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Biology (BIOL) 2202 General Zoology (5 Units) CSU:UC
[formerly Zoology 1A]

Prerequisite: Eligibility for Mathematics 1500 or higher

Advisory: Completion of Biology 2201 and eligibility for English 1500 strongly recommended

Prerequisite knowledge/skills:

Before entering the course, the student should be able to:

1. identify numbers as belonging to specified sets, and graph discrete and continuous sets of real numbers,
2. perform the basic arithmetic operations with positive and negative real numbers, plus raising to powers,
3. know and apply the rules of exponents and the order of operations in algebraic calculations,
4. apply the properties of addition and multiplication for real numbers and identify their use in practice,
5. solve linear equations and inequalities in one variable, and analyze and solve applications leading to such equations or inequalities,
6. solve and graph the solutions of compound inequalities or absolute value inequalities in one variable,
7. perform addition, subtraction, multiplication and division of polynomials,
8. factor simple polynomials, with special emphasis on trinomials quadratic in form, and solve related polynomial equations,
9. add, subtract, multiply and divide rational algebraic expressions, and simplify to lowest terms,
10. solve equations involving rational algebraic expressions, and analyze and solve word problems leading to such equations,
11. simplify radical expressions involving numbers and/or variables,
12. use fractional exponents,
13. perform addition, subtraction, multiplication and division of expression involving radicals and complex numbers and simplify the results, including rationalization of denominators,
14. solve equations that involve radicals,
15. solve quadratic equations in one variable, and equations quadratic in form, by factoring, completing the square, and the quadratic formula,
16. analyze and solve application problems requiring the use of quadratic equations,
17. solve and graph quadratic inequalities in one variable,

18. graph points in the rectangular coordinate system, and straight lines from ordered pairs obtained from its equation,
19. determine the slope of the line between any specified pair of points,
20. know the slope forms of the equation of a straight line, and be able to determine the equation of a particular straight line from specified input information,
21. solve and graph linear inequalities in two variables,
22. solve linear systems of equations in two or three variables algebraically, and solve those in two dimensions graphically,
23. analyze and solve application problems requiring the use of linear systems of equations in two or three variables,
24. evaluate determinants and use them to solve linear systems of equations,
25. determine whether or not a specified relation is a function,
26. for a function, compute the value of the function given the value of the independent variable, and be able to construct the inverse of simple functions in numeric or algebraic terms,
27. identify the quadratic equation representing a specific conic section, and be able to draw the graph of a conic section by analyzing its equation, or to write the equation of a specified conic section,
28. solve nonlinear systems of equation involving the intersection of two conic sections or a conic section and a straight line,
29. compute and graph specified exponential and logarithmic functions,
30. know the properties of logarithms (product, quotient, power and change of base rules) and be able to use them in practical numerical computations using a table of common logarithms or a calculator, and
31. solve simple exponential and logarithmic equations.

Total Hours: 48 hours lecture; 96 hours lab (144 hours total)

Catalog Description: This course is intended for majors, and includes a survey of animal phyla and non-photosynthetic, single-celled, eukaryotic taxa. It covers the comparative structure, function, and life cycles of animals, as well as principles of evolution, taxonomy, and systematics. Topics include development, morphology and physiology, phylogeny, and behavior of animals, as well as principles of evolution, mechanisms of evolutionary change, and speciation. Field trips are required. Students who intend to transfer to a UC should take BIOL 2202 after BIOL 2201. C-ID: BIOL 150; BIOL 135S

Type of Class/Course: Degree Credit

Text: Hickman, Cleveland, et al. *Integrated Principles of Zoology*. 16th ed. New York: McGraw, 2014. Print.

Additional Instructional Materials: none

Course Objectives:

By the end of the course, a successful student will be able to

1. Recognize characteristics of major animal taxa,
2. Understand the phylogenetic relationships among major animal taxa,
3. Construct and interpret phylogenies,
4. Identify and describe structures in animals from a variety of phyla and relate them to their functions, including nutrient acquisition, circulation, respiration, movement, nervous and sensory function, and reproduction,
5. Illustrate and exemplify physiological functions across the animal phyla,
6. Compare and contrast anatomical and physiological features of selected animal phyla.
7. Understand and compare different patterns of animal development and life cycles of animals and non-photosynthetic, single-celled, eukaryotic taxa,
8. Identify examples of animal behavior and explain the evolutionary significance of particular behaviors,
9. Describe the development, evolutionary origins and modifications of representative structures,
10. Describe the significance of sexual reproduction,
11. Describe the origin of multicellularity,
12. Describe mechanisms of evolutionary change, including speciation,
13. Provide evidence for evolution,
14. Acquire, use, and cite scientific literature appropriately in scientific writing,
15. Apply scientific methodology and reasoning through active experimentation, investigations, or other activities, and
16. Demonstrate critical thinking/scientific reasoning skills.

Course Scope, and Content: (Lecture)

- Unit I Biological Principles and the Science of Zoology
- A. Fundamental Properties of Life
 - B. Zoology as a Part of Biology
 - C. Principle of Science
- Unit II Cells as Units of Life
- A. Review of Mitosis
 - B. Review of Cellular Respiration
- Unit III Genetics
- A. Review
- Unit IV Organic Evolution
- A. Darwinian Evolutionary Theory
 - B. Microevolution: Genetic Variation and Change Within Species
 - C. Mechanisms of Evolutionary Change
 - a. Natural Selection, Genetic Drift, Gene Flow, Mutation, Non-random mating.
 - D. Principle of Population Genetics
 - E. Macroevolution: Major Evolutionary Events
 - a. Speciation
 - F. Precambrian Animal Evolution
- Unit V The Reproductive Process
- A. Asexual: Budding, Fragmentation, Parthenogenesis

- B. Sexual: Variety of Techniques
 - C. Review of Meiosis
- Unit VI Principles of Development for Representative Animals and Non-Photosynthetic Single-Celled Eukaryotic Taxa.
- A. Cleavage and Development
 - B. Life Cycles
- Unit VII Architectural Pattern of an Animal
- A. Animal Body Plans
 - B. Components of Animal Bodies
 - C. Complexity and Body Size
- Unit VIII Phylogeny and Evolutionary History of Animals
- A. Linnaeus and Taxonomy
 - B. Species
 - C. Taxonomic Characters and Phylogenetic Reconstruction
 - D. Major Divisions of Life
 - E. Major Subdivisions of the Animal Kingdom
 - F. Systematics and Taxonomy: Classification Schemes
- Unit IX Unicellular Eukaryotes
- A. Form and Function
 - B. Major Protozoan Taxa
 - C. Phylogeny and Adaptive Diversification
- Unit X Survey and Phylogeny/Evolutionary History of Animal Phyla
- A. Study of morphology, physiology, taxonomy, locomotion, reproduction, behavior and ecology of the major phyla, classes and orders.
 - B. Study of How Animal Structures are Related to Their Development, Evolutionary Origins, and Modification.
 - C. Phyla studied:
 1. Porifera, Placozoa
 2. Cnidaria, Ctenophora
 3. Platyhelmenthes
 4. Nematoda
 5. Mollusca
 6. Annelida
 7. Arthropoda
 8. Echinodermata
 9. Chordata
- Unit XI Anatomy and Physiology: Support, Protection, and Movement
- A. Integument
 - B. Skeletal System
 - C. Muscular System
 - D. Animal Movement
- Unit XII Anatomy and Physiology: Other Tissue and Organ Systems

- A. Excretory System
- B. Circulatory System
- C. Respiratory System
- D. Digestive System
- E. Nervous System
- F. Endocrine System
- G. Immune System

- Unit XIII Animal Behavior
- A. Describing behavior: Principles of Classical Ethology
 - B. Control of Behavior
 - C. Social Behavior

- Unit XIV Animal Ecology
- A. The Hierarchy of Ecology
 - B. Extinction and Biodiversity

Course Scope and Content (Laboratory):

- Unit I Basics of Science
- A. Experimental Design
 - B. Scientific Method
 - C. Hypothesis generation
 - D. Performance of the actual experiment

- Unit II Measurement and Unit Conversions
- A. Length, weight and volume measurements
 - B. English system of measure
 - C. Metric system of measure
 - C. Unit conversions and calculations

- Unit III Microscope Use
- A. Basic Technique for both Compound and Dissection Scopes
 - B. Microscope parts
 - C. Calculation of total magnification
 - D. Determination of field size

- Unit IV Basic Chemistry
- A. pH
 - B. Buffers
 - C. Diffusion and Osmosis
 - D. Hemolysis and Crenation

- Unit V Mitosis
- A. The cell cycle
 - B. Interphase
 - C. Stages of mitosis
 - D. Cytokinesis

- Unit VI Cellular Respiration and Respiratory Physiology
- A. pH indicators
 - B. The bicarbonate buffer system
 - C. Exercise physiology
 - D. Exercise demands on cellular respiration
- Unit VII Isolation of Animal DNA
- A. Laboratory technique
 - B. Precipitation
 - C. Buffer use
 - D. Importance of DNA as genetic blueprint
 - E. DNA use in evolutionary phylogeny
- Unit VIII Heart Dissection: Anatomy and Physiology
- A. Anatomy of chambers, vessels and structures
 - B. Physiology of blood flow
 - C. O₂ and CO₂ levels in the heart and vessel structures
 - D. Atherosclerosis anatomy and physiology
 - E. Physiology of heart contraction
- Unit IX Brain Dissection: Anatomy and Physiology
- A. Anatomy of structures
 - B. Physiology of specific brain parts
 - C. White and gray matter differences in anatomy and physiology
 - D. Neuron Anatomy
- Unit X Natural Selection Experiments
- A. Predator/Prey interactions
 - B. Adaptations of predators and prey
 - C. Natural selection
 - D. Mate choice, Non-random mating
- Unit XI Construction of the Phylogenetic Tree for Animals
- A. Evolution of animals
 - B. How to construct a phylogenetic tree
 - C. Phyla of some animal phyla
 - D. Identification of traits of some animal phyla
 - E. Evolutionary advancements of some animal phyla
 - F. How to use a dichotomas key
- Unit XII Comparative Phylogeny/Evolutionary History/Survey of Representative Animals and Non-Photosynthetic Single-Celled Eukaryotic Taxa.
Utilizing Microscopic Examination, Observation, Dissection, and Field Trips
- A. Functional Morphology
 - B. Physiology
 - C. Behavior
 - D. Ecology

E. Groups and Phyla Studied:

1. Protozoa
2. Porifera, Placozoa
3. Cnidaria, Ctenophora
4. Platyhelmenthes
5. Nematoda
6. Mollusca
7. Annelida
8. Arthropoda
9. Echinodermata
10. Chordata

Learning Activities Required Outside of Class:

The students in this class will spend a minimum of 6 hours per week outside of the regular class time doing the following:

1. Studying
2. Completing required reading
3. Written work
4. Insect collection

Methods of Instruction:

1. Assigned reading from text and selected references
2. Lecture and demonstrations given by instructor
3. Laboratory exercises using living and prepared materials
4. Field trips to make observations in nature

Methods of Evaluation:

1. Substantial writing assignments, including:
 - a. essay exams
 - b. laboratory reports
 - c. term or other papers
2. Computational or non-computational problem-solving demonstrations, including:
 - a. exams
 - b. homework problems
 - c. field work
 - d. laboratory reports
3. Skill demonstrations, including:
 - a. field work
 - b. dissection
4. Proctored, closed book/closed note unit examinations approximately every 4 weeks which include:
 - a. multiple choice
 - b. matching items
 - c. true/false items
 - d. essay

The grading is based on the mastery of the subject matter.

Laboratory Category: Extensive Laboratory

Pre delivery criteria: All of the following criteria are met by this lab.

1. Curriculum development for each lab.
2. Published schedule of individual laboratory activities.
3. Published laboratory activity objectives.
4. Published methods of evaluation.
5. Supervision of equipment maintenance, laboratory setup, and acquisition of lab materials and supplies.

During laboratory activity of the laboratory: All of the following criteria are met by this lab.

1. Instructor is physically present in lab when students are performing lab activities.
2. Instructor is responsible for active facilitation of laboratory learning.
3. Instructor is responsible for active delivery of curriculum.
4. Instructor is required for safety and mentoring of lab activities.
5. Instructor is responsible for presentation of significant evaluation.

Post laboratory activity of the laboratory: All of the following criteria are met by this lab.

1. Instructor is responsible for personal evaluation of significant student outcomes (lab exercises, exams, practicals, notebooks, portfolios, etc.) that become a component of the student grade that cover the majority of lab exercises performed during the course.
2. Instructor is responsible for supervision of laboratory clean up of equipment and materials.

Supplemental Data:

TOP Code:	040700 Zoology
SAM Priority Code:	E: Non-Occupational
Funding Agency:	Y: Not Applicable
Program Status:	1: Program Applicable
Noncredit Category:	Y: Not Applicable
Special Class Status:	N: Course is not a special class

Basic Skills Status:	N: Not Applicable
Prior to College Level:	Y: Not Applicable
Cooperative Work Experience:	N: Course is not a part of a cooperative education program
Eligible for Credit by Exam:	No
Eligible for Pass/No Pass:	Yes