BIOL G186: DIVERSITY OF ORGANISMS

Item	Value
Curriculum Committee Approval Date	11/16/2021
Top Code	040800 - Natural History
Units	5 Total Units
Hours	162 Total Hours (Lecture Hours 54; Lab Hours 108)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	No
Basic Skills	Not Basic Skills (N)
Repeatable	No
Grading Policy	Standard Letter (S)
California General Education Transfer Curriculum (Cal-GETC)	• Cal-GETC 5B Biological Sciences (5B) • Cal-GETC 5C Laboratory Activity (5C)
Intersegmental General Education Transfer Curriculum (IGETC)	• IGETC 5B Biological Sciences (5B) • IGETC 5C Laboratory Activity (5C)
California State University General Education Breadth (CSU GE-Breadth)	• CSU B2 Life Science (B2) • CSU B3 Laboratory Activity (B3)

Course Description

This course is a survey of extant living organisms including physiological and anatomical adaptations of organisms in response to their environment. Each kingdom is examined, with an emphasis on evolution and ecology of organisms found in kingdoms Plantae and Animalia. Included in this survey is an introduction to scientific methodology including student-centered experimental design, execution, and subsequent analysis of data. PREREQUISITE: BIOL G180; and MATH G115 or MATH G120. Transfer Credit: CSU; UC. C-ID: BIOL 140, BIOL 135S. **C-ID:** BIOL 140, BIOL 135S.

Course Level Student Learning Outcome(s)

1. Course Outcomes
2. Differentiate among organisms of different taxonomic levels (and therefore phylogeny) using specific symplesiomorphies and synaopmorphies.
3. Demonstrate how environmental pressures spurred evolutionary adaptations which ultimately gave rise to the apomorphies among major taxa.
4. Explain the major physiological mechanisms of each of the kingdoms.
5. Analyze the link between form and function or anatomical structures as exemplified by members of each of the kingdoms.
6. Execute a simple student-designed experiment demonstrating thorough understanding of the scientific method.
7. Compose a report that communicates complex ideas using scientific format as is used by the scientific community to publish in science-based peer-reviewed journals.

Course Objectives

- 1. Outline similarities and differences in the development, life cycles, and anatomical and physiological characteristics of major organismal taxa.
- 2. Analyze the link between form and function for anatomical structures as exemplified by members of each of the kingdoms.
- 3. Compose an essay that communicates complex ideas in a scientific format.
- 4. Define what it means to be "alive" including essential elements and hypotheses of lifes history.

Lecture Content

Defining life Definition Differentiating life from not-life Characteristics of life Evolution Multi-discipline support People that influenced the origin of the theory of evolution Causes of evolution Natural selection Directional, disruptive, and stabilizing Genetic drift Gene flow Mutation Non-random mating Species Morphological, biological, phylogenetic species concepts Speciation Modes of speciation: allopatric, sympatric, parapatric Isolation mechanisms Premating Postmating Phylogenetics and Cladistics Reading cladograms Appropriate definitions, such as “monophyletic” Organization of life Karl VonLinnes taxonomic system Major taxonomic levels Grammar rules for taxonomic levels Binomial nomenclature Viruses Structure Methods of cellular invasion and replication Prokaryote Domains Archaebacteria Anatomical and physiological adaptations for homeostasis and metabolism Key characteristics that distinguish this domain including chemical composition of cell walls and memebrane phosolipid differences Bacteria Anatomical and physiological adaptations for homeostasis and metabolism Key characteristics that distinguish this domain including chemical composition of cell wall and plasma membrane Methods of reproduction such as plasmid transfer and partial bacterial chromosome transfer Domain Eukarya General characteristics Protista Major proposed supergroups Life cycles of examples of each supergroup Ecology of each supergroup General characteristics of each supergroup Anatomical and physiological adaptations for homeostasis and metabolism of each supergroup Survey of organelles and protist-centric structures Plantae Kingdom-wide general characteristics Organs Tissues Organelles Photosynthesis Light dependent reactions Light independeent reactions Anatomical and physiological adaptations for homeostasis and metabolism Mosses, liverworts Adaptations to land life Life cycle Relationships among and identification of major taxonomic groups Ferns Adaptations for land life Life cycle Gymnosperms Adaptations for land life Life cycle Relationships among and identification of major taxonomic groups Angiosperms Adaptations for land life Life cycle Relationships among and identification of major taxonomic groups Fruits Flowers Movement Growth hormones Fungi Kingdom-wide general characteristics Relationships among and identification of major taxonomic groups Life cycles within each of the groups Anatomical and physiological adaptations for homeostasis and metabolism Animalia Kingdom-wide general characteristics Relationships among and identification of major taxonomic groups Note: “general characteristics” below indicates blastopore condition, embryonic germ layer condition, coelom conditi on (as appropriate), body symmetry, level of body organization (cellular, tissue, organ or organ system), proposed superphylum membership, feeding mechanisms, and

anatomy and physiology of digestive, excretory, nervous, circulatory, and respiratory structures Porifera Phylogenetic position within the kingdom General characteristics Anatomical and physiological adaptations for homeostasis and metabolism Life cycles Cnidaria Phylogenetic position within the kingdom General characteristics Anatomical and physiological adaptations for homeostasis and metabolism Life cycles Platyhelminthes Phylogenetic position within the kingdom General characteristics Anatomical and physiological adaptations for homeostasis and metabolism Life cycles Mollusca Phylogenetic position within the kingdom General characteristics Anatomical and physiological adaptations for homeostasis and metabolism Life cycles Annelida Phylogenetic position within the kingdom General characteristics Anatomical and physiological adaptations for homeostasis and metabolism Life cycles Nematoda Phylogenetic position within the kingdom General characteristics Anatomical and physiological adaptations for homeostasis and metabolism Life cycles Arthropoda Phylogenetic position within the kingdom Relationships among and identification of major taxa General characteristics Anatomical and physiological adaptations for homeostasis and metabolism Life cycles Echinodermata Phylogenetic position within the kingdom General cha racteristics Anatomical and physiological adaptations for homeostasis and metabolism Life cycles Chordata Primitive subphyla: Cephalochordata and Urochordata Phylogenetic position within the kingdom General characteristics Anatomical/ physiological adaptations for homeostasis and metabolism Life cycles Vertebrata Note: “General characteristics” below indicates specific skeletal, circulatory, thermoregulatory, respiratory, integumentary, and reproductive anatomy and physiology 3 classes of fishes Phylogenetic position within the kingdom General characteristics Homeostasis and metabolism Amphibians Phylogenetic position within the kingdom General characteristics Adaptations for land life Homeostasis and metabolism Reptiles Phylogenetic position within the kingdom General characteristics Adaptations for land life Homeostasis and metabolism Aves Phylogenetic position within the kingdom General characteristics Adaptations for land life Homeostasis and metabolism Mammalia Phylogenetic position within the kingdom General characteristics Adaptations for land life Homeostasis and metabolism Muscle tissue types Physiology of muscular contraction Nervous tissues Physiology of nervous signal conduction Animal thermoregulation Animal hormones categories functions origins and target cells Ecology Population ecology Growth Interacti ons Symbiosis Predator/prey Competition Community ecology Succession Ecosystem ecology Flow of energy through an ecosystem

Lab Content

Scientific method Evolution Convergent evolution vs. adaptive radiation Natural selection and genetic drift Phylogenetics and cladistics Organization of specimens into taxonomic groups Identification of synapomorphies and symplesiomorphies Microscopy Compound light microsope function and use Dissecting microscope function and use Bacteriology Staining techniques (pending availabiltiy of Bunsen burners) Invstigation of bacertial resistance to antiseptics Protista Survey of the kingdom Focus of symplesiomorphies within taxa Plantae Anatomical study or organs and tissues of major taxa Life cycle investigation of major taxa Experimental design Proposing of a student research project Fungi Anatomical study of organs and tissues Invertebrate zoology Survey of major invertebrate phyla including: Anatomical study may include dissection Taxonomic survey includes investigation of various specimens within specific taxonomic units Vertebrate zoology Survey of major vertebrate phyla including: Anatomical study may include dissection Taxonomic survey includes investigation of various specimens within specific taxonomic units Presentation of student-created reserach project Student projects shall be presented to class using either a PowerPoint supported conference style format, or a poster presentation session, or both Field trip to Bolsa Chica Ecological Reserve Investigation of how energy flows through an ecosystem Investigation of how competiton may result in resource partitiioning.

Method(s) of Instruction

- Lecture (02)
- DE Live Online Lecture (02S)
- DE Online Lecture (02X)
- Lab (04)
- DE Live Online Lab (04S)
- DE Online Lab (04X)

Instructional Techniques

1. Instructor-led lectures during each lecture section that include use of PowerPoint visuals. 2. Instructor-led lectures introducing each laboratory activity that include, but are not limited to, demonstration of use of specialized equipment, introduction to safety hazards associated with that particular lab activity, outline of what is expected of students during lab, and indication of how student learning will be monitored. 3. Laboratory activities that use, among other techniques, inquiry-based student learning that includes hands-on interaction with appropriate taxa. 4. One-on-one instructor/student interaction in lab.

Reading Assignments

1. Assigned reading in textbook to accompany learning acquired during lecture. 2. Assigned reading of laboratory manual prior to students arrival in lab.

Writing Assignments

1. Writing of a scientific paper demonstrating the students ability to construct and execute an experiment.

Out-of-class Assignments

1. Design and execution of an experiment that accurately employs the scientific method.

Demonstration of Critical Thinking

1. Lecture examinations. 2. Scientific method project.

Required Writing, Problem Solving, Skills Demonstration

1. Scientific report covering the students designed an executed experiment.

Eligible Disciplines

Biological sciences: Masters degree in any biological science OR bachelors degree in any biological science AND masters degree in biochemistry, biophysics, or marine science OR the equivalent. Masters degree required.

Textbooks Resources

1. Required Campell, Reece. Biology, 12 ed. Pearson, 2020

Manuals Resources

1. Adams, B., Crawley, J.. VanDeGraffs Photographic Atlas for the Biology Laboratory, Morton , 01-01-2018