CIC Approval:
BOT APPROVAL:
STATE APPROVAL:
EFFECTIVE TERM:

SAN DIEGO COMMUNITY COLLEGE DISTRICT
CITY, MESA, AND MIRAMAR COLLEGES
ASSOCIATE DEGREE COURSE OUTLINE

SECTION I

SUBJECT AREA AND COURSE NUMBER: Biology 210B

COURSE TITLE: Introduction to the Biological Sciences II

Units: 4
Letter Grade or Pass/No Pass Option

CATALOG COURSE DESCRIPTION:

This course covers the three domains of life, including the phylogenetic relationships of major groups of organisms. Topics include adaptive radiation, anatomy, physiology, development, behavior, and ecology. This is the second semester of a two-semester sequence designed for biological science and pre-professional majors.

REQUISITES:

Prerequisite:
BIOL 210A with a grade of "C" or better, or equivalent

Advisory:

ENGL 101 with a grade of "C" or better, or equivalent

FIELD TRIP REQUIREMENTS:
May be required

TRANSFER APPLICABILITY:
Associate Degree Credit & transfer to CSU CSU General Education IGETC UC Transfer Course List

CID:
BIOL 140

TOTAL LECTURE HOURS:
48 - 54

TOTAL LAB HOURS:
48 - 54

TOTAL CONTACT HOURS:
96 - 108

OUTSIDE-OF-CLASS HOURS:
96 - 108

TOTAL STUDENT LEARNING HOURS:
192 - 216

STUDENT LEARNING OBJECTIVES:
Upon successful completion of the course the student will be able to:

1. Evaluate the role of relative fitness in speciation and adaptive evolution.
2. Arrange key events in the history of Earth with respect to the adaptations and evolution of life.
3. Apply knowledge of the fundamental concepts of systematics.
4. Differentiate and compare the diversity of structure, adaptations, metabolism, and ecological role in Domains Bacteria and Archaea.
5. Differentiate and organize the diversity of structure, adaptations, and metabolism of the major groups of protists relative to their origins, their synapomorphies, and their ecological roles.
6. Describe and classify the diversity of plants with particular reference to how plants were able to colonize land.
7. Describe and classify the diversity of fungi with particular reference to analysis of their life cycles and ecological role.
8. Differentiate and organize the diverse taxa of the Kingdom Animalia using cladistics.
9. Identify structures of the representative plant body, and relate those structures to function and growth.
10. Describe, examine, and evaluate the plant physiological processes required for the transport of fluids, nutrients, development, and response to internal and external signals.
11. Describe, examine, and evaluate the anatomy and physiology of animals, including major tissue types and digestive, circulatory, respiratory, immune, excretory, endocrine, reproductive, nervous, skeletal, and muscular systems.
12. Identify, relate, and assess the steps involved in embryonic animal development.
13. Relate, compare, and appraise selected morphological, physiological, and general behavioral responses of animals to their respective environments with respect to proximate and ultimate causations.
14. Distinguish and evaluate the significant features of population biology dynamics.
15. Characterize and analyze ecosystems and ecosystem dynamics.
16. Interpret, debate, and critique selected principles and techniques for biological conservation considering the need for biodiversity.

SECTION II

1. COURSE OUTLINE AND SCOPE:

A. **Outline Of Topics:**
The following topics are included in the framework of the course but are not intended as limits on content. The order of presentation and relative emphasis will vary with each instructor.

I. Speciation
  A. Fitness
  B. Directional, disruptive, and stabilizing selection
  C. Sexual selection
  D. The biological species concept
  E. Sympatric and allopatric speciatio
  F. Reproductive barriers in sympatric species, prezygotic, and postzygotic isolation
II. Key events in life's history on Earth and the adaptations and evolution of life
  A. Conditions on early Earth and a model for the origin of life
  B. Documenting the history of life
    1. The fossil record
    2. Radiometric dating
  C. Geologic eons and eras
    1. Plate tectonics
    2. Mass extinctions and radiations
    3. First life
    4. Photosynthesis and oxygen production
    5. Origins of eukaryotic life and endosymbiosis
    6. The origin of multicellularity
    7. The Cambrian explosion
    8. The colonization of land
  D. The effect of developmental genes on adaptation
III. Systematics

A. Taxonomy and nomenclature
B. Traits
    1. Morphological and molecular
    2. Ancestral and derived
C. Major taxa of life and their shared traits
    1. Cladistics: constructing and interpreting phylogenetic trees
    2. Homologous s. analogous traits (homoplasies)
    3. Synapomorphies of major taxa

IV. Domains Bacteria and Archaea
A. Diversity of structure, Gram staining
B. Adaptations for mobility and resistance
C. Metabolic and nutritional adaptations
D. Reproduction and genetic recombination
E. Major groups of Bacteria and Archaea
F. The role of prokaryotes in the biosphere

V. Major groups of protists
A. Supergroup Excavata: Diplomonads, Parabasalids, Euglenozoans
B. Supergroup Chromalveolata
    1. Alveolates: dinoflagellates, apicomplexans, ciliates
    2. Stramenopiles: diatoms, golden algae, brown algae, oomycetes
C. Supergroup Rhizaria: cercozoans, forams, radiolarians
D. Supergroup Archaeplastida: red algae, green algae
E. Supergroup Unikonta: amoebozoans, choanoflagellates
F. The role of protists in the biosphere
    1. Ecological impact, symbioses
    2. Aquatic productivity

VI. Plant diversity
A. The shared derived traits of plants
    1. Alternation of generation
    2. Multicellular, dependent embryos
    3. Walled spores
    4. Multicellular gametangia
    5. Apical meristems
B. Bryophytes
    1. Phylum Hepatophyta
    2. Phylum Bryophyta
    3. Phylum Anthocerophyta
C. Tracheophytes
    1. Phylum Lycophyta
    2. Phylum Pterophyta
    3. Phylum Ginkgophyta
    4. Phylum Cycadophyta
    5. Phylum Gnetophyta
    6. Phylum Coniferophyta
    7. Phylum Anthophyta
D. Plant adaptations for the colonization of land
    1. Jacketed gametangia
    2. Vascular tissue, roots, and shoots
    3. Homospory and heterospory
    4. Ovules, pollen, and seeds
    5. Flowers and fruits

VII. Phylogeny and diversity of fungi
A. The shared derived traits of fungi
B. Phylum Chytridiomycota
C. Phylum Zygomycota
D. Phylum Glomeromycota
E. Phylum Ascomycota
F. Phylum Basidiomycota
G. The role of fungi in the biosphere

VIII. Overview of animal evolution

A. The shared derived traits of animals
B. Animal phylogeny and diversity
    1. The animal body plan
    2. Evolution of body cavities and coelom
    3. Protostome and Deuterostome development
    4. Major branches in the animal lineage
C. Major invertebrate taxa and their characteristics
    1. Parazoa (or Metazoa): Phylum Porifera
    2. Eumetazoa
        a. Phylum Ctenophora
        b. Phylum Cnidaria
        c. Bilateria: Phylum Acoela
            i. Lophotrochozoa: Phylum Plathelminthes, Phylum Syndermata, Phylum Ectoprocta, Phylum Brachiopoda, Phylum Gastrotricha, Phylum Cycliophora, Phylum Nemertea, Phylum Annelida, Phylum Mollusca
            ii. Ecdysozoa: Phylum, Loricifera, Phylum Priapula, Phylum Onychophora, Phylum Tardigrada, Phylum Nematoda, Phylum Arthropoda
            iii. Deuterostomia: Phylum Hemichordata, Phylum Chordata, Phylum Echinodermata
        d. Phylum Cordata: major vertebrate taxa and their characteristics
            i. Subphylum Cephalochordata
            ii. Subphylum Urochordata
            iii. Subphylum Vertebra
            iv. Superclass Cyclostomes: Class Myxini, Class Petromyzontida
            v. Infraphylum Gnathostomes: Class Chondrichthyes
            vi. Superclass Osteichthyans: Class Actinopterygii
            vii. Clade Sarcopterygii: Subclass Actinistia, Subclass Dipnoi
            viii. Superclass Tetrapoda: Class Amphibia
            ix. Clade Amniota: Class Reptilia, Class Mammalia
D. Human origins and evolution
    1. The derived characteristics of hominins
    2. Human phylogeny

IX. Plant growth and structure
A. Anatomy: cells and tissues
B. Anatomy: organs and systems
C. Plant growth regions, meristems
D. Primary growth
E. Secondary growth

X. Plant physiology
A. Resource acquisition and transport of materials in plants
    1. Principles of materials transport
    2. Root absorption of water and minerals
    3. Transpiration and its control
    4. Phloem sap and its translocation
    5. Symbiotic relationships, e.g. mycorrhizae
B. Flower, seed, and fruit development in Angiosperms
C. Plant responses to internal and external signals

XI. Animal anatomy and physiology
A. Basic cell and tissue types
B. Survey of animal organ systems
C. Homeostasis as a central regulation concept
D. Metabolic rate and bioenergetics
E. Body plans related to surface area and volume
F. Nutrition and digestion in animals
G. Circulatory systems, comparative anatomy, structure, and functions
H. The lymphatic system
I. Respiratory systems, comparative anatomy and physiology
J. Immune system
K. Osmoregulation and nitrogen excretion
L. The excretory system

M. Hormones and the endocrine system
N. Animal reproduction
1. Asexual vs. sexual reproduction
2. Introduction to reproductive cycles
3. Internal and external fertilization mechanisms
4. Mammalian reproductive anatomy
O. The nervous system
1. Tissue structure and function
2. Nervous system organization
a. Central and peripheral nervous systems
b. The autonomic nervous system
P. Sensory and motor mechanisms
1. Sensory receptors and their actions
2. Motor mechanisms

XII. Animal development
A. Embryonic development
B. Mechanisms of morphogenesis
C. Cytoplasmic determinants and pattern formation by inductive signals

XIII. Responses of animals to their respective environments
A. Morphological and physiological adaptations
B. Stimulation of simple and complex behaviors
C. Learning
D. Foraging
E. Mating behavior and mate choice
F. Inclusive fitness

XIV. Population ecology
A. Characteristics of populations, including density and spacing
B. Growth and decline of populations (Demography)
C. Patterns in life histories
D. Exponential and logistic population growth models
E. Density-dependent factors affecting population growth
F. Density-independent factors affecting population growth

XV. Ecosystems and ecosystem dynamics
A. Introduction to ecology and the biosphere
1. Global climate patterns
2. Regional climate patterns
3. The structure of terrestrial biomes
4. The structure of aquatic biomes
5. Factors limiting the distribution of a species
B. Characterization of ecosystems and ecosystem dynamics
1. Trophic levels
2. Primary productivity
3. Trophic relationships and energy flow through an ecosystem
4. Biological and geologic processes for nutrient cycling
5. Water, nitrogen, carbon, and phosphorus cycles
6. Toxins and poisons, biomagnification concept
7. Ecosystem restoration
C. Community ecology
1. Community interspecific interations
a. Competition
b. Predation and parasitism
c. Herbivory
d. Symbiosis
e. Commensalism and mutualism
2. Diversity and trophic structure
a. Diversity and community stability
b. Keystone species
c. Bottom-up and top-down effects
3. Environmental succession
4. Biogeographic factors and community diversity

XVI. Conservation of natural resources
- A. Biodiversity and extinction rates
- B. Threats to biodiversity
  1. Habitat destruction
  2. Overexploitation
  3. Competition from introduced species
  4. Global change
- C. Population conservation
  1. Small populations and the extinction vortex
  2. Minimal viable population
  3. Declining population approach
- D. Landscape and regional conservation
  1. Fragmentation and edges
  2. Corridors
  3. Protection of biodiversity hot spots
  4. Nature reserves
- E. Sustainable development
- F. Human impact on biodiversity

XVII. Laboratory
- A. Domains Bacteria and Archaea
- B. Protist diversity
- C. Fungi and fungal symbioses
- D. Bryophyte diversity and evolution
- E. Tracheophyte diversity and evolution
- F. Angiosperm anatomy, morphology, and development
- G. Dissection techniques and terms of position and direction
- H. Animal diversity: invertebrates
- I. Animal diversity: vertebrates
- J. Animal cells and tissues
- K. Mammalian integumentary, skeletal, and muscular systems anatomy and physiology
- L. Mammalian nervous systems anatomy and physiology
- M. Mammalian circulatory system anatomy and physiology
- N. Mammalian respiratory system anatomy and physiology
- O. Mammalian digestive system anatomy and physiology
- P. Mammalian excretory system anatomy and physiology
- Q. Mammalian reproductive systems anatomy and physiology

B. **Reading Assignments:**
Reading assignments are required and may include, but are not limited to, the following:

I. Textbooks.
II. Journal articles.
III. Secondary sources such as Scientific American.

C. **Writing Assignments:**
Writing assignments are required and may include, but are not limited to, the following:

I. Weekly laboratory exercises and reports that identify and elaborate on selected organisms' structure and function.
II. Homework questions that analyze and apply knowledge of material from lecture and lab.
III. Reports on class discussions.
IV. Short essays and reviews of current articles that evaluate evolutionary theory as related to placement of phyla in a hierarchy.
V. Semester projects that survey and analyze a selected animal class, order, genus, or species from an adaptation standpoint.

D. **Appropriate Outside Assignments:**
Outside assignments may include, but are not limited to, the following:

I. Appropriate topical lectures and programs at local institutions, such as the San Diego Zoo, San Diego

Natural History Museum, Sea World, University of California San Diego, or San Diego State University.
II. Independent searches of selected topics of interest such as animal and plant diversity and evolution.
III. Field trips to gain acquaintance with local biomes, observe and collect data on animal behaviors, or observe and collect data on ecosystems and ecosystem dynamics.
IV. Collaboration with other students to complete coursework.

E. **Appropriate Assignments that Demonstrate Critical Thinking:**
Critical thinking assignments are required and may include, but are not limited to, the following:

I. Analyzing and applying information extracted from graphs, tables, charts, and diagrams to the principles of cladistics.
II. Evaluating, relating, and applying the principles of homeostasis to the functioning of organ systems of animals.
III. Comparing and contrasting organ systems in diverse phyla of animals.
IV. Relating the characteristics of a biome and integrating and applying them into a plan for resource management.
V. Comparing the structures in diverse phyla in a discussion of evolutionary trends.
VI. Analyzing behavioral systems of animals to predict behavior under specific parameters.
VII. Using techniques and information learned in lab to design an original experiment.

2. METHODS OF EVALUATION:

A student's grade will be based on multiple measures of performance unless the course requires no grade. Multiple measures may include, but are not limited to, the following:

I. Objective and subjective examinations in the laboratory and lecture venues that test for definitions and major biological concepts.
II. Laboratory exercises that apply the practical aspects of general biology.
III. Laboratory reports on material that directly relates to principles of biology, comparative organism diversity, behavior, and ecology.
IV. Field trip assignments that show pragmatic approaches to understanding biological concepts.
V. Library projects that demonstrate a focus on a selected biological topic.
VI. Analytical semester projects on topics that reflect knowledge of a selected biological principle.

3. METHODS OF INSTRUCTION:

Methods of instruction may include, but are not limited to, the following:

* Collaborative Learning
* Laboratory
* Lecture
* Lecture Discussion
* Lecture-Lab Combination
* Other (Specify)
* Field trips to various sites.
* Review of selected journal articles.

4. REQUIRED TEXTS AND SUPPLIES:
Textbooks may include, but are not limited to:

TEXTBOOKS:
1. Clymer, Janice J. Introduction to the Biological Sciences II Lab Manual, 2nd ed. RandomNPC LLC, 2011, ISBN: 9780982010365
2. Dolphin, Warren D. and David Vleck. Biological Investigations Lab Manual, 10th ed. McGraw-Hill, 2014, ISBN: 9780073532264
3. Raven, Peter H., et al. Biology, 12th ed. McGraw Hill, 2019, ISBN: 9781260169614
4. Urry, Lisa A., et al. Campbell Biology, 3rd ed. Pearson, 2020, ISBN: 9781036780892

5. Vodopich, Darrell S. and Randy Moore. Biology Laboratory Manual, 12th ed. McGraw-Hill, 2019, ISBN: 9781260200720

MANUALS:

PERIODICALS:

SOFTWARE:

SUPPLIES:
1. Dissection kit.
2. Plain microscope slides and coverslips.
3. Gloves for dissections.
4. Biology atlas.

ORIGINATOR: Janice Clymer
ORIGINATION DATE: 12/09/2011
PROPOSAL ORIGINATOR: Andrew Lowe
CO-CONTRIBUTOR(S) Daniela Bruckman,Kevin Jagnandan
PROPOSAL DATE: 03/02/2019