El Camino College

COURSE OUTLINE OF RECORD - Official

I. GENERAL COURSE INFORMATION

Subject and Number: Biology 101
Descriptive Title: Principles of Biology I

Course Disciplines: Biological Sciences

Division: Natural 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.

Note: It is recommended that Chemistry 1A be taken concurrently in preparation for Biology 102.

Conditions of Enrollment: **Prerequisite**

Chemistry 4 or

Chemistry 4H
with a minimum grade of C or equivalent

Recommended Preparation

eligibility for English 1A

Course Length: [X] **Full Term** [ ] **Other (Specify number of weeks):**
Hours Lecture: **3.00 hours per week** [ ] **TBA**
Hours Laboratory: **6.00 hours per week** [ ] **TBA**
Course Units: **5.00**

Grading Method: **Letter**
Credit Status **Associate Degree Credit**

Transfer CSU: [X] **Effective Date: 1/22/2007**
Transfer UC: [X] **Effective Date: Fall 2007**

General Education:

El Camino College: **1 – Natural Sciences**

Term: Other:

CSU GE: **B2 - Life Science**

Term: Other:

B3 - Laboratory Sciences

Term: Other:

IGETC: **5B - Biological Science with a Lab**

Term: Other:

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. The student will understand and apply principles of the scientific method; recognizing an idea based on reproducible evidence.
2. The student will be able to use the compound and dissecting microscope to observe cells and microorganisms.
3. 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.

The above SLOs were the most recent available SLOs at the time of course review. For the most current SLO statements, visit the El 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. Characterize interactions among organisms and between organisms and environment.

   Multiple Choice
2. Discriminate among population dynamics, community structure and ecosystem functions.

   Objective Exams
3. Outline major events in the evolutionary history of life.

   Multiple Choice
4. Explain the principles and mechanisms of evolution at the micro and macro levels.

   Homework Problems
5. Compare and contrast representative phyla of supergroups of Eukarya (formerly protists).

   Matching Items

6. Recognize the various protist, fungal, plant, and animal phyla viewed in the lab.

   Other exams

7. Compare and contrast the life cycles of the fungal divisions.

   Completion

8. Diagram and explain the alternation of generations in the life cycle of plants.

   Homework Problems

9. Identify samples of flower, fruit, and seed types.

   Other exams

10. Describe the various plant tissues and organs.

    Written homework

11. Explain water and food transport in plants.

    Objective Exams

12. Discuss the role of phytohormones in plant growth.

    Matching Items

13. Identify and describe animal structures and relate them to functions.

    Objective 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	6	I	I Evolution 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
Lecture	10	II	II Ecology A. Populations and communities B. Energy flow and natural resources

			1. Carbon Cycle 2. Nitrogen Cycle 3. Water Cycle C. Biomes D. Pollution
Lecture	4	III	III "Protists" The Evolution, Adaptations, and Diversity of Ancestral and Modern Eukarya A. Supergroups within Eukarya 1. Diplomonads 2. Euglenozoa 3. Alveolata 4. Stramenopila 5. Amoebozoa 6. Archaeplastida 7. Ophistokonta
Lecture	4	IV	IV Fungi - Evolutionary Trends and Adaptations 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
Lecture	14	V	V Plants - Evolutionary Trends and Adaptations 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
Lecture	16	VI	VI Animals - Evolutionary Trends and Adaptations

			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. Subphylum Urochordata b. Subphylum Cephalochordata c. Subphylum Vertebrata 1) Agnatha 2) Chondrichthyes 3) Osteichthyes 4) Amphibia 5) Reptilia 6) Aves 7) Mammalia
Lab	4	VII	Microscope 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. 1. Letter "e" and silk fiber 2. Fern fronds and sporangia 3. Low power 4. High power
Lab	8	VIII	Research Methods 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. 1. Reading peer-reviewed articles 2. Learning library access to establish scientific literature 3. Hypothesis generation

			4. Producing means, standard deviation, and variance for data sets to compare values and understand principles of scientific method 5. Introduction to other statistical analyses such as t-test, contingency tables, or other methods
Lab	14	IX	Ecology 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. 1. Understanding population biology 2. Examining producers in different ecosystems 3. Consumer, detritivore, and decomposer roles in ecosystems 4. Examining the effects of temperature variation, genetic divergence, and environmental factors
Lab	7	X	Protists 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. 1. Understanding and examing wide variation in Eukarya design 2. Parasitic and free-living examples among many supergroups 3. Details of Archaeplastida 4. Details of Opisthokonta
Lab	7	XI	Fungi 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. 1.Understanding aquatic versus terrestrial fungal features 2. Chytridiomycota 3. Zygomycota 4. Glomeromycota 5. Ascomycota 6. Basidiomycota 7. Mycorrhizae 8. Lichen assemblages
Lab	28	XII	Plants 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. 1. Evolutionary and morphological diversity 2. Liverworts

			3. Hornworts 4. Mosses 5. Vascular plant diversity 6. Ferns and allies 7. Lycopods such as *Selaginella*, quillworts, and others 8. Seed Plants 9. Cycadophyta 10 Gingkophyta 11. Gnetophyta 12 Pinophyta 13. Anthophyta 14. Anthophyta Anatomy a. Roots b. Stems c. Leaves 15. Anthophyta Physiology a. Transpiration b. Guttation c. Photorespiration 16. Anthophyta Fruit and Seed Dispersal 17. Fruit types and dichotomous key exercise
Lab	40	XIII	Animals 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	

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:**

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.

C. **COLLEGE-LEVEL CRITICAL THINKING ASSIGNMENTS:**

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.
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.

D. **OTHER TYPICAL ASSESSMENT AND EVALUATION METHODS:**

Essay exams
Objective Exams
Other exams
Embedded questions
Quizzes
Written homework
Laboratory reports
Field work
Homework Problems
Term or other papers
Multiple Choice
Completion
Matching Items
True/False
Other (specify):
Laboratory research project; Use of a dichotomous key; animal dissection; short answer laboratory practicum exams.

Presentation

V. INSTRUCTIONAL METHODS

Demonstration
Discussion
Field trips
Group Activities
Guest Speakers
Internet Presentation/Resources
Laboratory
Lecture
Multimedia presentations

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
Answer questions
Required reading
Problem solving activities
Written work
Observation of or participation in an activity related to course content
Other (specify)
Group laboratory project

Estimated Independent Study Hours per Week: 6

VII. TEXTS AND MATERIALS

A. **UP-TO-DATE REPRESENTATIVE TEXTBOOKS**
Vodopich & Moore. Biology Laboratory Manual. 10 ed. McGraw-Hill, 2013.
Nature Education. Principles of Biology. 1 ed. Nature, 2012.

B. **ALTERNATIVE TEXTBOOKS**

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
Non-Course Prerequisite	Students in this course need to have reading skills to understand and interpret information in college-level textbooks. The appropriate reading skills will greatly enhance their chance for understanding the reading material and successfully completing this course.

	Students are required to answer essay questions and write a research paper or lab journal. A student needs to have good writing skills to effectively write a paper or essay to explain the concepts and principles in this field.
Course Prerequisite Chemistry-4 or	
Course Prerequisite Chemistry-4H	

B. Requisite Skills

Requisite Skills
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 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. 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.
Identify oxidation/reduction processes. 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. 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.
Create graphs from raw data and interpret the graph. CHEM 4H - Demonstrate basic laboratory skills, including making, recording, and evaluating observations of chemical systems. CHEM 4 - Demonstrate basic laboratory skills, including making, recording, and evaluating observations of chemical systems.

C. Recommended Preparations (Course and Non-Course)

Recommended Preparation	Category and Justification
Non-Course Recommended Preparation eligibility for English 1A	

D. Recommended Skills

Recommended Skills
Read the college-level textbook and scientific journal articles with understanding. ENGL 84 - Select and employ reading strategies to interpret the content of a college-level textbook, with special focus on constructing a thesis statement and providing valid support.
Compose the written text of a poster presenting the introduction, experimental methods and results, and conclusions drawn from the experiment. ENGL A -

Apply appropriate strategies in the writing process including prewriting, composing, revising, and editing techniques.
Utilize library resources to find primary sources of information regarding the topic of the poster project. ENGL A - Utilize MLA guidelines to format a document, to cite sources in the text of an essay, and to compile a Works Cited list.

E. Enrollment Limitations

Enrollment Limitations and Category	Enrollment Limitations Impact

Course created by Steve Leonelli and Teresa Palos on 10/01/2006.

BOARD APPROVAL DATE: 01/22/2007

LAST BOARD APPROVAL DATE: 12/18/2017

Last Reviewed and/or Revised by Bryan Carey on 09/30/2016

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