlds using the databases of these missions.

#### Jovian Planets

- 4.5** Identify the main Jovian Planets; Jupiter, Saturn, Uranus, and Neptune from databases of the Voyager, Galileo, Cassini, etc. missions.
- 4.6** Identify and contrast the primary visible features of the four Jovian worlds.
- 4.7** Contrast the composition and structures of the atmosphere and interior of the Jovian worlds.
- 4.8** Analyze Saturn's rings in terms of their overall structures and of their constituent parts.
- 4.9** Compare the orbits and physical characteristics of the satellites of Jupiter, Saturn, Uranus, and Neptune especially focusing on the major Galilean moons and Almathea, Titan, Triton, and Miranda using the databases of the previously mentioned missions.

**Common Course Number:** AST 1003

## **Unit 5 Small Bodies and the Study of the Solar System**

### **General Outcome:**

- 5.0 The student shall:** be able to compare the remaining bodies of the solar system such as planetary satellites, comets, meteorites, meteors, asteroids and Pluto. The student will evaluate the importance of these body's properties to studies of the Solar System.

### **Specific Measurable Learning Outcomes:**

**Upon successful completion of this unit, the student shall be able to:**

#### Small Bodies

- 5.1 Identify and compare asteroids in terms of their orbits, sizes and abundances.
- 5.2 Identify and compare comets in terms of their orbits, associated visible phenomena and physical structures.
- 5.3 Identify and compare meteorites in terms of their properties, probable origin and importance for understanding the solar nebula.
- 5.4 Evaluate Pluto's status as a dwarf planet and contrast it to other planets, comets and asteroids.
- 5.5 Assess the asteroidal population and orbits as to their importance in causing catastrophic impacts of the past.

#### Studies of the Solar System

- 5.6 Interpret gravitational mass as the primary reason for differences in the physical characteristics of Terrestrial planets, Jovian planets and the Sun.
- 5.7 Assemble orbital and rotational properties of solar system bodies in order to diagram the history of the solar nebula and subsequent solar system evolution.
- 5.8 Evaluate modern determinations of the age of the solar system with respect to their observational or experimental basis.