EL CAMINO COLLEGE
COURSE OUTLINE OF RECORD - Approved

Subject:	BIOL
Course Number:	120
Descriptive Title:	Ecology, Evolution, Diversity, and Physiology
Division:	Natural Sciences
Department:	Biology
Course Disciplines:	Biological Sciences
Catalog Description:	This course is a survey of eukaryotic organisms, their evolution and ecology. The student will have a thorough exposure to plant and animal anatomy and physiology, and will utilize animal dissection in the lab. Students will be expected to complete a project that includes hypothesis, prediction, experimentation, and presentation of results. This course is one of three courses in the biology series designed for biology majors, including those students planning to pursue a career in medicine, dentistry, or other life sciences.
Prerequisite:	Chemistry 4 or Chemistry 4H with a minimum grade of C or equivalent
Recommended Preparation:	Biology 110 and English 1 or eligibility for English 1A or qualification by appropriate assessment.
Course Length:	**Full Term**
Hours Lecture (per week):	3
Hours Laboratory (per week):	6
Outside Study Hours:	6
Total Course Hours:	162
Course Units:	5
Grading Method:	Letter Grade only
Credit Status:	Credit, degree applicable
Transfer CSU:	Yes
Effective Date:	1/22/2007
Transfer UC:	Yes
Effective Date:	
General Education: ECC	Area 1 - Natural Sciences
Term:	
Other:	
CSU GE:	Area B2 - Physical Universe and its Life Forms: Life Science, Area B3 - Physical Universe and its Life Forms: Laboratory Activity
Term:	
Other:	

IGETC:	Area 5B - Biological Science
Term:	
Other:	
Student Learning Outcomes:	**SLO #1 Scientific Method** The student will understand and apply principles of the scientific method; recognizing an idea based on reproducible evidence. **SLO #2 Use of Microscope** The student will be able to use the compound and dissecting microscope to observe cells and microorganisms. **SLO #3 Content Knowledge (Energy Flow)** Students will use basic energy principles to explain the flow of energy in living systems, such as those that occur in the cellular metabolic pathways of photosynthesis and cell respiration, or the relationships observed between autotrophs and heterotrophs in ecosystems.
Course Objectives:	1. Characterize interactions among organisms and between organisms and environment. 2. Discriminate among population dynamics, community structure and ecosystem functions. 3. Outline major events in the evolutionary history of life. 4. Explain the principles and mechanisms of evolution at the micro and macro levels. 5. Compare and contrast representative phyla of supergroups of Eukarya (formerly protists). 6. Recognize the various protist, fungal, plant, and animal phyla viewed in the lab. 7. Compare and contrast the life cycles of the fungal divisions. 8. Diagram and explain the alternation of generations in the life cycle of plants. 9. Identify samples of flower, fruit, and seed types. 10. Describe the various plant tissues and organs. 11. Explain water and food transport in plants. 12. Discuss the role of phytohormones in plant growth. 13. Identify and describe animal structures and relate them to functions.
Major Topics:	**I. Evolution (6 hours, lecture)** A. History of Life B. Miller-Urey Experiment C. Microevolution D. Mutation E. Genetic Drift F. Gene Flow G. Hardy-Weinberg Equation H. Natural Selection I. Darwin and Wallace J. Modern Synthesis K. Systematics and Phylogeny L. Linnaean Hierarchy M. Modern Adaptations to Systematics

N. Cladistics
O. Speciation patterns including allopatric, sympatric and adaptive radiation
P. Other species concepts such as ring species

II. Ecology (10 hours, lecture)

A. Populations and communities
B. Energy flow and natural resources
    1. Carbon Cycle
    2. Nitrogen Cycle
    3. Water Cycle
C. Biomes
D. Pollution

III. "Protists" The Evolution, Adaptations, and Diversity of Ancestral and Modern Eukarya (4 hours, lecture)

A. Supergroups within Eukarya
    1. Diplomonads
    2. Euglenozoa
    3. Alveolata
    4. Stramenopila
    5. Amoebozoa
    6. Archaeplastida
    7. Ophistokonta

IV. Fungi - Evolutionary Trends and Adaptations (4 hours, lecture)

A. Aquatic and Terrestrial Specializations
B. Ecological variances
    1. General Decomposition
    2. Agricultural Products
    3. Pathogenic or Disease Agents
C. Life cycles
D. Spore types
    1. Asexual spore structures
    2. Sexual Spore Structures
E. Reproduction
F. Mycorrhizae Associations
    1. Ectomycorrhizae
    2. Endomycorrhizae
G. Lichen Symbiont Assemblages
    1. Species Partnership Variations
    2. Ecological Significance
    3. Morphological Variation

V. Plants - Evolutionary Trends and Adaptations (14 hours, lecture)

A. Non-vascular and Seedless Plants
    1. Liverworts
    2. Hornworts
    3. Mosses
B. Vascular Seedless Plants
    1. *Selaginella*, Quillworts, and other Lycopods

2. Ferns and Their Allies

C. Seed Plant Diversity, Ecology, and Reproduction
    1. Cycadophyta
    2. Gingkophyta
    3. Pinophyta
    4. Gnetophyta
    5. Anthophyta (Angiosperms)
D. Angiosperm Anatomy
E. Angiosperm Physiology
F. Angiosperm Ecology
G. Angiosperm in Agriculture
    1. Food Production
    2. Textiles
    3. Medicine

VI. Animals - Evolutionary Trends and Adaptations (16 hours, lecture)

A. Animal Tissues and Comparative Developmental Features
    1. Ectoderm
    2. Mesoderm
    3. Endoderm
B. Animal Organ Systems
    1. Skin/Integument
    2. Cardiovascular
    3. Respiratory
    4. Skeletal
    5. Reproductive
    6. Excretory
    7. Digestive
    8. Endocrine
    9. Muscle
    10. Nervous
C. Taxonomic Diversity
    1. Porifera
    2. Cnidaria
    3. Ctenophora
    4. Platyhelminthes
    5. Nematoda
    6. Annelida
    7. Onycophora
    8. Mollusca
    9. Arthropoda
    10. Chaetognatha
    11. Echinodermata
    12. Hemichordata
    13. Chordata
        a. Subphylm Urochorata
        b. Subphylm Cephalochordata
        c. Subphylm Vertebrata
            i. Agnatha
            ii. Chondrichthyes
            iii. Osteichthyes

iv. Amphibia
v. Reptilia
vi. Aves
vii. Mammalia

A minimum of 80% of lab activities are hands-on experiences.

VII. Microscope (4 hours, lab)

Students will learn proper microscope technique, and utilize the microscopes to examine slides. Students will learn how to make their own microscope slides. Students will compare the dissecting microscope vs. the compound microscope, in respect to magnification and orientation of the specimen. Students will discover the effect that the different magnification lenses have on the field of view and depth of view of the specimen.

A. Letter "e" and silk fiber
B. Fern fronds and sporangia
C. Low power
D. High power

VIII. Research Methods (8 hours, lab)

Students will read peer-reviewed articles, utilize the library to access scientific literature, generate hypotheses, design an experiment, manipulate data, and conduct statistical analysis of data.

A. Reading peer-reviewed articles
B. Learning library access to establish scientific literature
C. Hypothesis generation
D. Producing means, standard deviation, and variance for data sets to compare values and understand principles of scientific method
E. Introduction to other statistical analyses such as t-test, contingency tables, or other methods

IX. Ecology (14 hours, lab)

Students will determine the density of bacterial populations at different times to understand the effect that environmental factors have on the size of a population. Students will analyze data to determine the effect that a predator species has on the diversity of a community.

A. Understanding population biology
B. Examining producers in different ecosystems
C. Consumer, detritivore, and decomposer roles in ecosystems
D. Examining the effects of temperature variation, genetic divergence, and environmental factors

X. Protists (7 hours, lab)

Students will examine live and preserved Eukaryotes in the laboratory. They will manipulate the samples and draw accurate representations. Students will identify key structural cellular features of each specimen. They will classify each protist specimens into their respective phylum and supergroup.

A. Understanding and examing wide variation in Eukarya design
B. Parasitic and free-living examples among many supergroups
C. Details of Archaeplastida
D. Details of Opisthokonta

XI. Fungi (7 hours, lab)

Students will examine live and preserved aquatic and terrestrial fungi. They will manipulate the samples and draw accurate representations. Students will compare the different modes of asexual and sexual reproduction for each of the phyla of fungi. They will classify fungal specimens into their respective phylum Students will compare and distinguish between the three types of lichens.

A. Understanding aquatic versus terrestrial fungal features
B. Chytridiomycota
C. Zygomycota
D. Glomeromycota
E. Ascomycota
F. Basidiomycota
G. Mycorrhizae
H. Lichen assemblages

XII. Plants (28 hours, lab)

Students will examine live and preserved plants. They will manipulate the samples and draw accurate representations. They will compare and identify the different reproductive structures in each group of plants. They will classify plant specimens into their respective phylum. They will distinguish the internal and external anatomical features of the stems, roots, and leaves of monocots and eudicots. Students will compare the process of guttation vs. transpiration. Students will expose guard cells to different salinity concentrations and observe the effect this on stomata size. Students will use a dichotomous key to classify different types of fruits.

A. Evolutionary and morphological diversity
B. Liverworts
C. Hornworts
D. Mosses
E. Vascular plant diversity
F. Ferns and allies
G. Lycopods such as *Selaginella*, quillworts, and others
H. Seed Plants
I. Cycadophyta
J. Gingkophyta
K. Gnetophyta
L. Pinophyta
M. Anthophyta
N. Anthophyta Anatomy
    1. Roots
    2. Stems
    3. Leaves
O. Anthophyta Physiology
    1. Transpiration
    2. Guttation
    3. Photorespiration
P. Anthophyta Fruit and Seed Dispersal
Q. Fruit types and dichotomous key exercise

XIII. Animals (40 hours, lab)

	Students will examine live and preserved animals. They will manipulate the samples and draw accurate representations. Students will correctly identify the specific stages and sequence of the development of an animal embryo. They will identify the 5 main categories of human tissues and differentiate between the different specific tissues within each of these categories. A. Overview of Animals Systems B. Cells and Tissues C. Diploblastic and Triploblastic Phyla D. Porifera E. Cnidaria F. Platyhelminthes G. Nematoda H. Annelida I. Mollusca J. Arthropoda K. Echinodermata L. Hemichordata M. Chordata 1. Subphylum Urochordata 2. Subphylum Cephalochordata 3. Subphylum Vertebrata
Total Lecture Hours:	54
Total Laboratory Hours:	108
Total Hours:	162
Primary Method of Evaluation:	2) Problem solving demonstrations (computational or non-computational)
Typical Assignment Using Primary Method of Evaluation:	Independent research project: Formulate a hypothesis regarding a clinical laboratory study, make a testable prediction regarding your hypothesis, then design and carry out the test, collect data and do a comparison of treatment means with their standard deviation, draw conclusions, and present the project in written and/or oral formats.
Critical Thinking Assignment 1:	Use a dichotomous key to distinguish between the types of fleshy and dry fruits upon examination of samples in the lab. Record your findings in your lab manual or on the handout provided.
Critical Thinking Assignment 2:	Dissect a frog and a fetal pig and identify homologous structures based on your observations. Record your findings in your lab manual or on the handout provided.
Other Evaluation Methods:	Completion, Embedded Questions, Essay Exams, Fieldwork, Homework Problems, Laboratory Reports, Matching Items, Multiple Choice, Objective Exam, Other Exams, Quizzes, Term or Other Papers, True/False, Written Homework
Instructional Methods:	Demonstration, Discussion, Field trips, Group Activities, Guest Speakers, Lab, Lecture, Multimedia presentations
If other:	Internet Presentation/Resources
Work Outside of Class:	Answer questions, Observation of or participation in an activity related to course content (such as theatre event, museum, concert, debate, meeting),

	Problem solving activity, Required reading, Study, Written work (such as essay/composition/report/analysis/research)
If Other:	Group laboratory project
Up-To-Date Representative Textbooks:	Peter J. Russell; Paul E. Hertz; Beverly McMillan, **Biology: The Dynamic Science**, 5th ed. 2021 Darrell Vodopich and Randy Moore, **Biology Laboratory Manual**, 12th Edition 2020
Alternative Textbooks:	
Required Supplementary Readings:	
Other Required Materials:	
Requisite:	Prerequisite
Category:	standard
Requisite course(s): List both prerequisites and corequisites in this box.	Chemistry-4 or Chemistry- 4H
Requisite and Matching skill(s): Bold the requisite skill. List the corresponding course objective under each skill(s).	**Utilize the language of chemistry including vocabulary and symbols.** CHEM 4 - Utilize the language of chemistry, including vocabulary, symbols, formulas, and equations. CHEM 4H - Utilize the language of chemistry, including vocabulary, symbols, formulas, and equations. **Recognize polar and nonpolar substances based on their structure type and bonds.** CHEM 4 -Compare and contrast ionic and covalent compounds. Evaluate bonding based on the chemical formula, and then correlate compound properties with the structure and types of bonding present. CHEM 4H - Compare and contrast ionic and covalent compounds. Evaluate bonding based on the chemical formula, and then correlate compound properties with the structure and types of bonding present. **Identify oxidation/reduction processes.** CHEM 4 - Differentiate between five reaction types: combination, decomposition, single replacement, double replacement, and complete oxidation. Given a set of reactants, diagnose the reaction type and predict the products. CHEM 4H - Differentiate between five reactions types: combination, decomposition, single replacement, double replacement, and complete oxidation. Given a set of reactants, diagnose the reaction type and predict the products. **Create graphs from raw data and interpret the graph.** CHEM 4 - Demonstrate basic laboratory skills, including making, recording, and evaluating observations of chemical systems.

	CHEM 4H -Demonstrate basic laboratory skills, including making, recording, and evaluating observations of chemical systems.
Requisite Skill:	
Requisite Skill and Matching Skill(s): Bold the requisite skill(s). If applicable	
Requisite course:	Biology 110 and English 1
Requisite and Matching skill(s):Bold the requisite skill. List the corresponding course objective under each skill(s).	**Ability to relate eukaryotic cellular structures with their functions.** BIOL 110/110H - Demonstrate general knowledge of eukaryotic cell anatomy, gene expression, metabolism, and division, including Mendelian genetics. **Provide an integrated overview and explain the importance of the flow of information from DNA to RNA to protein** BIOL 110/110H Explain in detail the processes of transcription and translation in cells. omy, gene expression, metabolism, and division, including Mendelian genetics. **Read the college-level textbook and scientific journal articles with understanding.** ENGL 1- Summarize, analyze, evaluate, and synthesize college-level texts. **Compose the written text of a poster presenting the introduction, experimental methods and results, and conclusions drawn from the experiment.** ENGL 1 -Write a well-reasoned, well-supported expository essay that demonstrates application of the academic writing process.
Requisite Skill:	eligibility for English 1A or qualification by appropriate assessment.
Requisite Skill and Matching skill(s): Bold the requisite skill. List the corresponding course objective under each skill(s). If applicable	**Read the college-level textbook and scientific journal articles with understanding.** Summarize, analyze, evaluate, and synthesize college-level texts. **Compose the written text of a poster presenting the introduction, experimental methods and results, and conclusions drawn from the experiment.** Write a well-reasoned, well-supported expository essay that demonstrates application of the academic writing process.
Enrollment Limitations and Category:	
Enrollment Limitations Impact:	
Course Created by:	Steve Leonelli and Teresa Palos
Date:	10/01/2006
Original Board Approval Date:	01/22/2007

Last Reviewed and/or Revised by:	Karla Villatoro
Date:	11/15/2021
Last Board Approval Date:	010/18/2022