

LAST REVIEW: 2008-09
(i.e. 2003-2004)

NEXT REVIEW: 2013-14
(i.e. 2008-2009)

STATUS: a
(A, I, D)

COURSE TITLE: Comparative Vertebrate Morphology and Physiology

COMMON COURSE NUMBER: ZOO4713

CREDIT HOURS:

CONTACT HOUR BREAKDOWN
(per 16 week term)

CLOCK HOURS:
(Voc. Course ONLY)

Lecture: **48** Lab:
Clinic: Other:

PREREQUISITE(S):

COREQUISITE(S): ZOO4713L

PRE/COREQUISITE(S):

COURSE DESCRIPTION This course is designed to familiarize the student with morphological and anatomical features of vertebrates from a comparative evolutionary perspective. The course starts with an introduction to the comparative method, including evolutionary concepts such as homology and homoplasy. The underlying biology of tissue-organ systems and evolutionary perspectives on the origin, maintenance, and diversification of form among the vertebrates will be discussed. The remainder of the course will be an overview of major organ systems, interspersed with discussion of particular vertebrate phenomenon that highlight the development, function and/or evolution of these organ systems :

General Education Requirements – Associate of Arts Degree (AA), meets Area(s): Area
General Education Requirements – Associate in Science Degree (AS), meets Area(s): Area
General Education Requirements – Associate in Applied Science Degree (AAS), meets Area(s): Area

UNIT TITLES

- 1. Principles of Evolution and Origins of Chordates**
- 2. Embryological development and Diversity of Vertebrates**
- 3. Integumentary System**
- 4. Musculoskeletal System**
- 5. Digestive System**
- 6. Respiratory System**
- 7. Urinary System**
- 8. Reproductive and Endocrine Systems**
- 9. Circulatory and Lymphatic Systems**
- 10. Nervous System**

EVALUATION:

Please provide a brief description (250 characters maximum) that details how students will be evaluated on the course outcomes.

**** Complete the following only if course is seeking general education status ****

GENERAL EDUCATION Competencies and Skills *:

Please highlight in green font all Competencies/Skills from the list below that apply to this course. In the box to the right of the Competency/Skill, enter all specific learning outcome numbers (i.e. 1.1, 2.7, 5.12) that apply.

1. Read with critical comprehension	
2. Speak and listen effectively	
3. Write clearly and coherently	
4. Think creatively, logically, critically, and reflectively (analyze, synthesize, apply, and evaluate)	
5. Demonstrate and apply literacy in its various forms: (highlight in green ALL that apply) (1. technological, 2. informational, 3. mathematical, 4. scientific, 5. cultural, 6. historical, 7. aesthetic and/or 8. environmental)	
6. Apply problem solving techniques to real-world experiences	
7. Apply methods of scientific inquiry	
8. Demonstrate an understanding of the physical and biological environment and how it is impacted by human beings	
9. Demonstrate an understanding of and appreciation for human diversities and commonalities	
10. Collaborate with others to achieve common goals.	
11. Research, synthesize and produce original work	
12. Practice ethical behavior	
13. Demonstrate self-direction and self motivation	
14. Assume responsibility for and understand the impact of personal behaviors on self and society	
15. Contribute to the welfare of the community	

** General Education Competencies and Skills endorsed by '05-'06 General Education Task Force*

UNITS

Unit 1 Principles of Evolution and Origins of Chordates

General Outcome:

- 1.0 The student shall: be able to discuss the history, development, and major concepts in the theory of evolution, detail the physical forces underlying vertebral evolution, and describe the origins of Chordates**

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 1.1 Understand the historical predecessors to the theory of evolution.
- 1.2 Analyze the classical species concept and understand its limitations
- 1.3 Understand the morphological concepts of homology, analogy and convergence
- 1.4 Understand how cladograms are constructed and their relationship to classification
- 1.5 Describe the fundamental physical forces underlying vertebral evolution (biomechanics and biodesign) and identify major animal body plans
- 1.6 Explain the development of vertebral design as a unity of both structure (form and function) and evolution (adaptation and natural selection)
- 1.7 Be able to list those features that chordates share with other animal phyla and those that are unique to chordates
- 1.8 Know the difference between protostomes and deuterostomes and which is generally considered immediate ancestor to vertebrates
- 1.9 Know the protochordate groups (Urochordate, Hemichordates, and Cephalochordates) and their relative phylogenetic position to vertebrates

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Unit 2 Diversity and Embryological Development of Vertebrates

General Outcome:

- 2.0 The student shall: be able to understand and describe the evolutionary characteristics unique to vertebrates and compare and contrast embryological development patterns and processes in representative vertebrate species**

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 2.1** Be able to classify the subphylum Vertebrata
- 2.2** Detail the evolutionary innovations unique to vertebrates (spinal column and head)
- 2.3** Recognize the phylogenetic relationships of the classes, subclasses, and infraclasses of vertebrates (Agnathans, Gnathostomes, Teleostomi, Tetrapods, and Amniotes)
- 2.4** Compare the different cleavage patterns found in representative vertebrate
- 2.5** Describe the process of gastrulation and neurolation in vertebrates
- 2.6** Understand histogenesis and organogenesis with emphasis on the evolutionary significance of neural crest cells and epidermal placodes
- 2.7** Discuss the concept that ontogeny recapitulates phylogeny

Unit 3 Integumentary System

General Outcome:

- 3.0 The student shall: compare and contrast the general features, evolutionary development and embryological origin of the integumentary system in representative vertebrate species**

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 3.1** Recognize the general features of the dermis and epidermis and their embryonic origins
- 3.2** Be able to name (in order) and explain the function of the layers of vertebrate epidermis
- 3.3** Understand the different integumentary adaptations and their functions found in fishes and tetrapods
- 3.4** Be able to trace the evolution of epidermal derivatives of vertebrates including integumentary glands

Unit 4 Musculoskeletal System

General Outcome:

- 4.0 The student shall: compare and contrast the basic components, evolutionary development of the musculoskeletal system and modes of locomotion in various vertebrate species**

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 4.1** Discuss the physical properties, cellular characteristics, and function of skeletal materials.
- 4.2** Describe the evolutionary development of the cranium and the variations and their functions found in the major classes of vertebrates
- 4.3** Understand the development of the jaw relative to feeding adaptations and describe the various jaw attachments found in vertebrates
- 4.4** List the basic components of the vertebral column (vertebrae, ribs, sternum) and compare the vertebral columns and their functions found in the major classes of vertebrates
- 4.5** Be able to explain the biomechanical forces on the vertebral column in aquatic and terrestrial environments and the adaptations that developed
- 4.6** List the basic components of the appendicular skeleton of vertebrates (the pectoral and pelvic girdles and the paired fins or limbs) discuss the major features found in different vertebrate classes and describe their evolutionary development
- 4.7** Compare the biomechanical forces and skeletal adaptations for different forms of locomotion – including swimming, flying, digging, walking and running
- 4.8** Describe the 3 different types of muscle – skeletal, cardiac, and smooth
- 4.9** Understand the basic principles of muscle contraction, as well as the function of muscle fibers, whole muscles and bone-muscle lever systems
- 4.10** Compare and contrast the anatomy of both cranial and post-cranial musculature among various vertebrates

Unit 5 Digestive System

General Outcome:

- 5.0 The student shall: compare and contrast the basic components of the digestive system in various vertebrate species and well as its evolutionary development**

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 5.1** Discuss the different body plans found in vertebrate and know the membranes that line the internal cavities
- 5.2** Describe the basic structures and functions of the digestive system in vertebrates
- 5.3** Understand the evolutionary adaptations of the digestive tract found in various vertebrate groups
- 5.4** Compare the digestive system anatomy of select vertebrate species

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Unit 6 Respiratory System

General Outcome:

- 6.0 The student shall: compare and contrast the general features and evolutionary adaptations of the respiratory system in representative vertebrate species**

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 6.1** Describe the basic structures and functions of the respiratory system in vertebrates
- 6.2** Understand the adaptations necessary for respiration in water and on land
- 6.3** Compare and contrast the respiratory system anatomy of select vertebrate species

Unit 7 Urinary System

General Outcome:

- 7.0 The student shall: compare and contrast the general features and evolutionary development of the urinary system in representative vertebrate species**

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 7.1** Understand the basic function and structure of urinary systems in vertebrates
- 7.2** Discuss the adaptations necessary for osmoregulation in different vertebrate environments
- 7.3** Describe the urinary system anatomy of select vertebrate species

Unit 8 Reproductive and Endocrine Systems

General Outcome:

- 8.0 The student shall: The student shall: compare and contrast the general features and evolutionary development of the urinary system in representative vertebrate species**

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 8.1** Describe the basic structures and functions of the reproductive system in vertebrates
- 8.2** Understand the evolutionary adaptations of the reproductive system found in various vertebrate groups and well as variations in sex determination
- 8.3** Compare the reproductive system anatomy of select vertebrate species
- 8.4** Detail the structure and function of the major endocrine glands and hormones found in vertebrates
- 8.5** Compare and contrast the anatomy of the endocrine glands in select vertebrate species

Unit 9 Circulatory and Lymphatic Systems

General Outcome:

9.0 The student shall: compare and contrast the evolutionary adaptations and general features of the lymphatic and circulatory systems in representative vertebrate species

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 9.1** Discuss the basic components of the circulatory system; blood, the heart, and vasculature
- 9.2** Know the various components of blood including nucleated vs. non-nucleated red blood cells
- 9.3** Understand the evolutionary changes which occurred in the heart, single vs. double circulatory systems as well as various configurations of the hearts found in vertebrates
- 9.4** Compare and contrast the adaptations of vascular patterns in various vertebrates, including the evolutionary changes of the aortic arches
- 9.5** Describe the functions and structures found in the lymphatic system of vertebrates
- 9.6** Compare the anatomy of the circulatory and lymphatic systems in select vertebrate species

Common Course Number: ZOO4713

Unit 10 Nervous System

General Outcome:

10.0 The student shall: compare and contrast the general features, anatomy and evolutionary development of the nervous system in representative vertebrate species

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 10.1** Describe the structure and function of the different cells in the nervous system as well as the neuronal circuits found in all vertebrates
- 10.2** Discuss the evolutionary changes in the brain, meninges, and spinal cord as well as their anatomy in various vertebrates
- 10.3** Know the functions of the autonomic nervous system in vertebrates
- 10.4** Detail the evolutionary changes in structure and function of receptors and sense organs, including olfaction, vomeronasal organs, gestation, lateral line system, equilibrium, audition, eyes, and thermoregulation
- 10.5** Compare and contrast the anatomy of the nervous system and sense organs in select vertebrate species