

**Course Outline for:** BIOL 1502 Principles of Biology 2**A. Course Description**

1. Number of credits: 4
2. Lecture hours per week: 3  
Lab hours per week: 3
3. Prerequisites: BIOL 1501 (C or higher)
4. Corequisites: None
5. MnTC Goal: #3 Natural Sciences

This course is the second in a sequence designed for students majoring in biology and other science related fields, including the health professions. Students will explore the evolution and diversity of organisms and their interactions with each other and the environment. Students will engage in techniques appropriate to the study of diverse organisms and their interactions and gain experience in experimental design, data analysis and interpretation, and the communication of results. Lecture 3 credits, 3-hour lab 1 credit.

**B. Date last reviewed/updated:** April 2023**C. Outline of Major Content Areas**

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

1. Darwinian evolution
  - a. Historical perspectives regarding Darwinian evolution
2. Modern synthesis
  - a. Review of cell cycle and mitosis and meiosis
  - b. Review of Mendelian and molecular genetics
  - c. Genetic variation
  - d. Hardy-Weinberg principle
  - e. Forms of selection
  - f. Microevolution
3. Macroevolution
  - a. Divergence
  - b. Reproductive isolation
  - c. Adaptive radiation
  - d. Biological species concept
  - e. Punctuated equilibrium
4. Phylogeny
5. Evidence of evolution
6. Diversity

- a. Archaea
- b. Eubacteria
- c. Protista
- d. Fungi
- e. Plantae
- f. Animalia
- 7. Population ecology
  - a. Demography
  - b. Life history
  - c. Population growth models
- 8. Community ecology
  - a. Stability and diversity
  - b. Coevolution and symbiosis
  - c. Species interactions
  - d. Ecological succession
  - e. Island biogeography
- 9. Ecosystem ecology
  - a. Biogeochemical cycles
  - b. Trophic levels
  - c. Energy flow
  - d. Climate
  - e. Major biomes
  - f. Aquatic ecosystems
- 10. Paleoecology
  - a. Plate tectonics
  - b. Geologic time
  - c. Cambrian explosion?

**Laboratory:** Students will actively participate in lab by engaging in studies related to:

- 1. Microscopy
- 2. Principles of ecology
  - a. Population growth
  - b. Species interactions
- 3. Mechanisms of evolution
  - a. Mutation
  - b. Proteomics
- 4. Evolutionary history of biological diversity, reproduction and development
  - a. Systematics
  - b. Phylogenetics
  - c. Bacteria and Archaea
  - d. Protista
  - e. Plants
  - f. Fungi
  - g. Animals

## **D. Course Learning Outcomes**

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

1. Understand and apply knowledge of plant biology, animal biology, evolution and diversity, and ecology. (Goal 2a, 3a)
2. Recall, explain, and apply concepts, knowledge, and vocabulary of biology at the level necessary for success in subsequent biology courses for science majors. (Goal 2a, 3a)
3. Demonstrate understanding of scientific theories in biology. (Goal 3a)
4. Demonstrate quantitative reasoning skills at a level appropriate for subsequent courses in biology for science majors. (Goal 2a, 3b)
5. Distinguish between and demonstrate appropriate use of primary and secondary scientific literature. (Goal 2a, 3a)
6. Formulate and test hypotheses by performing laboratory experiments in biology that include the collection of data, statistical analysis, graphical presentation of results, and interpretation of sources of error and uncertainty. (Goal 2a, 2b, 2c, 2d, 3b)
7. Communicate experimental findings both orally and in writing. (3c)
8. Understand and apply knowledge of the use of the microscope and other biological laboratory equipment and apply that knowledge in the proper conduct and interpretation of laboratory investigations. (Goal 2a, 2b, 2c, 2d, 3a, 3b)
9. Describe current biological issues and research and evaluate societal issues in a biological context. (Goal 2a, 2b, 2c, 2d, 3a, 3d)

#### **E. Methods for Assessing Student Learning**

A variety of evaluation and assessment methods maybe used including, but not limited to, the following:

1. Written examinations (multiple choice, true-false, fill-in-the-blank, matching, short answer, and critical thinking questions)
2. Quizzes
3. Written assignments or papers
4. Graphing exercises
5. Problems
6. Laboratory reports
7. Oral presentations
8. Classroom activities
9. A final comprehensive exam

#### **F. Special Information**

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

The laboratory portion of the course is delivered in the Biology Learning Center (BLC). Instructors will include the most recent version of the Biology Learning Center (BLC) Expectations document in their course syllabus.

Laboratory procedures may require the handling, treatment, manipulation, and killing of living organisms including but not limited to plants, termites, and microorganisms; there are no exceptions or alternate activities.