University of Arkansas – Fort Smith
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General Syllabus

BIOL 4504 Ichthyology

Credit Hours: 4 Lecture Hours: 3 Laboratory Hours: 3

Prerequisite: BIOL 2703/2701 General Zoology/Laboratory or consent of instructor.

Effective Catalog: 2018~2019

I. Course Information

A. Catalog Description:

Provides a broad overview of various aspects of the biology of fishes. Primary emphasis is placed on morphological and physiological adaptations, fish diversity and systematics, behavior, zoogeography, and ecology. Laboratory topics include morphology, taxonomy and identification, field collection, and natural history of fishes.

B. Additional Information

Field trips are required. Students are also required to dissect fish specimens in lab.

II. Student Learning Outcomes

A. Subject Matter:

Upon completion of this course, the student will be able to:

1. Compare and contrast the morphological and physiological adaptations of fishes in marine and freshwater environments.
2. Collect and analyze data on the natural history of fishes such as age and growth, feeding, and reproduction.
3. Use a dichotomous key to identify fishes.
4. Identify common freshwater fishes of Arkansas and selected representatives of various marine taxa.
5. Identify and name major orders and families of fishes worldwide.
6. Demonstrate knowledge of various field techniques for collecting fishes.
7. Explain basic aspects of fish behavior and communication, genetics, and speciation.

B. University Learning Outcomes

Ichthyology enhances student abilities in the following areas:

Analytical Skills
Critical Thinking Skills: Students will research, evaluate, and compare information from varying sources in order to evaluate authority, accuracy, recency, and bias relevant to the problems/issues, and generate solutions/analysis of problems/issues evaluated. Student will assess and justify the solutions and/or analysis, and apply appropriate mathematical/statistical models to solve problems.

Communication Skills (written and oral)
Students will compose coherent documents appropriate to the intended audience.

Global & Cultural Perspectives
Students will demonstrate understanding or application of their discipline in a global environment, and work collaboratively in the laboratory and field. This will allow students of diverse backgrounds to demonstrate how the discipline of ichthyology impacts these cultures.

III. Major Course Topics

A. Fish morphology
    1. External anatomy
    2. Scales
    3. Internal anatomy
B. Respiration
    1. Gills
    2. Air-breathing fishes
    3. Fish oxygen requirements
C. Blood and circulation
    1. Composition of the blood
    2. Heart structure
    3. Circulation pathways
    4. Blood oxygen affinity and factors affecting it
D. Buoyancy and thermal regulation
    1. Methods of achieving neutral buoyancy
    2. Structure and functioning of swim bladders
    3. Behavioral thermoregulation
    4. Physiological thermoregulation
E. Hydromineral balance
    1. Osmoregulation
    2. Ionic regulation
    3. Stress responses and effects
    4. Resistance to freezing
    5. Acid-base balance
F. Feeding, nutrition, digestion, and excretion
    1. Categories of feeding habits
    2. Some morphological adaptations
    3. Methods of prey capture

4. Parts of digestive system and their functions

G. Growth
1. Factors affecting growth
2. Growth regulation
3. Growth rate measurements and models

H. Reproduction
1. Reproductive anatomy
2. Breeding behavior
3. Embryonic development and life cycle stages
4. Physiological adaptations
5. Mating systems
6. Alternate reproductive strategies

I. Sensory perception
1. Chemoreception
2. Olfaction
3. Taste
4. Acousticolateralis system
5. Hearing
6. Balance
7. Electroreception
8. Vision

J. Behavior and communication
1. Migratory behavior
2. Shoaling behavior
3. Feeding behavior
4. Aggressive behavior
5. Communication

K. Systematics, genetics, and speciation
1. Taxonomic methods
2. Genetic variability
3. Speciation
4. Hybridization
5. Nomenclature

L. Evolution
1. The earliest vertebrates
2. Ostracoderms
3. Placoderms
4. Chondrichthyes
5. Acanthodii
6. Osteichthyes
7. Sarcopterygii
8. Actinopterygii

M. Major groups of living fishes
1. Hagfishes and lampreys
2. Sharks, rays, and chimaeras
3. Relict bony fishes

4. Bonytongues, eels, and herrings
5. Minnows, characins, and catfishes
6. Smelt, salmon, and pike
7. Anglerfish, barracudinas, cods, and dragonfishes
8. Mullets, silversides, flying fish, and killifish
9. Opahs, squirrelfish, dories, pipefish, and sculpins
10. Perciformes: snooks to snakeheads
11. Flounders, puffers, and molas

N. Zoogeography
1. Broad zoogeographic patterns
2. Zoogeographic regions
3. Plate tectonics and the distribution of freshwater fishes

O. Laboratory Topics
1. Arkansas fish diversity
2. Taxonomic characters
3. Laboratory identification of selected Arkansas fishes
4. Laboratory identification of selected marine fishes
5. Field trips to collect and identify local fish specimens
6. Fish morphology
7. Age and growth
8. Reproduction
9. Fish parasitology