

University of Arkansas – Fort Smith
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General Syllabus

BIOL 4403 Evolutionary Biology

Credit Hours: 3

Lecture Hours: 3

Laboratory Hours: 0

Prerequisite: BIOL 3803/3801 Genetics/Laboratory

Effective Catalog: 2018~2019

I. Course Information

A. Catalog Description

Introduction to principles of evolution. Examines the history of the development of evolutionary theory and the mechanisms of evolutionary change. Fundamental concepts of evolutionary genetics, adaptation and natural selection, the origins of biological diversity, and macroevolution are included.

II. Student Learning Outcomes

A. Subject Matter

Upon successful completion of this course, students will have the ability to:

1. Assess the historical development of the modern evolutionary theory.
2. Dissect the evolutionary theme in nature.
3. Develop the scientific basis of modern evolutionary theory.
4. Examine the mechanisms of evolution.
5. Classify applications of biological evolution in current issues.
6. Explain in writing a scientific explanation of evolutionary theory.

B. University Learning Outcomes

BIOL 4403 Evolutionary Biology enhances student abilities in the following areas:

Analytical Skills

Quantitative Reasoning: Students will identify a problem by evaluating observational data, formulating a testable hypothesis, statistically testing a hypothesis, determining the level of statistical significance, making inferences, and evaluating the implications.

Communication Skills (written and oral)

Students will communicate with their lab partners to arrange work assignments for lab. Students will make a scientific presentation in both oral and poster form.

Ethical Decision Making

Students will model ethical decision-making processes by (1) identifying ethical dilemmas and affected parties, and (2) applying ethical frameworks to resolve these ethical dilemmas.

Global and Cultural Perspectives

Students will demonstrate an understanding that all humans, regardless of race or culture, are interrelated and have a profound influence on their environment.

III Major Course Topics

- A. Development of Evolutionary Thought
 - 1. Scientific paradigm shifts
 - 2. Charles Lyell and uniformitarianism
 - 3. Thomas Malthus and competition for resources
- B. Darwinian Evolution
 - 1. Natural selection & Common descent
 - 2. Alfred Russel Wallace
 - 3. Modern synthesis
- C. Components of Natural Selection
 - 1. Competition & predation
 - 2. Adaptation & constraints
- D. Phylogenetics
 - 1. Synapomorphy vs. homoplasy
 - 2. Tree interpretation & hypothesis testing
 - 3. Inference & statistical confidence
- E. Darwinian Evolution with Mendelian Genetics
 - 1. Hardy-Weinberg Model of population genetics
 - 2. Natural selection, mutation, migration, nonrandom mating
 - 3. Genetic drift, coalescent theory, biogeography
 - 4. Neutral theory, linkage disequilibrium, adaptive landscapes
 - 5. Molecular clock hypothesis
- F. Origin and Evolution of Life
 - 1. RNA World hypothesis
 - 2. Metabolic networks to early cells
 - 3. Eukaryotic cells, Multicellularity, Individuality, Populations
- G. Speciation
 - 1. Species concepts & modes of speciation
 - 2. Reproductive isolating mechanisms
- H. Extinction
 - 1. Extinction in phylogenetics & the fossil record
 - 2. Background extinction vs. mass extinctions
 - 3. Species longevity & probability of extinction

- I. Evolutionary Interactions
 1. Sexual selection
 2. Cooperation & conflict
 3. Coevolution