



El Camino College

COURSE OUTLINE OF RECORD - Official

I. GENERAL COURSE INFORMATION

Subject and Number: Astronomy 25H
Descriptive Title: Honors Stars and Galaxies

Course Disciplines: Astronomy

Division: Natural Sciences

Catalog Description: This honors course, intended for students in the Honors Transfer Program, is an introduction to the universe and its history. The main focus is on our view of the heavens and how astronomers learn about stars and galaxies. The formation, life histories, and fates of different kinds of stars, including the sun, are examined. Exotic stars as well as black holes are explored. The structure and distribution of galaxies are discussed, with a focus on our own Milky Way Galaxy. The possibility of simple and intelligent life in the Milky Way Galaxy will be examined. The history of the universe, starting with the Big Bang is also investigated. This course is enriched through extensive rigorous reading, writing, and research assignments.

Note: Students may take either Astronomy 25 or Astronomy 25H. Duplicate credit will not be awarded for Astronomy 25 and Astronomy 25H.

Conditions of Enrollment: Recommended Preparation

English 1A or

English 1AH

Course Length: Full Term Other (Specify number of weeks):
Hours Lecture: 3.00 hours per week TBA
Hours Laboratory: hours per week TBA
Course Units: 3.00

Grading Method: Letter
Credit Status: Associate Degree Credit

Transfer CSU: Effective Date: 12/19/2016
Transfer UC: Effective Date: Proposed

General Education:

EI Camino College:

1 – Natural Sciences

Term: Fall 2017

Other:

CSU GE:

B1 - Physical Science

Term:

Other: Proposed

IGETC:

5A - Physical Science without Lab

Term:

Other: Proposed

II. OUTCOMES AND OBJECTIVES

A. COURSE STUDENT LEARNING OUTCOMES (The course student learning outcomes are listed below, along with a representative assessment method for each. Student learning outcomes are not subject to review, revision or approval by the College Curriculum Committee)

1. Students will be able to recognize the elements of the Scientific Method in the discussion of a scientific problem.

Students will explain how electromagnetic radiation and
2. astronomical instruments are used to reveal the properties of stars and planets.

Students will be able to describe the modern theory of the origin
3. of the universe (the Big Bang Theory) and discuss the evidence that supports the theory.

The above SLOs were the most recent available SLOs at the time of course review. For the most current SLO statements, visit the EI Camino College SLO webpage at <http://www.elcamino.edu/academics/slo/>.

B. Course Student Learning Objectives (The major learning objective for students enrolled in this course are listed below, along with a representative assessment method for each)

1. Compare and contrast the scientific method to pseudo science.
Essay exams
2. Illustrate and describe why it is hot in summer and cold in winter.
Essay exams
3. Explain how electromagnetic radiation and astronomical instruments are used to reveal the properties of stars and galaxies
Essay exams
4. Describe the solar cycle and how it affects the Sun and the Earth.
Essay exams
5. Compare different methods used to measure astronomical distances
Multiple Choice
6. Contrast the life history of a low-mass star with the life history of a high-mass star
Essay exams
7. Explain what black holes are, how they are formed and their effect on local spacetime.
Essay exams

8. Illustrate and describe the structure and contents of the Milky Way Galaxy.

Essay exams

9. Compare and contrast the different types of galaxies.

Multiple Choice

10. Illustrate how galaxies are distributed through space in superclusters, walls, and voids.

Essay exams

11. Discuss the conditions for nuclear fusion and how elements are created.

Multiple Choice

12. Discuss the evidence for Dark Matter and Dark Energy.

Essay exams

13. Discuss the evidence in favor of the Big Bang theory.

Essay exams

14. Estimate the possibility of intelligent life elsewhere in the Milky Way.

Essay exams

15. Explain the evidence for the expansion of the Universe and discuss how the expansion will change in the future.

Essay exams

III. OUTLINE OF SUBJECT MATTER (Topics are detailed enough to enable a qualified instructor to determine the major areas that should be covered as well as ensure consistency from instructor to instructor and semester to semester.)

Lecture or Lab	Approximate Hours	Topic Number	Major Topic
Lecture	7.5	I	Overview of the Universe A. The Universe in Space: Structure, Size, and Contents B. The Universe in Time: Origin, Expansion, and Evolution C. Matter in the Universe: Atomic Structure D. The Scientific Method and the Heliocentric vs. Geocentric Models of the Universe E. Galileo's Discoveries and Kepler's Laws of Motion F. Newton's Law of Gravity G. Newton's Laws of Motion H. Gravity, Orbits, Weightlessness
Lecture	6	II	Sky Phenomena A. The Celestial Sphere and Constellations B. The Seasons
Lecture	6	III	Light and Telescopes A. Properties of Light 1. Wave Properties 2. Particle Properties B. The Electromagnetic Spectrum C. Thermal Radiation 1. Wien's Law 2. Stefan's Law D. Spectroscopy 1. Line Emission 2. Line Absorption 3. Doppler Effect E. Visible Light Telescopes

			1. Resolution and Light Gathering F. Non-Visible Light Telescopes
Lecture	3	IV	The Sun A. Structure, Hydrostatic Equilibrium B. The Solar Activity Cycle and its Possible Effect on Earth C. The Process of Fusion D. The Role of the Four Forces
Lecture	4.5	V	Stars A. Determination of Distances, Color, and Temperature B. Properties of Stars 1. Luminosity 2. Radius 3. Mass 4. Brightness 5. Temperature C. Binary Stars D. The Hertzsprung-Russell Diagram E. Star Clusters
Lecture	6	VI	Stellar Evolution A. Star Formation B. Life History of Low-Mass Stars C. Life History of High-Mass Stars D. The Origin of the Elements
Lecture	3	VII	Compact Objects A. White Dwarfs B. Neutron Stars C. Black Holes
Lecture	3	VIII	The Milky Way Galaxy A. Shape and Size of the Galaxy B. Structure of the Galaxy C. Contents of the Galaxy 1. Open Star Clusters 2. Globular Star Clusters 3. Nebulae D. The Galactic Center E. History and Age of the Galaxy
Lecture	4.5	IX	Galaxies A. Determination of Distances to Galaxies: the Cosmic Distance Ladder (Pyramid) B. Classification of Galaxies 1. Spiral 2. Elliptical 3. Dwarf 4. Irregular Active Galaxies, Quasars C. Galaxy Clusters D. Starburst Galaxies and Galaxy Evolution
Lecture	4.5	X	Cosmology A. Einstein's Theory of General Relativity B. Gravitational Lensing C. Hubble's Law and the Expansion of the Universe D. Distances in an Expanding Universe E. Curvature of Space and Matter Density F. Closed and Open Universes G. Dark Matter, Dark Energy and the Future of the Universe
Lecture	3	XI	The Big Bang

			A. Development of the Big Bang Theory B. The First Second: Grand Unified Theories C. The Creation of Helium D. The Creation of Atoms E. The Cosmic Microwave Background Radiation
Lecture	3	XII	Life in the Universe A. Possibility of Life in the Universe: the Drake Equation B. Intelligent Life C. Interstellar Travel and the Special Theory of Relativity
Total Lecture Hours	54		
Total Laboratory Hours	0		
Total Hours	54		

IV. PRIMARY METHOD OF EVALUATION AND SAMPLE ASSIGNMENTS

A. PRIMARY METHOD OF EVALUATION:

Problem solving demonstrations (computational or non-computational)

B. TYPICAL ASSIGNMENT USING PRIMARY METHOD OF EVALUATION:

Spectra are shown of hydrogen, helium, and sodium as they appear in the laboratory here on Earth. In addition, the spectra of three gas clouds as seen from Earth are shown.

Indicate which cloud has the most sodium and justify your answer.

Indicate which cloud is moving towards us the fastest and justify your answer.

Indicate which cloud is hottest and justify your answer.

Write a one to two page essay using at least 2 sources.

C. COLLEGE-LEVEL CRITICAL THINKING ASSIGNMENTS:

1. The Hertzsprung-Russell diagram of a star cluster is shown in the Figure.

Determine the age of the cluster and justify your answer in a one page essay with one source. What kind of cluster is it?

2. In a one page essay with two sources, explain where the hydrogen in your body came from and how old it is. Repeat for the calcium in your bones and iron in your blood. Repeat for the helium in your birthday party balloon. Justify your answers.

D. OTHER TYPICAL ASSESSMENT AND EVALUATION METHODS:

Essay exams

Other exams

Quizzes

- Homework Problems
- Multiple Choice
- Matching Items
- True/False
- Other (specify):
- Short answers and drawing diagrams

V. INSTRUCTIONAL METHODS

- Demonstration
- Lecture
- Other (please specify)
- Planetary demonstrations or interactive computer demonstrations, activities with models

Note: In compliance with Board Policies 1600 and 3410, Title 5 California Code of Regulations, the Rehabilitation Act of 1973, and Sections 504 and 508 of the Americans with Disabilities Act, instruction delivery shall provide access, full inclusion, and effective communication for students with disabilities.

VI. WORK OUTSIDE OF CLASS

- Study
- Required reading
- Problem solving activities
- Other (specify)
- sky observations

Estimated Independent Study Hours per Week: 6

VII. TEXTS AND MATERIALS

A. UP-TO-DATE REPRESENTATIVE TEXTBOOKS

Bennett et al. Cosmic Perspective. 7th ed. Pearson Addison Wesley, 2013.

B. ALTERNATIVE TEXTBOOKS

Chaisson and McMillan. Astronomy Today. 8th ed. Pearson, 2014.

C. REQUIRED SUPPLEMENTARY READINGS

D. OTHER REQUIRED MATERIALS

VIII. CONDITIONS OF ENROLLMENT

A. Requisites (Course and Non-Course Prerequisites and Corequisites)

Requisites	Category and Justification
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B. Requisite Skills

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Requisite Skills

C. Recommended Preparations (Course and Non-Course)

Recommended Preparation	Category and Justification
Course Recommended Preparation or English-1A	
Course Recommended Preparation English-1AH	

D. Recommended Skills

Recommended Skills
Students have a higher chance of success if they possess college-level reading and writing skills. ENGL 1A - Read and apply critical-thinking skills to numerous published articles and to college-level, book-length works for the purpose of writing and discussion. ENGL 1A - Compose multi-paragraph, thesis-driven essays with logical and appropriate supporting ideas, and with unity and coherence.

E. Enrollment Limitations

Enrollment Limitations and Category	Enrollment Limitations Impact
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Course created by Perry Hacking on 03/08/2016.

BOARD APPROVAL DATE: 12/19/2016

LAST BOARD APPROVAL DATE:

Last Reviewed and/or Revised by Perry Hacking on 03/08/2016