

PALOMAR COLLEGE
COURSE OUTLINE OF RECORD FOR
DEGREE CREDIT COURSE

X Transfer Course _____ A.A. Degree applicable course
(check all that apply)

COURSE NUMBER AND TITLE: ES110 – Earth System Science: Life in the Universe

UNIT VALUE: 3

MINIMUM NUMBER OF SEMESTER HOURS: 48

BASIC SKILLS REQUIREMENTS: Appropriate language and computational skill.

ENTRANCE REQUIREMENTS

PREREQUISITE: None

COREQUISITE: None

RECOMMENDED PREPARATION: None

SCOPE OF COURSE:

Introduction to astrobiology, a multi-disciplinary field of science that investigates questions related to life on Earth, the nearby Solar System, and the Universe in general. Students will gain an appreciation of many fields of science as they apply to one of the most profound questions one can ask about our world: Are we the only life in the universe?

SPECIFIC COURSE OBJECTIVES:

- Students will list and describe the basic structure of the solar system, discussing the role of the sun in producing various physical conditions that may be essential for the development of life.
- Students will outline the essential components of Earth's hydrologic, geologic and atmospheric systems and discuss our understanding of the origins of these systems.
- Students will differentiate between living and non-living things and describe the variety of life forms and their development and evolution through time.
- Students will discuss the process of scientific investigation and how we separate credible scientific hypothesis and theory from belief and myth.
- Students will outline the various ways in which the evolution of life forms can be documented, including the fossil record, stratigraphic record and the genetic record.
- Students will discuss the evidence for the origins of life on Earth and the conditions under which that life developed including problems related to gleaning information related to such questions.
- Students will list and discuss the basic elements needed for life.

- Students will list and discuss evidence for which other planets in the Solar System may harbor life, or might have harbored life at some time in the past.

CONTENT IN TERMS OF SPECIFIC BODY OF KNOWLEDGE:

- I. Ecology of the Solar System
 - A. Introduction and Overview
 - B. Discovery of the Solar System
 - C. The Age of the Solar System
 - D. The Life-giving Sun
 - E. The Nuclear Generator
 - F. The Planets of the Solar System
 - G. Origin of the Solar System: Clues from Meteorites
 - H. Origin of the Solar System: Clues from Comets
 - I. Discovery of the Galaxy and the Vastness of Space
- II. Life's Home Planet
 - A. Introduction and Overview
 - B. Earth from Space
 - C. Earth in Space
 - D. The Water Planet
 - E. Carbon and Oxygen
 - F. Drifting Continents
 - G. Plate Tectonics
 - H. Onion structure of Earth
 - I. Origin of the Earth
 - J. History of the Earth
- III. The Essence of Life
 - A. Introduction and Overview
 - B. Life is All Around Us
 - C. What People Say About Life
 - D. What is Common to All Life Forms
 - E. Life Is as Life Does
 - F. Environmental Limits of Life
 - G. The "Tree" of Life
 - H. Evolution, the Central Concept
 - I. Discovery of Extinction
- IV. The Origin of Knowledge
 - A. Introduction and Overview
 - B. The Rise of Science
 - C. How Science is Done
 - D. The Power of Mythos
 - E. Creation Myths
 - F. Beliefs, Delusions and Fraud
 - G. Science and Belief: Astrology
 - H. The Test for Credibility
 - I. Where Scientists find Information
- V. Discovering Life's History: The Great Adventure
 - A. Introduction and Overview
 - B. Classification, Natural Selection, and the Quanta of Inheritance
 - C. Clues From Development
 - D. The Nature of Fossils
 - E. The Nature of the Fossil Record
 - F. The Stratigraphic Record
 - G. The Genetic Record
 - H. The Rules of Evolution
 - I. Disturbance and Mass Extinction
 - J. Why Brains? The Likelihood for Getting Smart
- VI. Life's Origins

- A. Overview and Introduction
 - B. When Did Life on Earth Arise?
 - C. What Were the Conditions?
 - D. Suddenly, Life!
 - E. The Blueprint Problem
 - F. How Life Became Complicated Through Symbiosis
 - G. Lateral Gene Transfers—Crossing the Species Border
 - H. The Faint Young Sun Paradox
- VII. What Life needs
- A. The Elements of Life
 - B. How to Make Hydrogen and Helium
 - C. Elements as Star Dust
 - D. Host Star and Distance
 - E. Living on an Energy Gradient
 - F. Do We Need Water?
 - G. Do We Need Carbon?
 - H. Do We Need Time?
- VIII. Life in the Solar System and Beyond
- A. Overview and Introduction
 - B. What to Look For--Biomarkers
 - C. Looking Elsewhere
 - D. Panspermia?

REQUIRED READING:

Berger, W. H. and Baity, W. ABC's of Life in the Universe. 28 August, 2001.
 <<http://www.blackboard.com/courses/EDUC-30839/>>

SUGGESTED READING:

May include the following or other similar Internet sites:

- NASA's Origins Program <<http://origins.jpl.nasa.gov/>>
- NASA Astrobiology Institute <<http://nai.arc.nasa.gov/>>

May also include journal articles such as:

- Gonzalez, Guillermo, Donald Brownlee, and Peter D. Ward. "Refuges for Life in a Hostile Universe." *Scientific American*, October 2002:60-67.
- Gaidos, Eric J., Kenneth H. Nealson, and Joseph L. Kirschvink. "Life in Ice-Covered Oceans" *Science*, June 4, 1999:1631.

REQUIRED WRITING:

Two essays, 1 to 2 pages in length.

OUTSIDE ASSIGNMENTS:

Students are expected to spend a minimum of three hours per unit per week in class and on outside assignments, prorated for short-term classes.

Assignments may include any or all of the following: completion of required reading, participation in the on-line discussion board, investigation of class-related topics, and written assignments.

INSTRUCTIONAL METHODOLOGY:

Check all that apply:

- lecture
- laboratory
- lecture-laboratory combination
- directed study

DISTANCE LEARNING:

This course may be offered as a distance learning course and meets Title 5 regulations 55370, 55372, 55374, 55376, 55378, and 55380.

Yes No

If yes, check all that apply:

- Television Course (Video one-way, e.g. ITV, video cassette, etc.)
- Online Course (Text one-way, e.g. newspaper, correspondence, electronic file, etc.)
- Two-Way Video Conferencing (Two-way interactive video and audio)
- One-Way Video Conferencing (One-way interactive video and two-way interactive audio)
- Computer Assisted Instruction (A specialized form of mediated instruction relying primarily on student access to information and prepared lessons or teaching materials through a computer terminal, but not under immediate supervision of a qualified instructor.)

GRADING POLICY AND STANDARDS (include methods of determining whether the stated objectives have been met by students):

Quizzes	60 - 80%
Final Exam	10 - 20%
Assignments	10 - 20%
Participation	10 - 20%

IS COURSE REPEATABLE FOR REASON(S) OTHER THAN DEFICIENT GRADE?

Yes No Number of times course may be taken for credit: _____

If yes, identify specific provision of Title 5 Division 2 section(s), 55761-55763 and 58161 which qualifies course as repeatable:

CONTACT PERSON:

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SIGNATURES ON FILE