

OUTCOMES BASED LEARNING MATRIX

Course: Survey of Astronomy

Department: _Physical Science

This is a one semester, introductory astronomy course which is designed to acquaint students with a basic understanding and appreciation our universe, but with emphasis on the Solar System and the nature of the celestial bodies inhabiting it and the mechanics of their orbits. Emphasis is placed upon understanding scientific concepts as opposed to rote memorization. Topics included in the course are the nature and scale of the universe, observing the night sky from Earth, seasonal changes in the night sky and the Sun's place on the celestial sphere, the celestial coordinate system, highlights from the historical development of astronomy, the force of gravity and the motion of planets and other celestial bodies, origin of the Solar System, the Earth and the Moon, the planets of the Solar System, and the Sun. Students are expected to do some observing on their own and to become familiar with the night sky with the help of star charts which the instructor will provide to them.

Prerequisite: Intermediate Algebra and Trigonometry (38112) or permission of instructor.

*COURSE OUTCOMES	OUTCOMES ACTIVITIES	ASSESSMENT TOOLS
<i>Upon completion of this course, each student should be able to</i>		
1. Describe the relationship of Earth to the Cosmos.	<ul style="list-style-type: none"> - study the Cosmic Landscape in the text - complete the exercise on sci. notation and metric system 	<ul style="list-style-type: none"> - exercise on sci. notation and metric system (W,R,QS,OC) - quiz on lecture material and text (W,QS,CT,R)
2. Describe the celestial sphere, identifying the horizon, zenith, NCP, equator, ecliptic, vernal equinox	<ul style="list-style-type: none"> - study celestial maps and handouts provided by the instructor - complete solar system scale exercise 	<ul style="list-style-type: none"> - quiz on celestial map identifications (CT,QS,)
3. Describe the change in appearance of the celestial sphere over time and explain	<ul style="list-style-type: none"> - study the celestial maps and handouts provided by the instructor - use models in class and planetarium 	<ul style="list-style-type: none"> - quiz on celestial map (CT,QS)

4. Use the celestial coordinate system to locate objects on the celestial sphere	- study the celestial maps and handouts provided by the instructor	- quiz on celestial map (CT, QS)
5. Explain the causes of Earth's seasons	- read text and study handouts provided by instructor	- solve problems provided by instructor - quiz on text and lecture material (CT, QS, W, R)
6. Describe the lunar phases and explain their monthly cycle	- study the text and lecture material	- quiz on text and lecture (W, R, QS, CT)
7. Describe the influence of Pythagoras, Aristotle, Eratosthenes, and Aristarchus on our understanding of Earth, Moon and Sun	- study the text and lecture material	- quiz on text and lecture (W, R, QS, CT)
8. Contrast the geocentric and heliocentric models of the universe	- study the text and lecture material	- discuss the influence of the geocentric model on western theology (OC)
9. Use Kepler's laws to describe the planetary orbits	- study the text and lecture material - solve problems provided by instructor - complete exercise on Mar's Orbit	- quiz on text, lectures, and assigned problems (W, R, QS, CT)
10. Apply Newton's laws of motion and gravity to the orbits of planets	- study the text and lecture material - solve assigned problems - complete exercise on Earth-Moon relationship	- quiz on text, lecture material, and assignments (W, R, QS, CT)
11. Describe the electromagnetic spectrum and the differences between its components	- study the text and lecture material - demonstration of e spectrum of white light	- quiz on text and lecture material (W, R, CT)
12. Explain the relationship between the wavelength and frequency of light	- study the text and lecture material	- quiz on the properties of light (W, R, CT, QS)
13. Explain the relationship between the frequency of a photon and the energy it possesses	- study the text and lecture material	- quiz on text and lecture material (W, R, CT, QS)

14. Explain how the Stefan-Boltzmann law and Wien's law influence the appearance of stars	- study the text and lecture material	- quiz on text and lecture material (W,R,CT,QS)
15. Explain how the energy of a photon is related to wavelength and frequency.	- study the text and lecture material - demonstrate emission spectrums	- quiz on text and lecture material (R,W,CT,QS)
16. Distinguish between emission, absorption, and continuous spectrums	- study the text and lecture material	- quiz on text and lecture material (CT,R,W,QS)
17. Describe the doppler effect and relate it to the motion of the light source	- study the text and lecture material - demonstration of doppler effect with sound waves	- quiz on text and lecture material (CT,R,W)
18. Relate electron energy levels to light absorbed and emitted by atoms	- study the text and lecture materials - demonstration of emission spectrums - view Sun's absorption spectrum	- quiz on text and lecture material (R,W,CT,)
19. Describe the size, shape and inner structure of earth	- study the text and lecture materials	- quiz on text and lecture material (R,W,)
20. Explain the plate tectonic theory and the source of energy behind it	- study the text and lecture material	- quiz on text and lecture material (R,W)
21. Describe the formation of the solar nebula and the formation of the planets within. Discuss the evidence	- study the text and lecture material - view the film "Formation of Earth"	- quiz on text, lecture material and film (R,W,CT)
22. Describe the Moon's surface features and contrast the lunar maria with the highlands in terms of rock type and crater density	- study the text and lecture material - study the lunar geologic map	- quiz on text, lecture material and lunar map (R,W,CT)

23. Describe the Moon's origin and supporting evidence	<ul style="list-style-type: none"> - study the text and lecture material - Complete exercise on Earth-Moon relationship 	- quiz on text and lecture material (R,W,CT,QS)
24. Explain the nature of lunar and solar eclipses and their frequency	<ul style="list-style-type: none"> - study the text and lecture material - demonstrate the phenomena using models 	- quiz on text and lecture materials (R,W,CT,QS)
25. Explain the relationship between lunar phases and tides on Earth	<ul style="list-style-type: none"> - study the text and lecture material - study Boston Harbor tide chart 	- quiz on text and lecture material
26. Describe the characteristics of the two classes of planets in the solar system and the influence of distance from the Sun in the development of these characteristics	<ul style="list-style-type: none"> - study the text and lecture material 	- quiz on text and lecture material (R,W,CT,)
27. Describe the formation of the solar system from a solar nebula and cite evidence to support your thesis	<ul style="list-style-type: none"> - study the text and lecture material 	- quiz on text and lecture material (R,W,CT)
28. Describe the processes involved in the formation of the planets and cite evidence to support your thesis	<ul style="list-style-type: none"> - study the text and lecture material 	- quiz on text and lecture material (R,W,CT)
29. Describe the locations of Mercury, Venus, Earth, and Mars in the solar system and the conditions under which they can be seen	<ul style="list-style-type: none"> - study the text and lecture material 	- quiz on text and lecture material (R,W,CT)
30. Contrast Mercury, Venus, Earth and Mars in terms of size, mass,	<ul style="list-style-type: none"> - study the text and lecture material - view telescopic images of the planets 	-quiz on text and lecture material (R,W,CT,QS)

density, temp., and geologic activity	obtained on the Internet	
31. Discuss the likelihood of finding life (past or present) on the terrestrial planets and support your conclusions with evidence	- study the text and lecture material	-quiz on text and lecture material (R,W,CT)
32. Contrast the gas giant planets with the terrestrial planets in terms of composition, size, mass, temperatures, and number of moons	- study the text and lecture material - view telescopic images of the planets obtained on the Internet	-quiz on the text and lecture material (R,W)
33. Explain the significance of the color variations seen in Jupiter's atmosphere and what that reveals about Jupiter's atmospheric circulation and winds	- study the text and lecture material - view images of Jupiter obtained on the Internet	- quiz on the text and lecture material (R,W,CT)
34. Discuss the makeup and nature of the rings of Saturn	- study the text and lecture material - view images of Saturn obtained on the Internet	- quiz on the text and lecture material (R,W)
35. Contrast the properties of Neptune and Uranus with those of Jupiter and Saturn	- study the text and lecture material - view images of Uranus and Neptune obtained on the Internet	- quiz on the text and lecture material (R,W)
36. Describe the location of the asteroid belt and compare them with the terrestrial planets	-study the text and lecture material	-quiz on the text and lecture material (R,W,CT)
37. Discuss how an asteroid impact with Earth 65 million years ago may have influenced life on our planet	- study the text and lecture material	- quiz on the text and lecture material (R,W,CT)

38. Describe the makeup and origin of comets and their location in the solar system	- study on the text and lecture material - view images of comets on the Internet	- quiz on the text and lecture material (R,W)
39. Explain how and why the appearance of a comet changes as it orbits the Sun	- study on the text and lecture material	- quiz on the text and lecture material (R,W,CT)
40. Explain the relationship between the paths that comets have taken and meteor showers on Earth	- study the text and lecture material	- quiz on the text and lecture material (R,W)
41. Diagram and describe the internal structure of the Sun	- study the text and lecture material	- quiz on the text and lecture material (R,W)
42. Explain the significance of the granular structures seen in the Sun's photosphere	- study the text and lecture material	- quiz on the text and lecture material (R,W)
43. Describe the structure of the Sun's atmosphere and contrast the conditions in the chromosphere and corona	- study the text and lecture material - calculate the energy output of the Sun by comparison with a 100 watt bulb	- quiz on the text and lecture material (R,W,QS,CT)
44. Explain the relationship between the appearance of a sunspot and its temperature relative to the surrounding photosphere	- study the text and lecture material - view sunspot images on the Internet	- quiz on the text and lecture material ((R,W,CT)
45. Describe the photon-photon reaction as an energy source for the Sun	- study the text and lecture material	- quiz on the text and lecture material (R,W,CT)
46. Explain the importance of hydrostatic equilibrium to the stability of the Sun	- study the text and lecture material	- quiz on the text and lecture material (R,W,CT)

**Indicate the Core Competencies that apply to the outcomes activities and assessment tools: Critical Thinking (CT); technology skills (TS); oral communications (OC); quantitative skills (QS); reading (R); writing (w).