Course Outline for: BIOL 1120 Introduction to Evolutionary Biology

A. Course Description:

1. Number of credits: 3
2. Lecture hours per week: 3
3. Prerequisites: ENGC 0960 (C- or better) OR READ 0960 (C- or better) OR High School GPA of 2.60+ OR ACT Sub-Score of 21+ OR ACT Sub-Score of 19+ and High School GPA of 2.50+ OR SAT Read/Write score of 480+ OR SAT Read/Write score of 440+ and High School GPA of 2.50+ OR Accuplacer Reading score of 250+ OR Accuplacer Reading score of 236+ and High School GPA of 2.50+ OR MCA Reading score of 1047+ OR MCA Reading score of 1042-1046 and High School GPA of 2.50+
4. Corequisites: None
5. MnTC Goal: #3 Natural Sciences

A non-majors general education course without lab. Exploration of the process of biological evolution and the fundamental mechanisms and concepts by which evolution works. Topics typically covered include the nature of science, the science history of evolution, evidence and processes of evolution, natural selection and adaptation, role of DNA variation and gene regulation in evolution, macroevolution, and the tree of life.

B. Date last reviewed/updated: January 2023

C. Outline of Major Content Areas:

Subtopics listed under each main topic may vary due to recent developments in the field and current events.

1. Nature of Science and Evolution
   a. Scientific Method
   b. Evolution as a Science
   c. Evolution as a Theory
2. History of Evolutionary Ideas
   a. Natural Philosophy before Evolution
   b. Darwin's Idea and the Voyage of the Beagle
   c. Darwin and Wallace's Evolution by Natural Selection
   d. Darwin and Mendel's Laws of Inheritance (Modern Synthesis)
3. Evidence of Evolution
   a. Fossils
   b. Biogeography
   c. Molecular Genetics
   d. Anatomy and Embryology
   e. Experiments and Observations
4. Processes of Evolution
   a. Mutation
   b. Genetic Drift

c. Gene Flow
5. Natural Selection
   a. Experiments and Evidence
   b. Adaptation
   c. Sexual Selection
   d. Hardy-Weinberg Equilibrium
6. Genetic Variation
   a. Molecules of Evolution
      i. DNA
      ii. RNA
      iii. Protein
   b. Genomes and Gene Regulation
   c. Heritable Variation in Individuals
   d. Variation in Populations
   e. Quantitative Genetics and the Evolution of Phenotypes
7. Evolution of Life
   a. Evolutionary Time
   b. Evolution of RNA and Single Celled Organisms
   c. Evolution of Multi-celled Organisms
8. Tree of Life
   a. Phylogeny
   b. Molecular Phylogeny (History in the Genes)
9. Origin of Species
   a. Speciation and Macroevolution
   b. Mass Extinctions
   c. Adaptive Radiations
   d. Coevolution
10. Humans and Evolution
   a. Human Evolution
   b. Evolution and Medicine
   c. Culture, Religion and Evolution

D. Course Learning Outcomes:

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

1. Define evolution and describe the mechanism of natural selection as the primary mode of evolutionary change in populations. (Goal 2c, 3a)
2. Identify other modes of evolutionary change besides natural selection. (Goal 2c, 3a)
3. Describe the roles of ecological forces that drive evolutionary change. (Goal 2a, 2c, 3a, 3c)
4. Describe the detailed role of DNA, transcription, recombination, and gene regulation as the underlying mechanism of biological change. (Goal 2a, 2c, 3a, 3c)
5. Compare and contrast microevolution and macro-evolutionary concepts. (Goal 2a, 3a, 3c)
6. Recognize, describe, analyze, interpret, and communicate in writing and verbally the bodies of evidence used to understand evolutionary biology. (Goal 2a, 3a, 3c)
7. Construct and interpret evolutionary phylogenies according to the concepts of common ancestry and parsimony of derived characters. (Goal 2a, 2c, 3a, 3c)

8. Summarize the imperfect nature of evolutionary adaptation and how modern traits carry the baggage of ancestral evolution. (Goal 2a, 2c, 3a, 3c)
9. Demonstrate the relevance of evolutionary theory in many modern issues, including but not limited to infectious disease, human behavior, genetic engineering, general education and religion. (Goal 2a, 2b, 2c, 2d, 3a, 3c, 3d)

E. Methods for Assessing Student Learning:

A variety of evaluation and assessment methods may be used:

1. Written examinations (multiple choice, true-false, fill-in-the-blank, matching, short answer, and critical thinking essay questions)
2. Assignments outside of class
3. Discussions
4. Writing assignments
5. Graphical presentation of data
6. In-class group work
7. Oral presentations
8. Quizzes
9. A final comprehensive exam

F. Special Information:

Instructors will include the most recent version of the Departmental Expectations document in their course syllabus.