COURSE OUTLINE OF RECORD

Number: BIOL G182

TITLE: Zoology

ORIGINATOR: Travis Vail

FORMERLY KNOWN AS: Biology G185 - Principles of Zoology

CROSS LISTED COURSE: TOP NO: 0407.00

CID: BIOL 150

SEMIESTER UNITS: 4.0

HRS LEC: 36.0

CONTACT HRS TOTAL: 144.0

STUDY NON-CONTACT HRS RECOMMENDED: 72.0

CATALOG DESCRIPTION:

This course provides students with a broad foundation of kingdom Animalia and animal-like protists. It focuses on ecological, evolutionary, anatomical and physiological relationships among major animal taxa. Topics include embryology, body plans, life strategies, general characteristics, reproductive modes, and life cycles of each of the major animal phyla. This course provides a solid background in animal science for those students preparing to transfer to a four-year institution or professional school (dental, pharmacy, or optometrist schools, for example). The laboratory portion of this course emphasizes hands-on learning using dissection, models, slides, charts, living specimens and non-living specimens. Students will gain experience in using compound light microscopes and dissecting microscopes to study protists, animal tissues, and body plans of appropriately sized animals (the lancelet, for example). ADVISORY: Biology G180

JUSTIFICATION FOR COURSE:

PREREQUISITES:

- GWC Math Placement Level of 50 or higher.
- MATH G030: Intermediate Algebra with a minimum grade of C or better
- OCC Math Placement Level of 50 or higher.
- MATH A030: Intermediate Algebra with a minimum grade of C or better
- CCC Math Placement Level of 60 or higher.
- MATH C030: Intermediate Algebra with a minimum grade of C or better
- MATH G040: Accelerated Elementary and Intermediate Algebra with a minimum grade of C or better

COREQUISITES:

ADVISORIES:

- BIOL G180: Cell and Molecular Biology

ASSIGNED DISCIPLINES:

Biological sciences

MATERIAL FEE: Yes [X] No [ ] Amount: $6.50

CREDIT STATUS: Noncredit [ ] Credit - Degree Applicable [X] Credit - Not Degree Applicable [ ]
COURSE OBJECTIVES:

1. Explain how certain behaviors, such as parenting within the reptilian clade or courtship behaviors among lizards, may have resulted in symplesiomorphy and synapomorphy among individuals within phylogenetic groups.

2. Diagram the phylogenetic relationships among the general animal phyla and among the subphyla and classes of phylum Chordata, indicating which derived characteristics are vital to membership in each of the taxa and delineate general characteristics and phylogenetic relationships among 16 major animal phyla covered in the course including information regarding embryological development, and other general anatomical and physiological adaptations for respiration, excretion, feeding, body organization, nervous and sensory adaptations, and skeletal structures.

3. Outline and identify the characteristics and anatomy of animals found in the chordate subphyla and vertebrate classes, including specific adaptations in circulatory, excretory, reproductive, integumentary, and digestive systems and identification of stages and structures in the embryological development of 5 distinct animal lineages (non-chordates (as an outgroup), primitive chordates, amphibians, archosaurs (birds and reptiles) and mammals), contrasting and comparing differences and describing the evolutionary significance of such differences.

4. Analyze the mechanisms and attributes of ecosystems, communities and populations; explain the theory of evolution; relate information about its primary author; describe the various mechanisms by which it occurs; and apply evolutionary concepts to validate why specific characteristics are found in certain clades while such characteristics are absent in others.

5. Comprehend, summarize, and analyze peer-review primary scientific literature, applying knowledge in such a way as to analytically evaluate the soundness of the science and predict whether such information may lead to further inquisitions within the field studied in the article.
1. Anatomically describe and properly identify members of kingdoms Protista and Animalia including embryological development, anatomical adaptations that different lineages have obtained for survival, and the ecological role they play.

2. Describe the embryology of five different lineages of animals: non-chordates, primitive chordates, amphibians, archosaurs (birds and reptiles) and mammals.

3. Outline a broad understanding of how ecological and evolutionary concepts integrate to create the biodiversity witnessed among the animals and animal-like protists.

4. Apply critical thinking and analytical skills to correctly interpret data generated in class and as encountered via peer-review scientific literature.

COURSE CONTENT:

LECTURE CONTENT:

1. Introduction of the current classification scheme of animals.

2. Examination of 5 distinct pathways different animals groups take in developmental biology (embryology) and explanation of why the pathways differ
   a. non-chordates
   b. primitive chordates
   c. amphibians
   d. birds, reptiles, and non-placental mammals
   e. placental mammals

3. Evolution
   a. people
   b. support, including reference to usage phylogenetic trees by various fields of science
   c. mechanisms of evolution
      i. natural selection
      ii. genetic drift
      iii. mutation
      iv. gene flow
   d. species concept
   e. speciation

4. Populations and communities
   a. growth
   b. interactions
   c. community succession

5. Protista
   a. polyphyletic origins
   b. survey of animal-like protists

6. Animal body plans

7. Origins of multicellularity
   a. three theories
   b. comparison of three theories to the embryology of non-chordates

8. Porifera
   a. general characteristics
   b. adaptations for a sedentary, suspension-feeding life

9. Cnidaria
   a. general characteristics
   b. Hydrozoa (including
      c. Scyphozoa
         i. life cycle
      d. Anthozoa
         i. examination of resource partitioning and adaptive radiation of corals across different microhabitats of a typical coral reef

10. Platyhelminthes
   a. general characteristics
i. Lophotrochozoa
b. Turbellaria
   i. modes of reproduction
      - asexual
      - evolutionary advantages of bi-directional sperm exchange
      - evolutionary advantages of assuming the male role in copulatory events between monoecious animals
c. Cestoda
   i. life cycle
d. Trematoda
   i. life cycle

11. Mollusca
   a. general characteristics
      i. head-foot/visceral mass synapomorphic body plan
   b. Gastropoda
      i. ancient mollusk body plan
      ii. torsion as an apomorphy in only gastropoda
c. Bivalvia
d. Polyplacophora
e. Cephalopoda
      i. complexity of anatomy compared to other mollusk classes
      ii. convergence with Subphylum Craniata (eyes and circulatory system)

12. Annelida
   a. general characteristics
      i. metamerism
      ii. tagmatization
   b. Clitellata
      i. Oligochaeta
         - adaptions to fossorial life
      ii. Hirudinea
c. Polychaeta
   i. adaptations to predatory lifestyle
   ii. epitoky

13. Nematoda
   a. general characteristics
      i. ecdysis/Ecdysozoa
   b. life cycle

14. Arthropoda
   a. general characteristics
      i. metamerism and tagmatization
      ii. evolutionary advantages of metamorphosis
   b. Trilobitomopa
      i. origin of biramous appendages
c. Chelicerata
   i. analogous body design when compared to head-foot/visceral mass body design
   ii. Merostomata
      - stabilizing selection
   iii. Arachnida
      - adaptations and pre-adaptations for survival on land
c. Crustacea
   i. body design
   ii. tagmatization
d. Hexapoda
   i. body design
   ii. flight
15. Echinodermata
   a. general characteristics
      i. secondary derivation of body symmetry
      ii. water vascular system: anatomy and uses
      iii. Deuterostomia
   b. Asteroidea
   c. Ophiuroida
   d. Echinoidea
   e. Crinoidea
      i. origin of tube feet

16. Hemichordata
   a. general characteristics
      i. dorsal nerve cord
   b. Pterobranchia
   c. Enteropnuesta

17. Chordata (initially focusing on "protochordata")
   a. general characteristics
   b. Urochordata (aka Tunicata)
   c. Cephalochordata
      i. adaptations for locomotion

18. "Fishes"
   a. Craniata, Hyperotreti
      i. characteristics
   b. Craniata, Vertebrata
      i. characteristics
   c. Vertebrata, Chondrichthyes
      i. characteristics
   d. Vertebrata, Actinopterygii
      i. characteristics
      ii. Chondrosteans and Neopterygians
   e. Vertebrata, Sarcopterygii
      i. characteristics
      ii. Lungfishes, coelacanths
      iii. Osteolepiform fishes as extince predecessors to Amphibia
   f. comparative circulatory systems among lunged an unlunged fishes
   g. comparative digestive systems between Chondrichthyes and Actinopterygii

19. Amphibia
   a. Anura
      i. characteristics
   b. Caudata
      i. characteristics
   c. Gymnophiona
      i. characteristics
   d. adaptations for life on land
   e. circulatory syslem
   f. senses
      i. evolution of verbal communication

20. Reptilia
   a. discussion of polyphyly and lack of synapomorphies within Reptilia
   b. Crocodilia
      i. characteristics
      ii. synapomorphies with class Aves
   c. Rhynchocephalia
      i. characteristics
d. Testudines
   i. lack of synapomorphies with other reptilian taxa
   ii. characteristics

e. Squamata
   i. characteristics

f. circulatory system of squamates
g. adaptations for land life

h. senses

21. Aves
   a. synapomorphic adaptations for flight as seen in various organ systems
      i. skeletal
      ii. circulatory
      iii. respiratory
      iv. excretory
      v. reproductive
      vi. sensory
      vii. integumentary (feathers)

   b. methods of navigation
      i. reasons for migration

22. Mammalia
   a. taxonomy
      i. derivation of taxonomic groups based on evolution of said groups on distinct ancient land masses

   b. synapomorphies of mammalia
      i. hair
      ii. skin glands
      iii. heterodont dentition

23. Comparative digestive systems/tracts/methods
   a. mammalian digestion
      i. 8 steps
      ii. organs involved

   b. survey of feeding mechanisms evolved in phyla previously covered

24. Animal behavior
   a. learning
   b. communication
      i. evolution of appropriate modes of communication
   c. parenting
      i. inclusive fitness
   d. evolutionary advantages and disadvantages of participation in social groups

LABORATORY CONTENT:

1. Microscopes: efficient usage and storage, identification and functions of the parts
2. Tissues: identification and understanding the basic functions of various animal tissues
3. Embryology: analysis of differences and similarities among 5 lineages (non-chordates, Cephalochordates, Amphibians, Archosaurs, and Mammals)
4. Evolution and Classification: identification of macroevolutionary trends (convergent evolution and adaptive radiation), functional causes of evolution (genetic drift and natural selection), and inquiry into species identification using the morphological species concept, analyzing structure of preserved specimens to hypothesize probable species identification
5. Populations and Communities: usage of dichotomous key to identify specimens by skull morphology, analysis of food web interactions in wild owl populations
6. Communities and ecosystems: field trip that investigates the flow of energy through an
ecosystem and the results of competing for that energy, specifically, resource partitioning, specialization and speciation.

7. Protista: use of living and preserved specimens and models to highlight differences in survival strategies among protists.

8. Animalia: an 8-week (15 lab sessions) investigation of cells, tissues, organs, organ systems and gross anatomy of preserved and living individuals from the phyla Porifera, Cnidaria, Platyhelminthes, Nematoda, Mollusca, Annelida, Arthropoda, Echinodermata, and Chordata.

9. Animalia: dissection of specimens, identification and application of anatomical terms using sample specimens from the following taxa: Bivalvia, Cephalochordata, Oligochaeta, Crustaces, Orthoptera, Asteroidea, Actinopterygii, Anura, Columbiformes, and Artiodactyla.

10. Animalia: identification of taxonomic groups via preserved examples within the following: Protista, Cnidaria, Mollusca, Annelida, Nematoda, Arthropoda, Echinodermata, Hyperotreti, Petromyzontomorphi, Actinopterygii, Sacropterygii, Aves, Amphibia, Reptilia, and Mammalia.

11. Animalia: identification of anatomical structures as presented by various organismal models representing the following taxa: Amoebozoa, Euglenoidea, Porifera, Hydrozoa, Anthozoa, Cestoidea, Turbellaria, Bivalvia, Oligochaeta, Malacostraca, Orthoptera, Asteroidea, Actinopterygii, Anura, and Galliformes.

12. Animalia: analysis and identification of hearts from 2-chambered, 3-chambered, and 4-chambered circulatory systems.


14. Students will be presented with living organisms during a number of laboratory sessions including, but not limited to Annelida, Hydrozoa, Anthozoa, and Platyhelminthes. Students will then be lead in an inquiry-based investigation that answers questions regarding the animal’s abilities to maintain homeostasis as needed for survival.

METHODS OF INSTRUCTION:

A. Lecture:

B. Lab:

C. Field Experience:

D. Independent Study:

INSTRUCTIONAL TECHNIQUES:

COURSE ASSIGNMENTS:

Reading Assignments

Textbook

Out-of-class Assignments

Writing Assignments

1. A written summary of an article chosen from the journal, Integrative and Comparative Biology (3 pages) that demonstrates the students complete comprehension of the peer-review literature.

2. A research report on an animal that is parasitic or normally feeds on humans (2 pages) that includes 3 different types of information: internet, peer-reviewed journal, and bound library book.

3. A laboratory practical examination requiring students to identify anatomy and taxonomy of specimens presented in laboratory.

METHODS OF STUDENT EVALUATION:

Midterm Exam

Final Exam

Written Assignments

Essay Examinations

Objective Examinations
Demonstration of Critical Thinking:

1. Students are required to identify anatomical structures of three-dimensional dissection specimens and laboratory models using written and two-dimensional diagrams (in laboratory manual).
2. Short essay questions are presented and assessed that provoke thought and derivation of a thesis and its support.
3. Correct application of scientific method.

Required Writing, Problem Solving, Skills Demonstration:

1. A written summary of an article chosen from the journal, Integrative and Comparative Biology (3 pages) that demonstrates the students complete comprehension of the peer-review literature.
2. A research report on an animal that is parasitic or normally feeds on humans (2 pages) that includes different types of information: internet, peer-reviewed journal, and bound library book.
3. A laboratory practical examination requiring students to identify anatomy and taxonomy of specimens presented in laboratory.

TEXTS, READINGS, AND RESOURCES:

TextBooks:

LIBRARY:

Adequate library resources include:

Comments:

Attachments:

[Attached Files](#)